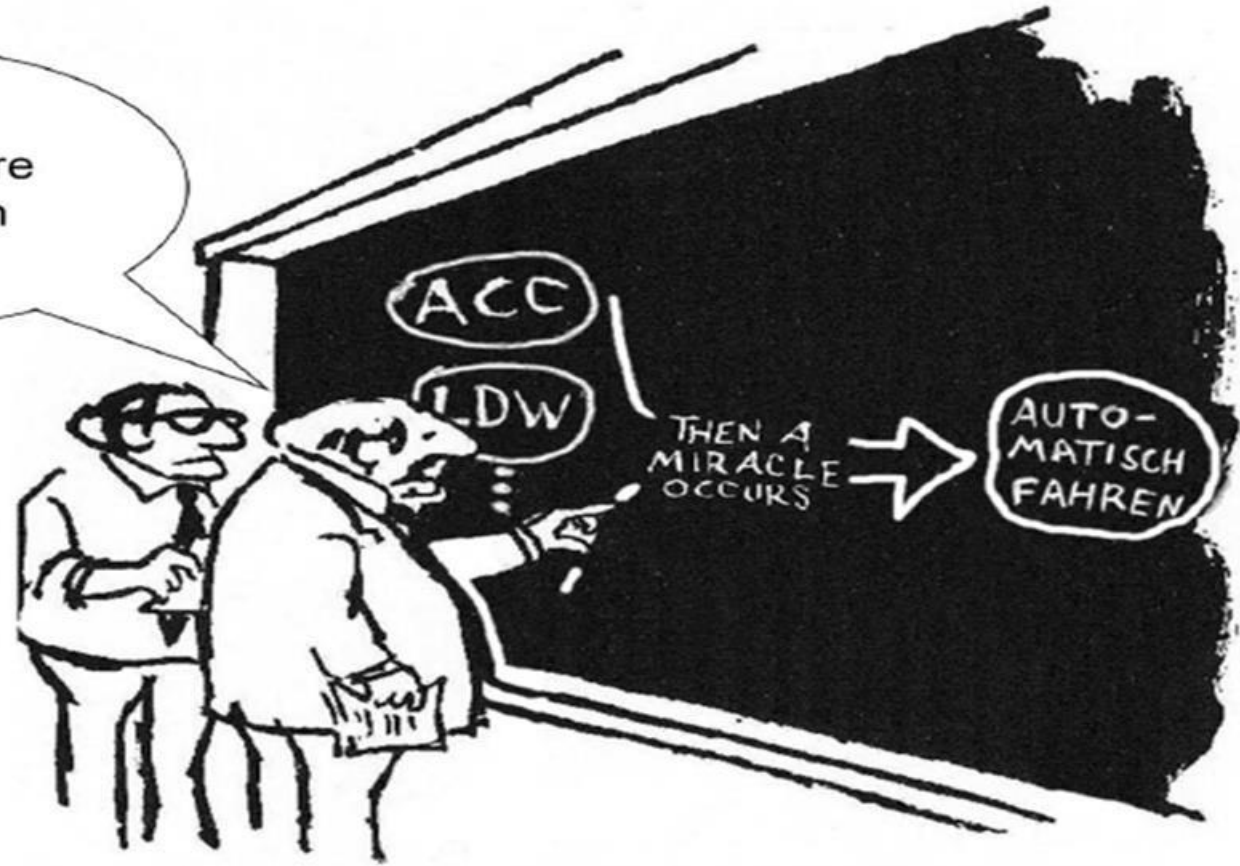# Challenges on data necessary to serve Automated Driving

Jean-Charles Pandazis, ERTICO - ITS Europe
SIP-adus workshop, dynamic map session
Tokyo, 14/11/2017

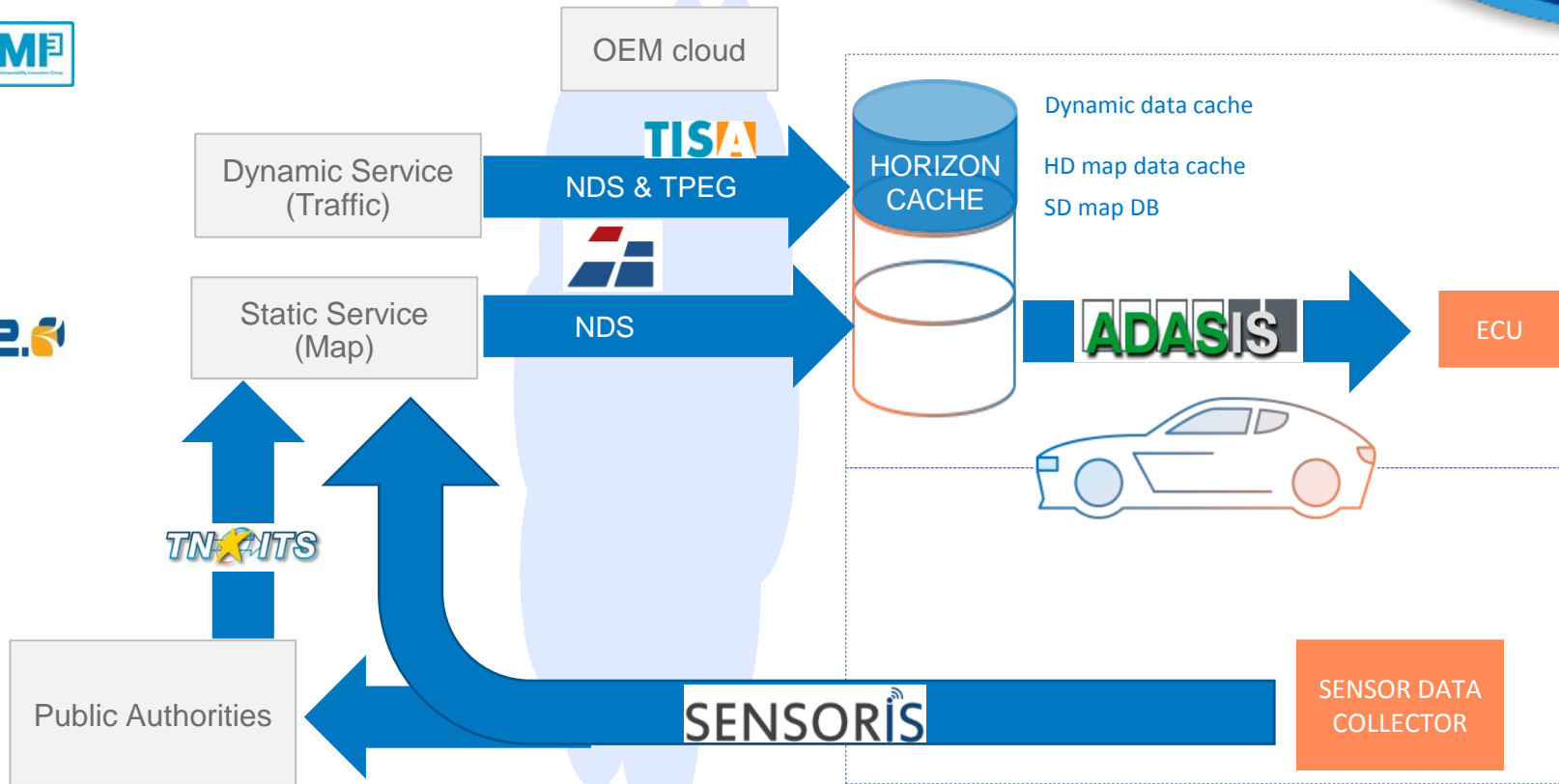# Challenges on Data Necessary to Serve Automated Driving

Data/Information is key and a common denominator, but what do we have today?

- many initiatives around Automated Driving

- many stakeholders with different views

- many use cases involving data of different kind

- standards fragmentation

What do we need?

- harmonisation and coherency

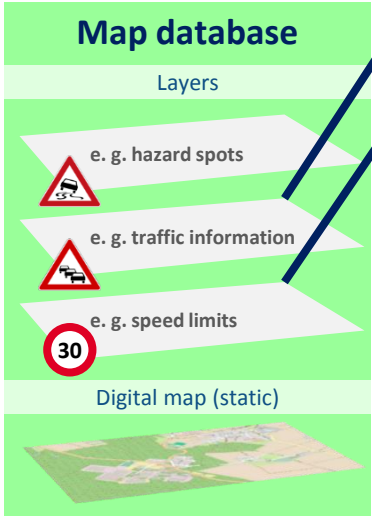- same understanding of the data eco-system

Automated driving data chain, ecosystem and beyond

ADASIS horizon

TPEG: Traffic Information

TIS/A

NDS: Incremental Map Update

Map database

Layers

e. g. hazard spots

e. g. traffic information

e. g. speed limits

Digital map (static)

In-vehicle systems

HMI

ADAS, Energy Management

Map data
(e.g. NDS Format)

► Determination of location and most probable path (MPP)

► Enrichment of MPP with road information (e.g. topography, speed limits)

► Conversion into ADASIS format

Relevant information for road ahead (ADASIS Format)

ADASIS horizon specifications supports major mobility trends

Energy Efficiency

- Reduced fuel consumption by linking topographic and speed limit information to other control units (e.g. cruise control, intelligent gearbox management)

- Improvement of battery consumption through driving strategies for (hybrid) electric vehicles

Connectivity & Assistance

- Increased safety and comfort for driver through predictive, real-time road information

- Enhanced performance of driver assistance systems

- More precision for electric vehicle range estimation

Automated Driving

- Provision of road information beyond reach of vehicle sensors is a key requirement for automated driving systems

- Enhanced performance of automated driving systems

- Enabling precise localization

ADASIS horizon addresses all major future mobility trends: connected, electrified and automated

members (56 including 11 Japanese members)

Vehicle Manufacturers (16)
BMW
China FAW-RDC
CRF (FCA)
Daimler *
Ford *
Ford-Otosan
Honda *
Hyundai Motor Company
Jaguar
Opel *
Nissan
Renault
Toyota Motor Corp.
Volkswagen
Volvo Car Corp.
Volvo Tech. Dev. Corp.

ADAS Manufacturers (17)
Autonomos
Continental Automotive *
CTAG
Delphi Automotive systems
Denso
dSPACE
**Fujitsu Ten (Europe) **
Hitachi
Ibeo
IPG
Knorr-Bremse
LG Electronic
Magna Electronic Europe
Magneti Marelli
Novero
TRW (ZF)
Valeo

Navigation System Manufacturers (13)
AISIN AW
Alpine
Autoliv
Elektrobit Automotive
Garmin
Harman
Mappers Co.
Mitsubishi Electric Europe
MXNAVI
NNG LLC
Panasonic
Robert Bosch GmbH * *(ADASIS Chair)*
Telenav

* *Steering Board Members*
** *New Members since 06/2016*

Map & Data Providers (10)
AND
AutoNavi Holding
Baidu Netcom
eMapgo Technologies
GeoDigital Automotive
Here *
Navinfo Co
TomTom *
Wuhan Kotei Informatics
Zenrin

v3 specifications supports highly automated driving

New ADASIS v3 specifications supports different aspects of autonomous driving
- Support of HAD maps (NDS)
- supporting long range horizon without any restrictions
- update & erasure mechanism for dynamic data
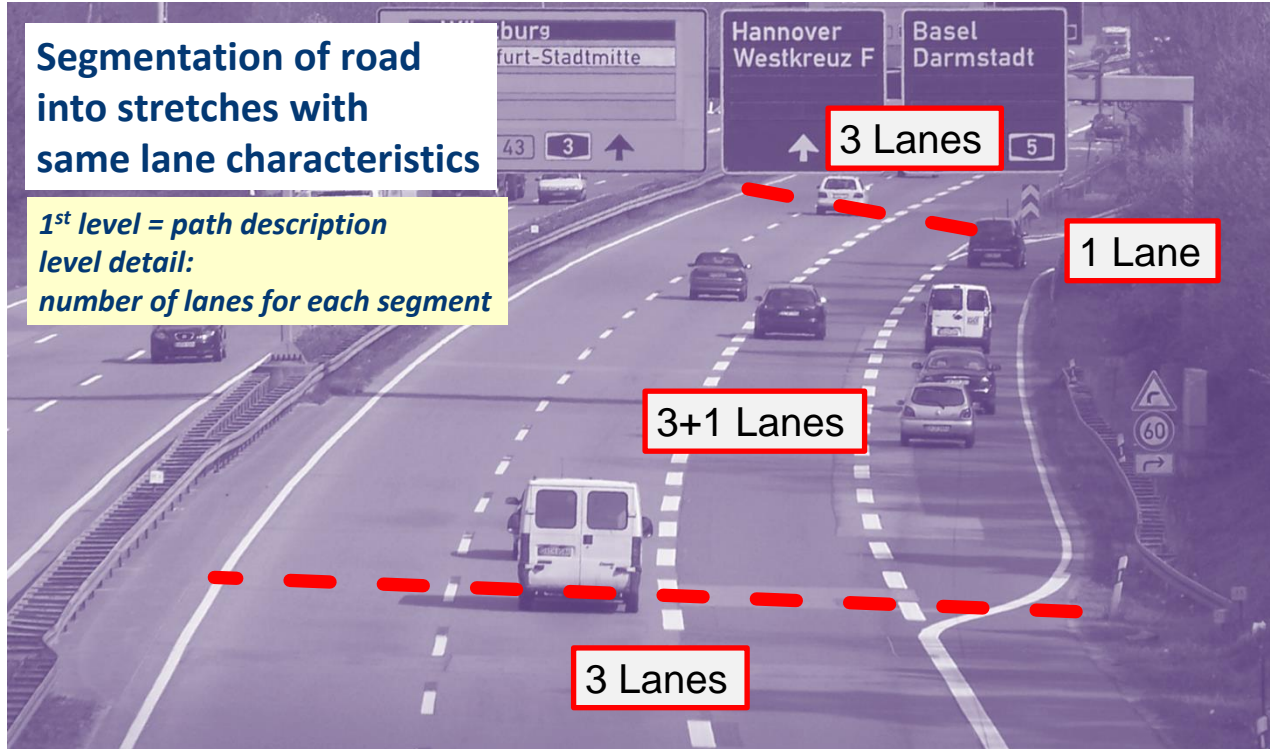

Copyright: Here.com

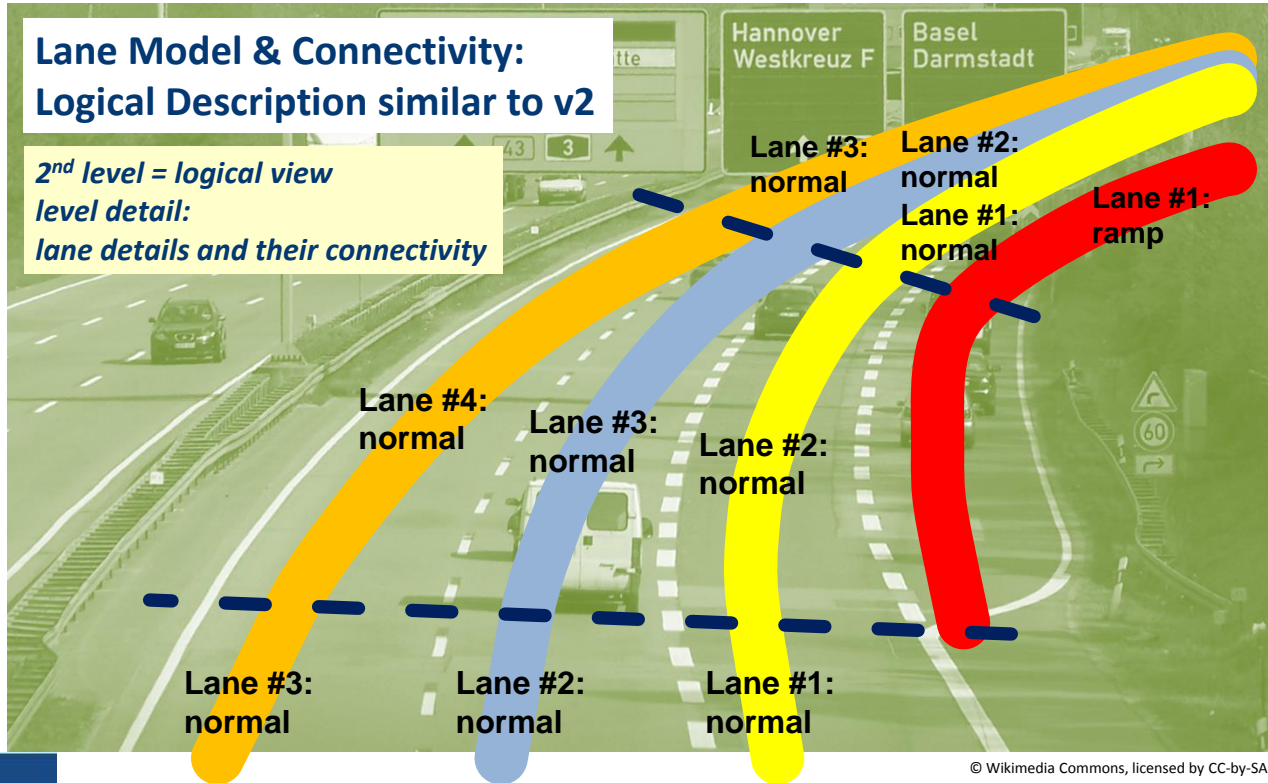# v3 specifications supports highly automated driving
Lane model & Geometry

Example: Highway Exit

"switch from a map-centric view to a vehicle-centric view of the world to create a simpler representation"

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v3 specifications supports highly automated driving

Lane model & road segmentation

Segmentation of road into stretches with same lane characteristics

*1st level = path description level detail:
number of lanes for each segment*

3 Lanes

1 Lane

3+1 Lanes

3 Lanes

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Lane model & connectivity

Lane Model & Connectivity:
Logical Description similar to v2

2nd level = logical view
level detail:
lane details and their connectivity

Lane #3: normal
Lane #2: normal
Lane #1: normal
Lane #1: ramp

Lane #4: normal
Lane #3: normal
Lane #2: normal

Lane #3: normal
Lane #2: normal
Lane #1: normal

Hannover Westkreuz F
Basel Darmstadt

Lane model & geometry

Geometry for Linear Objects:
- **Lane Boundaries**
- **Guardrails**

3rd level = geometry description level detail:
geometry of road, lane and lines

lines and boundaries

Lane #3: normal

Lane #2: normal

Lane #1: normal

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ERTICO
ITS EUROPE

Next steps

- v3 specifications currently under review within ADASIS

- Release of ADASIS v3 specifications to all ADASIS members (Q1/2018)

- Public release planned one year after (Q1/2019)

- Development of a reference implementation for ADASIS members only

- Initiate cooperation with ITS Japan and other ITS organisations to wider inform on ADASIS

SENSORIS - Vehicle based Sensor Data Interface

- Initiated by HERE, coordinated by ERTICO, Constituted on June 2016

- Open group from the global vehicle industry and suppliers who joined forces to standardise open specifications for vehicle based sensor data interface

- Focus on Sensor Data upstream

- Part of Open AutoDrive Forum => alignment with NDS, ADASIS and TISA

- Liaison with other Sensor Data specifications, e.g. Ko-HAF project (BMBF)

- 1st specifications planned for Q1/2018, Public released planned Q1/2019

- Initiate cooperation with ITS Japan and other ITS organisations to wider inform on SENSORIS
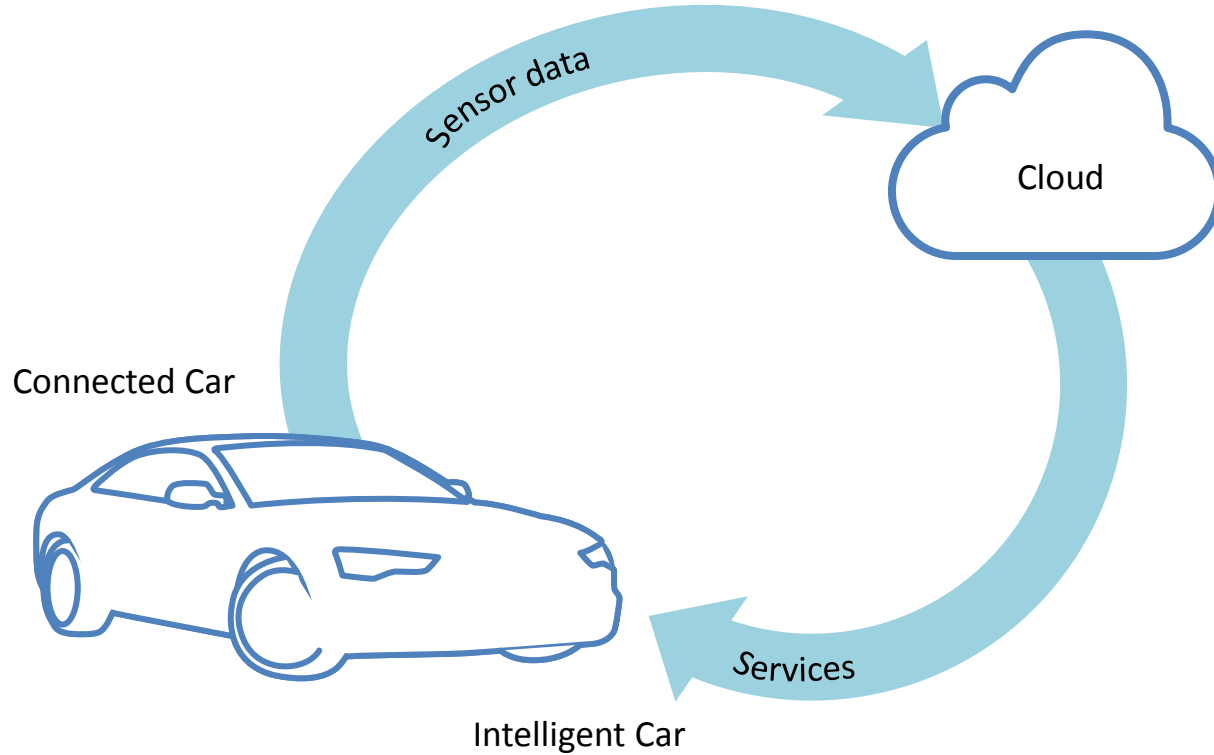
SENSORIS members (26 including 5 Japanese members)

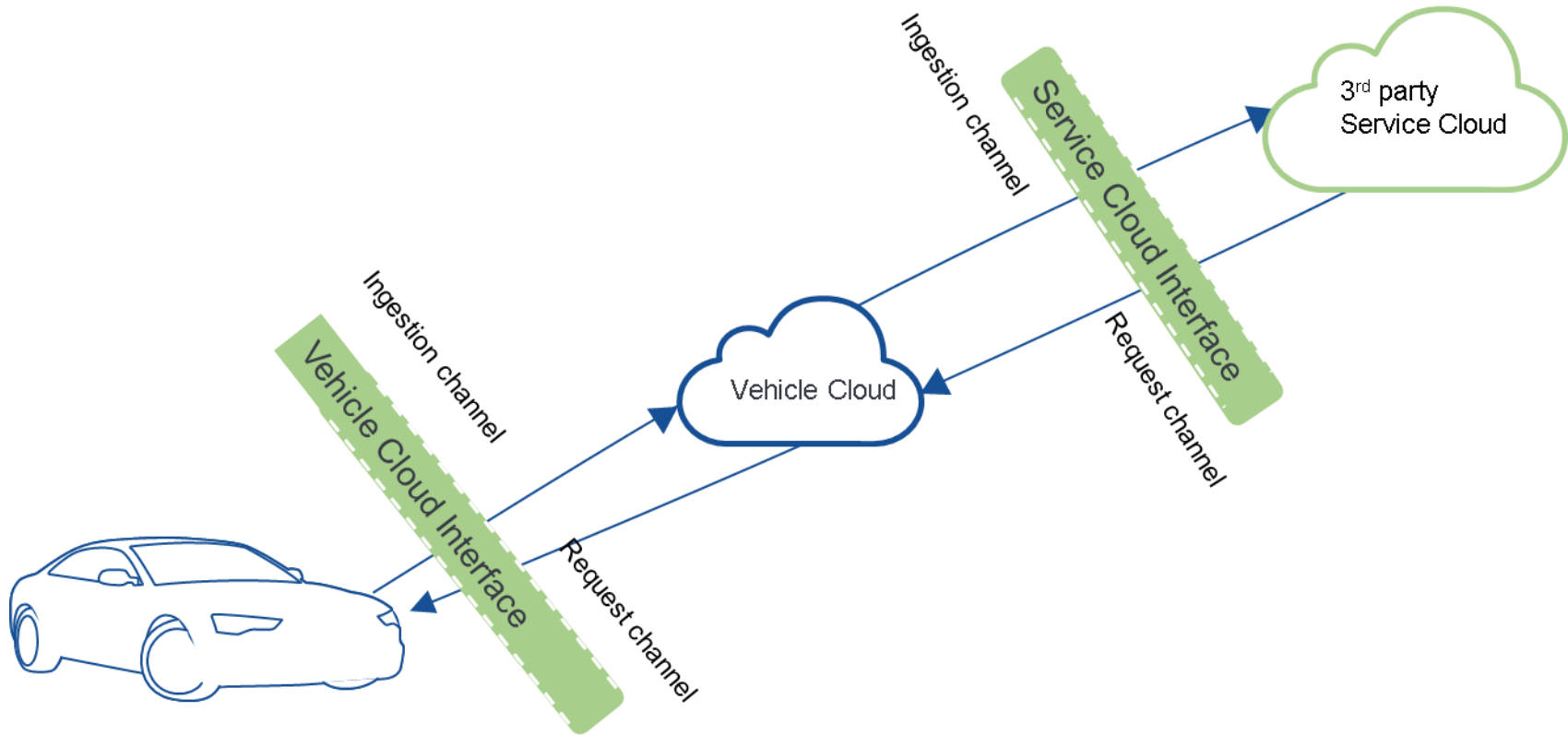| Main membership category	SENSORIS member	Main membership category	SENSORIS member
Vehicle manufacturers	Audi	ADAS manufacturers	AISIN AW
	BMW AG		Continental Automotive GmbH
	Daimler AG		Fujitsu Ten (Europe) GmbH
	Jaguar Land Rover Limited		LG Electronics
	Volvo Car		Valeo Comfort and Driving Assistance
Location content & Service providers	AutoNavi Software Co. Ltd.	Navigation System Suppliers	DENSO
	Baidu		Elektrobit Automotive GmbH
	HERE Global B.V. (Chair)		Harman
	INRIX Inc.		Hyundai Mnsoft
	NavInfo Co.Ltd.		NNG
	TomTom International B.V.		PIONEER Co.
	Zenrin		Robert Bosch Car Multimedia GmbH
Telecom & Cloud Infrastructure Providers	IBM	Other	ICCS

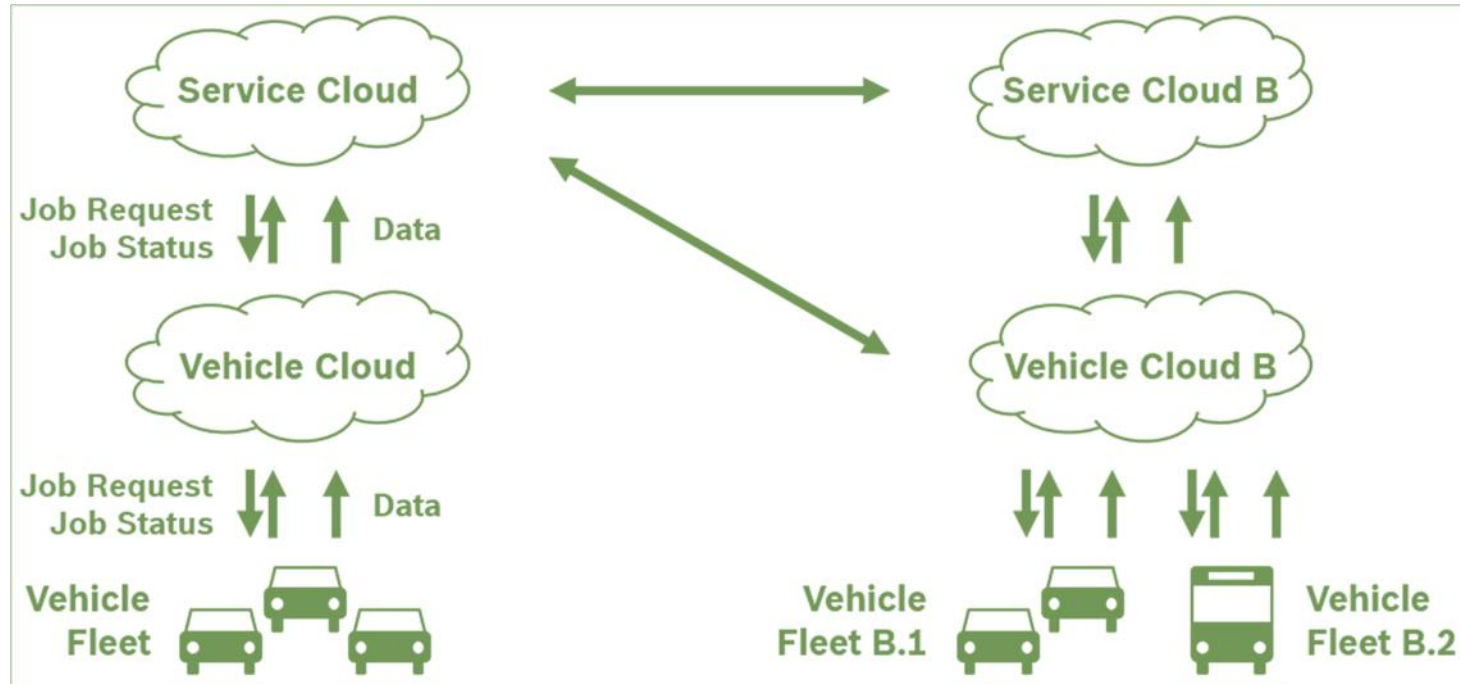# SENSORIS Closed feedback loop between car and cloud

Sensor data

Cloud

Connected Car

Services

Intelligent Car

SENSORIS the sensor data interfaces

3rd party Service Cloud

Service Cloud Interface

Ingestion channel

Request channel

Vehicle Cloud

Vehicle Cloud Interface

Ingestion channel

Request channel

SENSORIS architecture: Multi-role model

SENSOR_IS Use case: Real-time services

Traffic flow
Traffic incidents

Hazard warnings
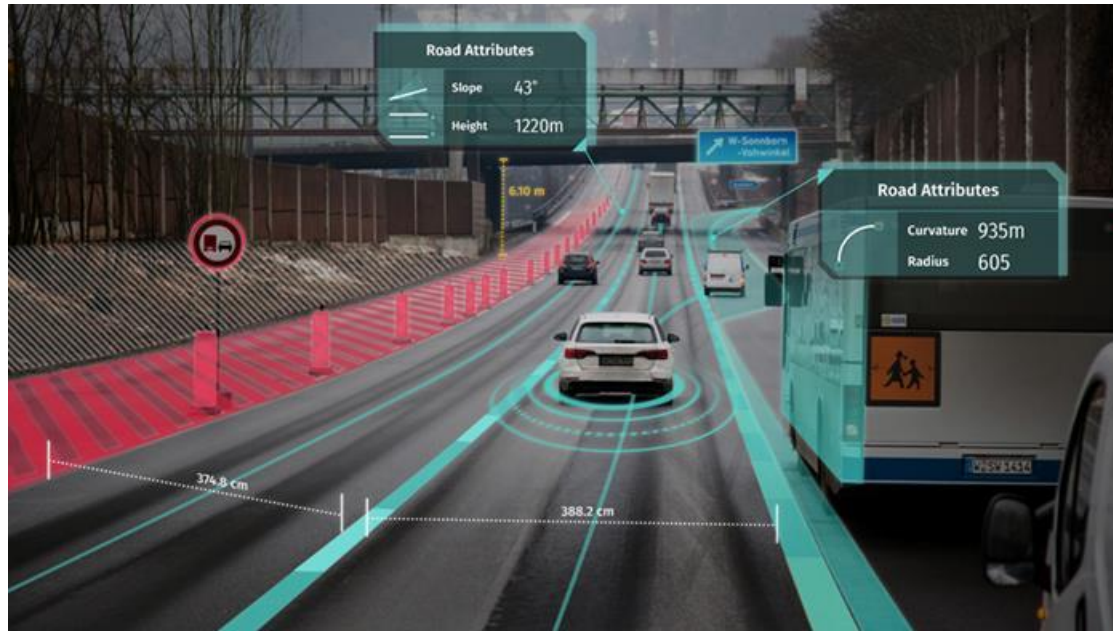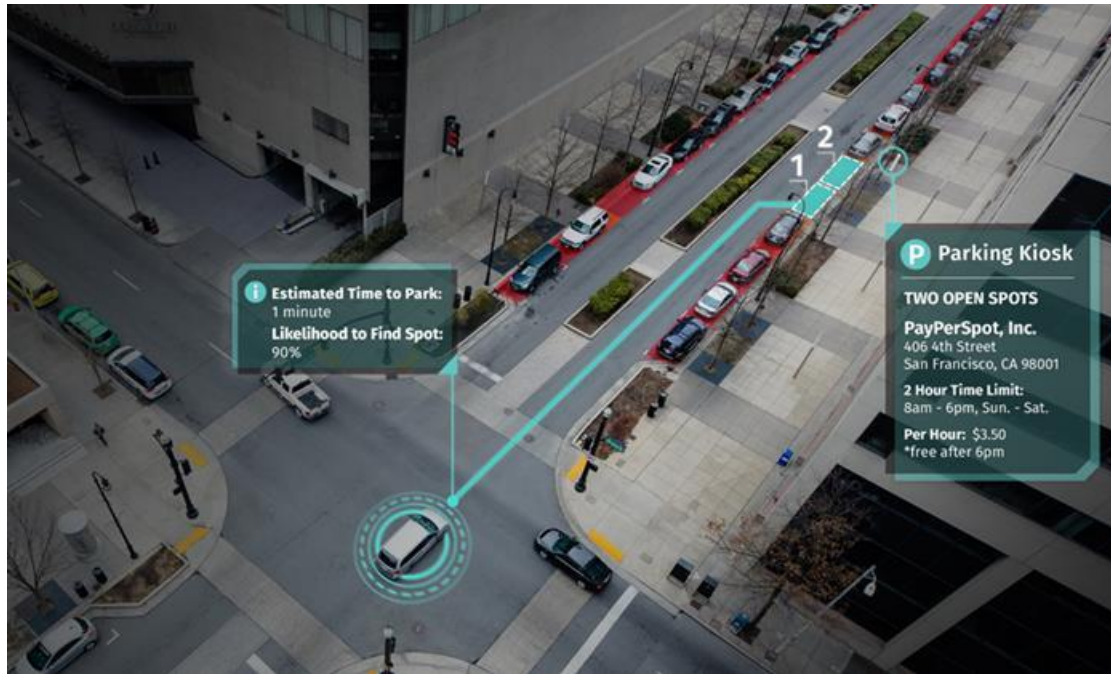
Environmental conditions

Traffic signage
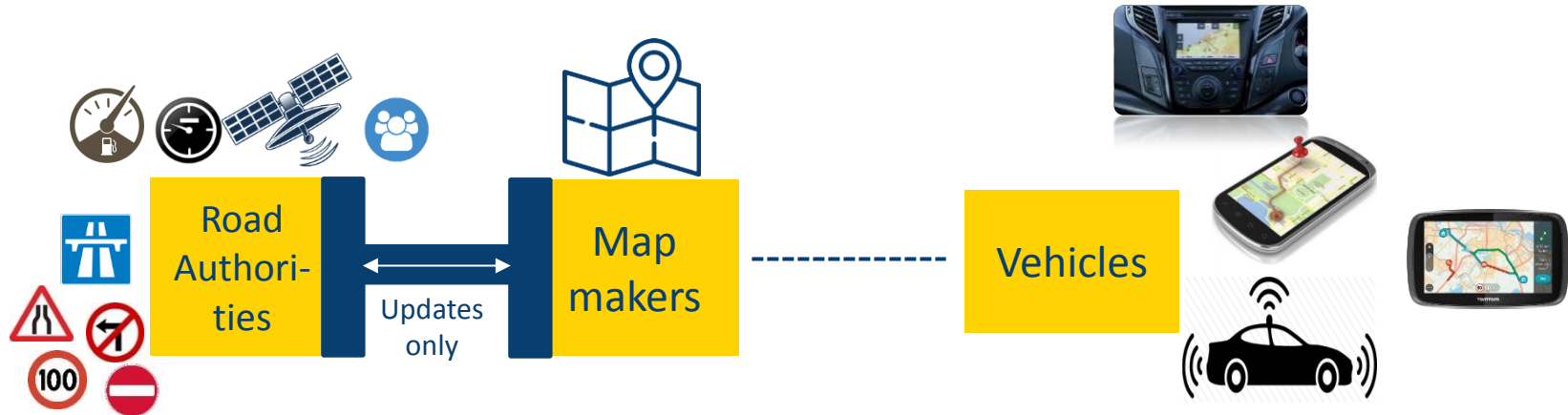
SENSOR**ıS** Use case: Self-healing map

- Road geometry and attributes
- Lane geometry and attributes
- POI entries and exits
- Road condition

SENSOR**ℹ**S Use Case: Statistical analysis

- Historical and real-time data analysis
- Personal preference learning
- POI recommendations

The data chain in a nutshell

Road Authorities — **Updates only** — **Map makers** ------------- **Vehicles**

Map data is obtained from vehicles, public authorities and various other sources (social media, satellites, etc.)

Mapmakers assemble all these to provide the most efficient maps and navigation advice

Drivers can benefit from up-to-date fresh map data in their in-vehicle system, stand-alone navigation device or smartphones

Vision

Bringing fresher map data to intelligent transport services

Mission

Facilitate and foster the exchange of ITS-related spatial road data between road authorities as <u>trusted</u> data providers and data users as map makers and other parties

Standardisation

Define & maintain
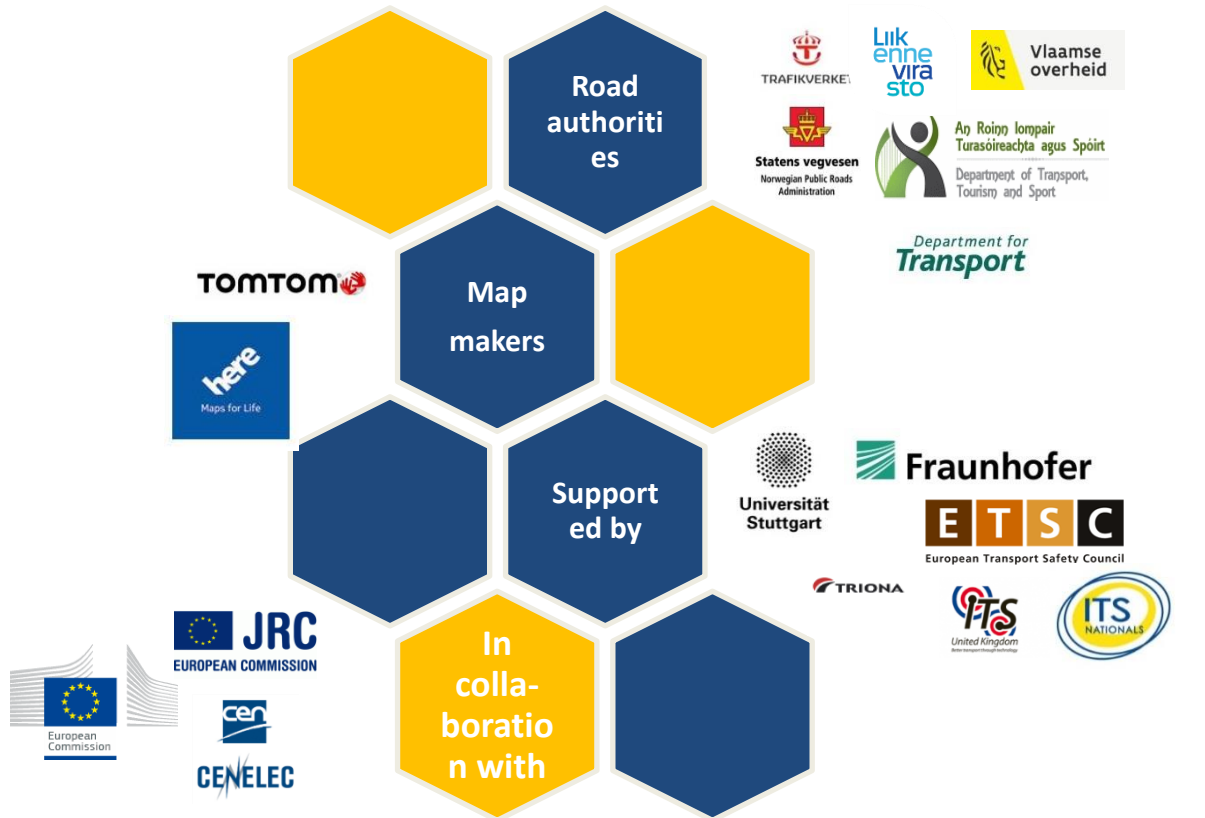TN-ITS specifications in
CEN/TC 278 WG7

Implementation

Provide guidelines, tools and services to support implementation in **Belgium, Finland, France**, **Ireland, Norway**, **Sweden**, and **United Kingdom**

(NL, HU, CY, SL, EE, LT, PT, ES, GR)

Conclusion

- ERTICO platforms have a clear focus on data interface enabling industrial solutions

- Harmonisation is needed and succeed today under the OADF

- Include other standard organisation beyond Automated Driving ecosystem

- Initiate cooperation with ITS Japan and other ITS organisation to achieve world-wide awareness

Thank you for your attention!

Contact :

Jean-Charles Pandazis

ERTICO-ITS Europe

Coordinator ADASIS and SENSORIS

jc.pandazis@mail.ertico.com