

# Vehicle Based Data for Road Winter Service

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This project is  
a collective work of  
PIARC TC 2.4. WG3.



TRAFIKVERKET

## Diapositiva 1

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T1

I think it would be more appropriate to show the PIARC Logo rather than individual agency logos. Piarc is the primary sponsor of this work.

Test; 27/01/2014

## CONTENT

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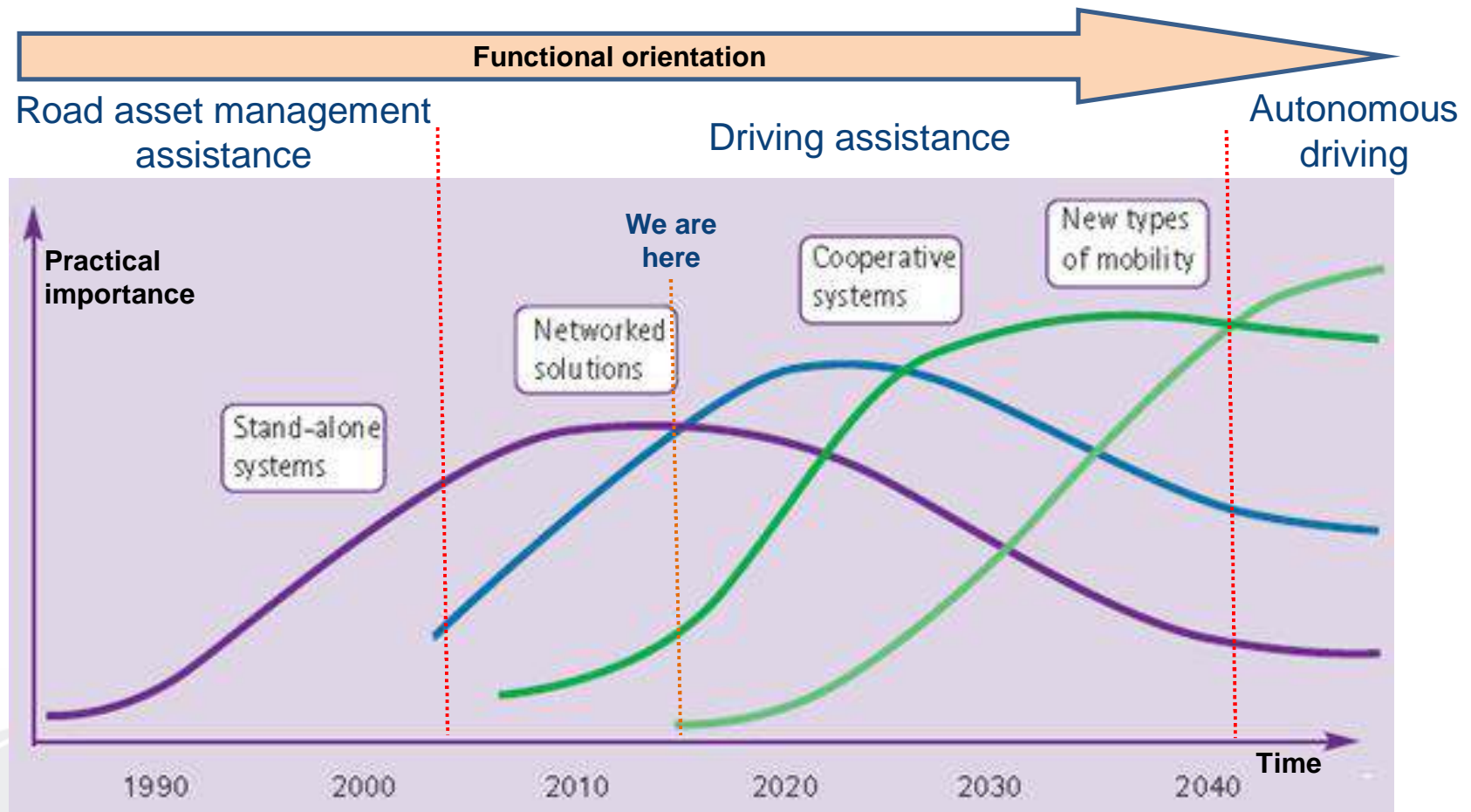
1. Project's overview
2. General trends
3. Vehicle based data scope
4. Case studies
5. Findings and conclusions

## 1. PROJECT'S OVERVIEW

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- ✓ **TITLE:** Advanced technology for data collection and information to road users and operators.
- ✓ **SCOPE:** vehicle based data (types, accuracy, accessibility, handling and use).
- ✓ **TEAM:** PIARC Technical Committee 2.4. Working Group 3.
- ✓ **TIMELINE:** 09.2012. – 03.2015.
- ✓ **METHODOLOGY:** Case studies, bibliographic review, joint meetings, questionnaire.
- ✓ **GEOGRAPHICAL COVERAGE:** Europa and Northern America.
- ✓ **PLANNED OUTPUT:** PIARC technical report and thematic conference at a country in transition.

## 2. GENERAL TREND OF ITS DEVELOPMENT



**Long term motivation:** effective multimodal split and autonomous driving.

**Opportunities:** globalisation and fast development of IT.

**Needs:** various real-time spatial transport data.

**Barriers:** data privacy and technological interoperability<sup>T2</sup>

## Diapositiva 4

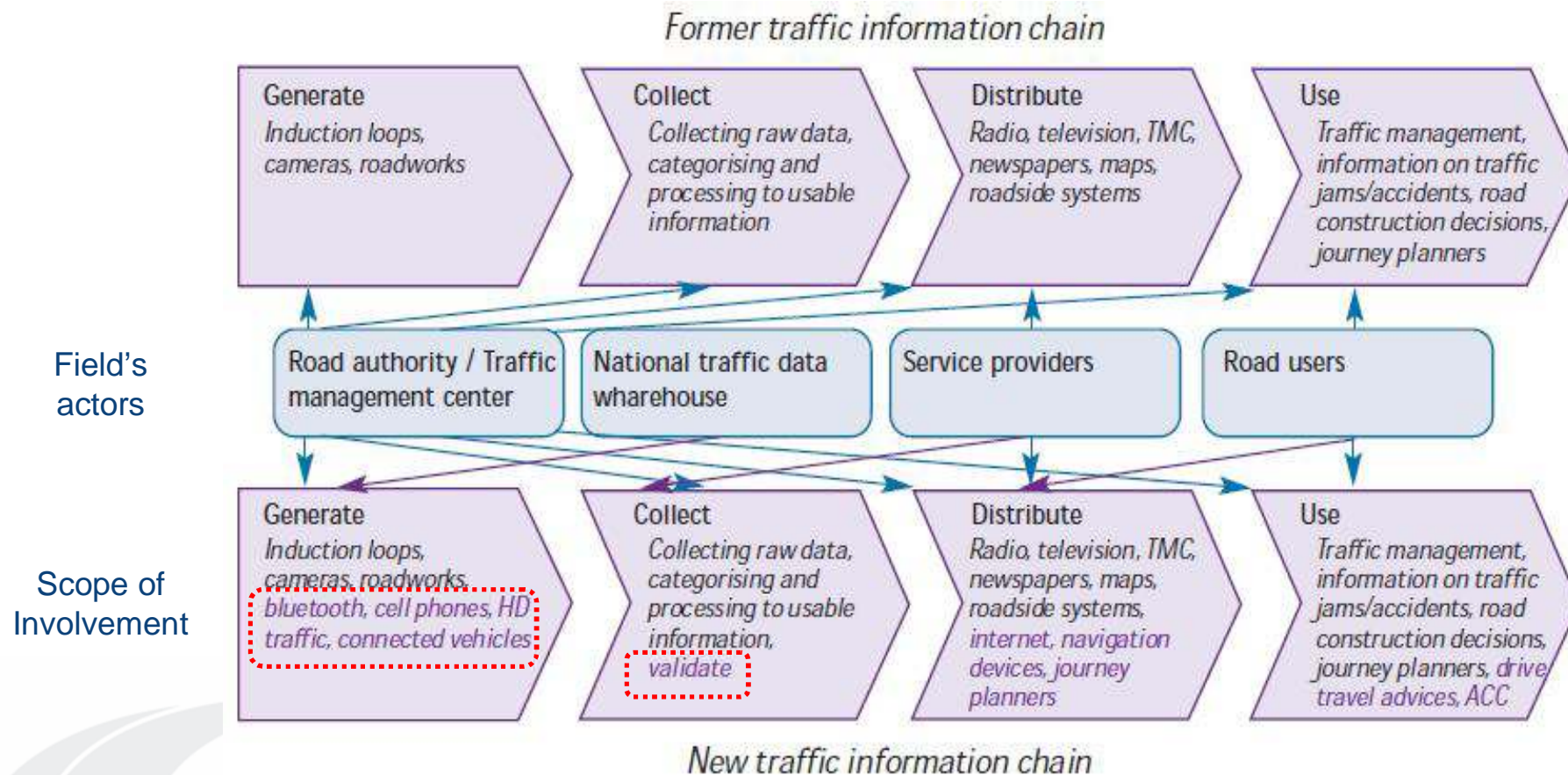
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T2

Coherence is a good word; in the US the commonly used term is "interoperability"...

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### 3. TRAFFIC INFORMATION CHAIN WITH NEW TYPES OF DATA



**Features:** vehicles are traffic/weather mobile probes by themselves;  
 basic mobile data already exist, but still not widely used in MDSS;  
 communication V2I is quite mature, but V2V has only pilot implementations.

## Diapositiva 5

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T3

I would expect to see arrows coming out from the bottom row elements into the middle row elements; for example, if we think of connected vehicles as a form of crowd-sourcing, arrows going from the "Generate" or "collect" modules be going back to the Road Authority or the National Traffic Data Warehouse? I guess I'm not understanding the Feedback loop for the mobile data in the illustration....

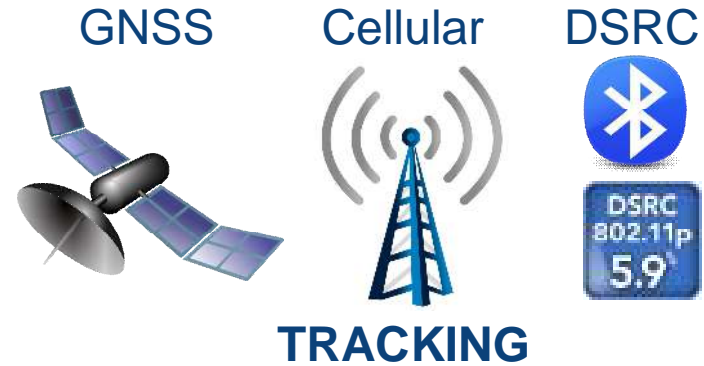
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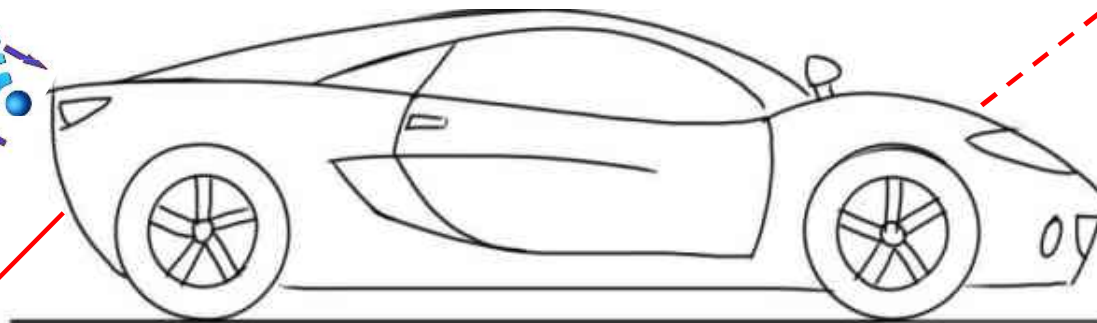
T4

## 4. VEHICLE BASED DATA FOR ROAD WEATHER APPLICATIONS

**Type:** collective derived data;  
**Data scope:** traffic flow and road conditions (indirectly);  
**Technologies:** common (FCD) and dedicated (DSRC a.o.).



DATA TRANSFER MEDIA



INTRINSIC SYSTEM



**Type:** individual derived data;  
**Data scope:** road conditions (indirectly);  
**Technologies:** on-board car diagnostic tools (CANbus a.o.).

**Type:** individual measured data;  
**Data scope:** traffic obstacles, road and weather conditions;  
**Technologies:** traditional in-bulit (ABS, ESC a.o.) and optional (radar a.o.).

## Diapositiva 6

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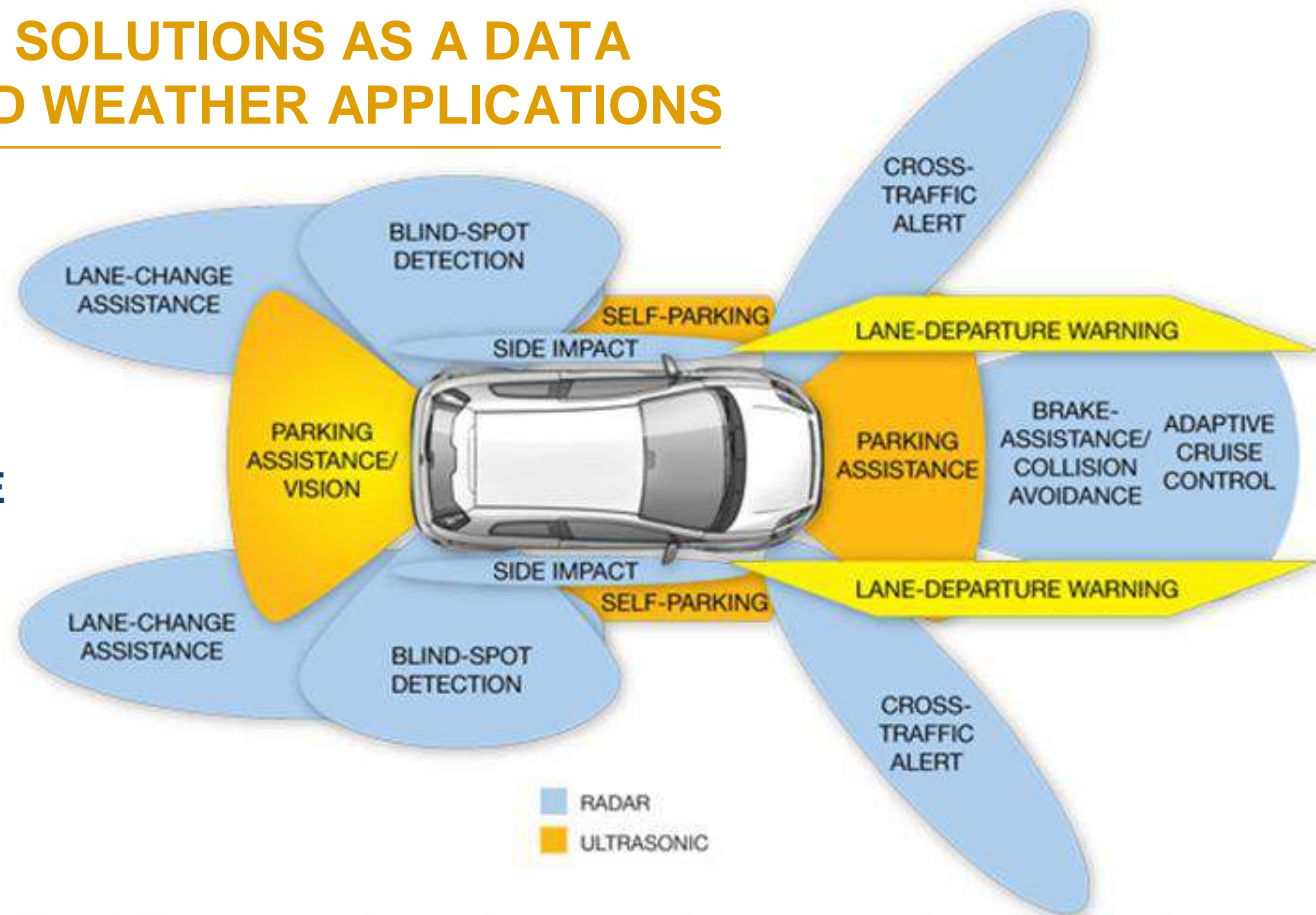
T4

Be sure to explain what the acronyms and abbreviations mean; personally, I do not know what a.o. or FCD stand for.

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## 5. IN-CAR SENSING SOLUTIONS AS A DATA SOURCE FOR ROAD WEATHER APPLICATIONS

### NEW ELEMENTS OF MODERN IN-CAR ACTIVE SAFETY SYSTEM.



#### Key points:

- ✓ different status data (yes/no) are captured by common in-car techniques (w/s wiper, ABS a.o.);
- ✓ there are some measured data also (f.i., air temperature, rain intensity);
- ✓ specific road data can be captured only with optional equipment on limited fleet (grip, road temp.);
- ✓ advanced driving assistance solutions may provide additional road data (technology in progress).

## 6. REAL-TIME DATA USE IN ROAD WEATHER APPLICATIONS

### Roadside equipment



- ✓ Max. accuracy.
- ✓ Specific environmental measurements.
- ✓ Data from certain point over time.
- ✓ Mature technology.
- ✓ Models' base.

### MDSS



### TIS

I2I  
Basic data

V2I  
Additional data

### Vehicles



### Added value:

- ✓ cost-effective data input;
- ✓ full network-wide real-time sensing;
- ✓ models' self calibration and cross checking opportunities.

- ✓ Spatial or linear multipoint coverage.
- ✓ Vast amount of measurements.
- ✓ Some data already exist.
- ✓ Data costs shared with car owners.
- ✓ Technology in development.
- ✓ Models' supplement.

## 7. CASE STUDIES

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- ✓ Scope: 10 different projects are analyzed (2 from USA and 8 from Europe);
- ✓ Projects' identification: 5,9GHzWA, SMITS, HERE, IMO2.0, CoSys, Fast-RO, Bluetooth VT, jTEC, BITSVint, Mobi-Roma.
- ✓ Projets' status: 4 are still on-going.
- ✓ Major findings:
  1. the accent is on special fleet (taxis, spreaders, public transport a.o.);
  2. mobile data shows certain correlation with the context, but still need to be interpreted more precisely;
  3. mobile data transfer is practically effective through various V2I interfaces;
  4. mobile data acquisition from ordinary vehicles asks for broad partnership and multipurpose data use.

T5

## Diapositiva 9

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T5

Finding # 4 will need some explaining. Challengeable in what sense? People could argue that the usefulness of vehicles intrinsic data (some parameters, at least) have undeniable benefit to the winter road maintenance community.

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## 8. CONCLUSIONS

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- ✓ Vehicle based data has a huge and still underestimated potential for road weather applications.
- ✓ This data can be gathered without investments in roadside installations (also ESS amount throughout the network can be limited).
- ✓ Vehicle's tracking data is already usable for traffic monitoring and identification of weather related events.
- ✓ Road weather applications should benefit from the latest in-car driving assistance and safety systems.
- ✓ Vehicle→infrastructure data flow is dominated in ready-to-use applications (V2V and mutual V2I solutions are more complicated).
- ✓ Capturing real-time vehicle's intrinsic data is technically possible, T6 but need to be laid down with a clear business model and to be coordinated with legal issues (privacy concern).

## Diapositiva 10

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T6

I like this conclusion. Consider expanding a little bit to include issues such as finding the right "business model" for vehicle manufacturers (OEM's) and the issue of "liability" assignment (or immunity); as legal issues go beyond just privacy issues. You can always discuss this rather than putting it on paper.

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