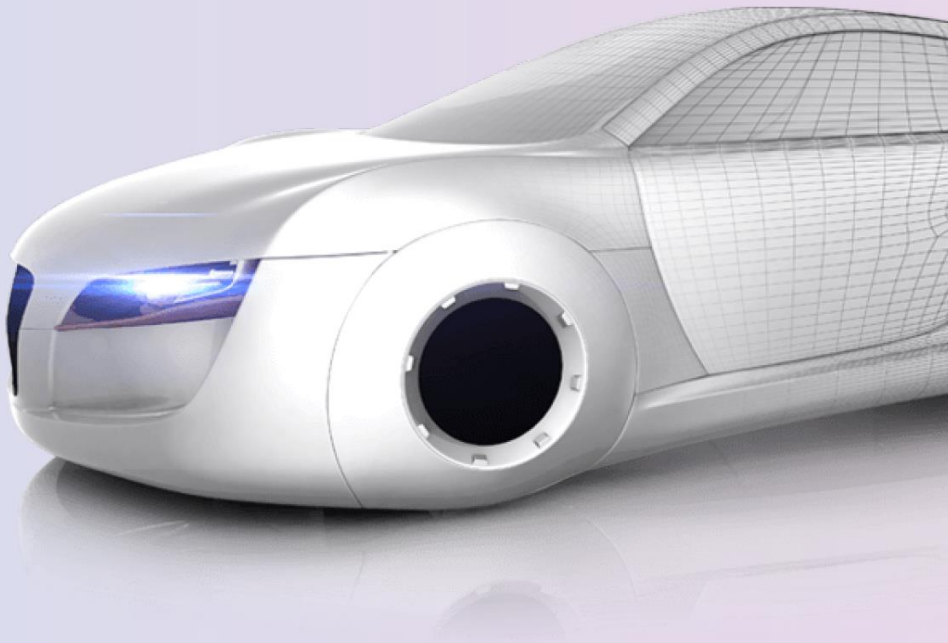
DUBAI WORLD CONGRESS
FOR SELF-DRIVING TRANSPORT
OCT | 2019

PIARC Task Forces B1 & B2 Connected and Automated vehicles : challenges and opportunities for road operators



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Stantec Consulting Ltd

Agenda

1. What is PIARC ?
2. TF B.1's Mission and Objectives
3. Input Data & analysis
4. Opportunities & Challenges
5. TF B.2's at a Glance
6. Conclusion

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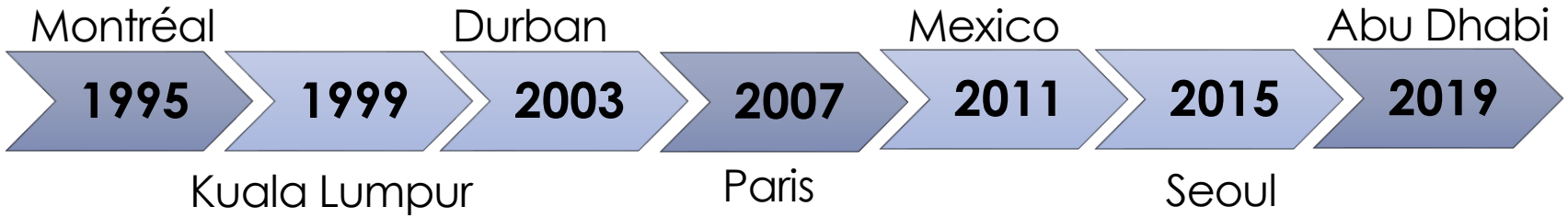
PIARC ?

The Association

- Stands for “Permanent International Association of Road Congresses”
- The World Road Association-PIARC , is a non-political, non-profit association established in 1909
- It brings together the road administrations of 122 governments
- Mission to promote international cooperation on issues related to roads and road transportation
- www.piarc.org

2016 to 2019 cycle

- World Congress each 4 years



- Strategic plan with 5 focus areas
  - A - Management and finance
  - **B - Access and mobility**
  - C - Safety
  - D – Infrastructure
  - E - Climate Change, Environment and Disasters

Focus area B – Access and mobility

- B.1 Road Network Operations / ITS
- B.2 Winter services
- B.3 Sustainable multimodality in urban areas
- B.4 Freight
- **TF B.1 - Connected vehicles : Challenges and opportunities for road operators**
- **TF B.2 – Automated vehicles: Challenges and opportunities for road operators**

Task Force B.1
Connected vehicles : challenges and opportunities for road operators

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TF B.1

Composition

29

18

- 29 Experts covering 18 countries across the globe
- Chair Eric Ollinger – French Ministry of Transportation
- Started June 2016 – Ended July 2018

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TF B.1

Setting the frame

- Goal - Identify major considerations in the development and deployment of V2I and V2V communication in road design and operations
  - From a road operator's point of view
  - Identify best practices regarding the main challenges and formulate recommendations for countries or regions who would like to step in
  - Highways are in the main focus
- Output : Report outlining key topics being explored and with references to other organizations.

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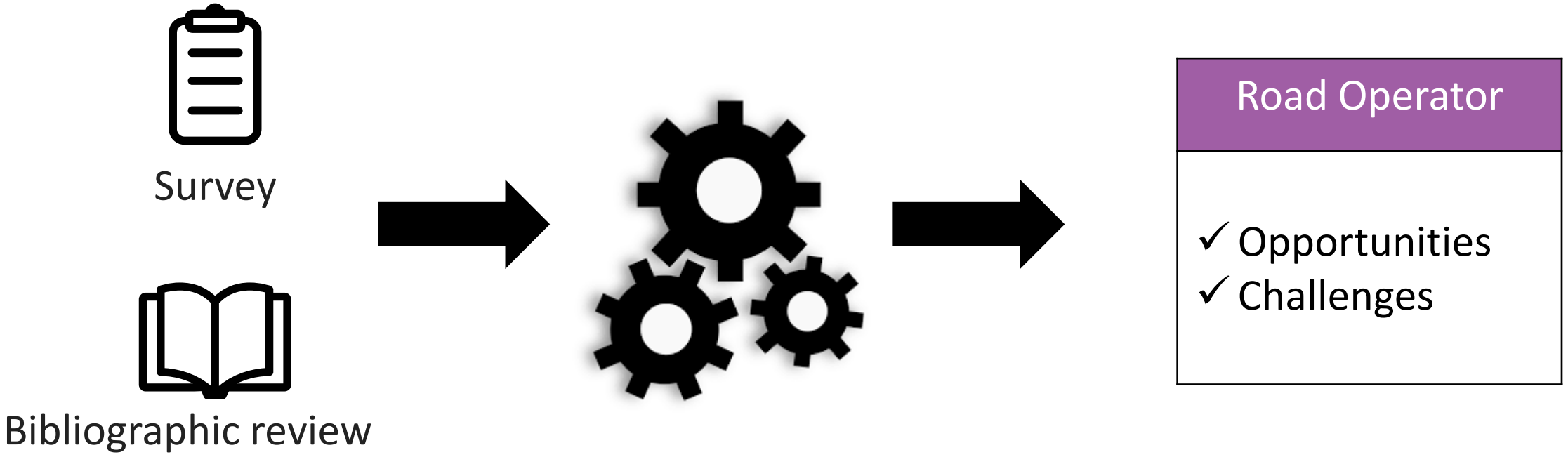
CV technology in a global context

- The work is based on surveys carried out on 23 existing projects all over the world, completed by a review of the existing literature



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Methodology

- A total of 47 reference documents were collected and reviewed, including:
  - 23 Connected ITS project surveys (40+ questions)
  - 13 Connected ITS project description reviews
  - 4 documents from previous PIARC cycles
  - 7 reference documents from countries with various deployment strategies or research activities and also from European working groups

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Task Force B.1
Input Data and analysis

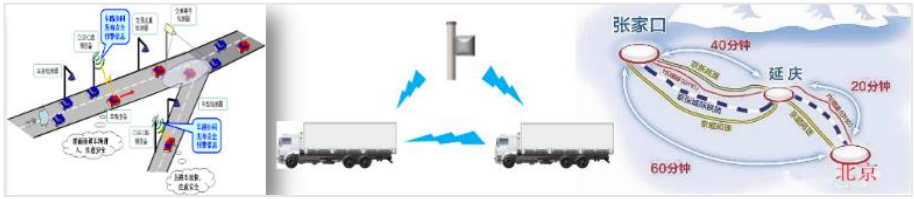
Connected Vehicles ??

- What do we mean by connected driving ?
- An exchange of information between a vehicle and :
  - Other vehicles : sensors embedded in the vehicles gather and transmit them automatically to vehicles behind (V2V)
  - The infrastructure : the same information is received by the road operator (V2I) ; the road operator can also send information directly displayed in the vehicle (I2V)
  - Other road users (V2Others)
- This is also called Cooperative Intelligent Transport Systems (C-ITS) or V2X.

Projects Sample

US: Connected Vehicle Pilot Deployment Program

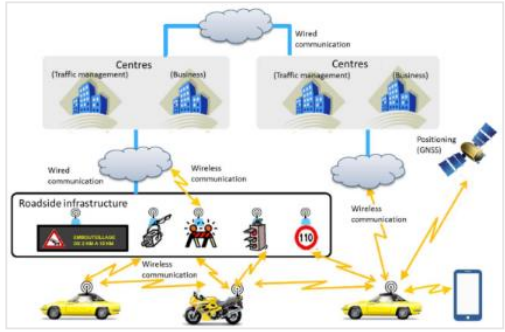
South Korea: Dajeon and Sejong city



China: Bejing, Shanghai, Chongqing

Japan: Smart use of road project

Europe: C-Roads



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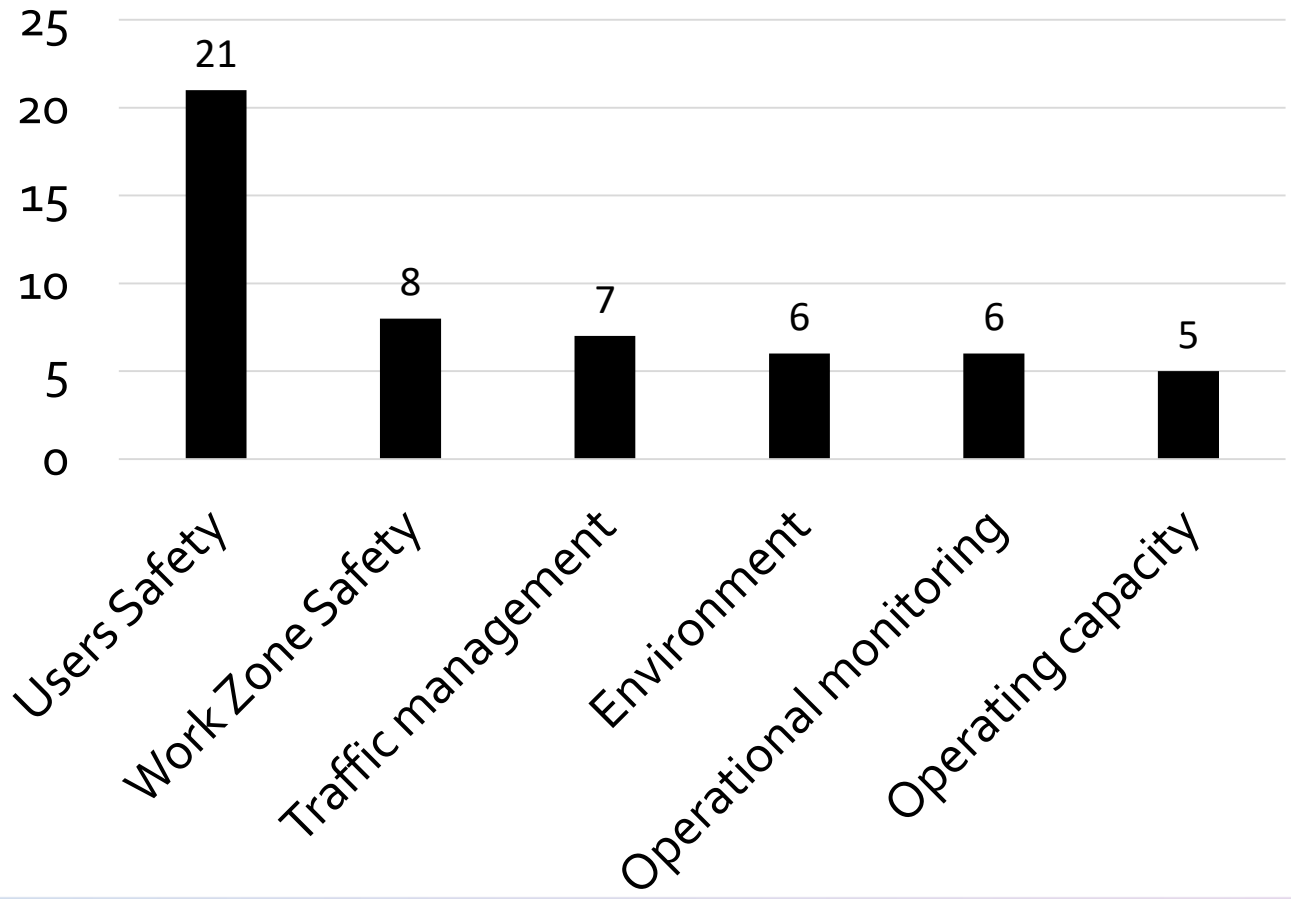
Benefits Expected by Operators

- Benefits expected from the projects are grouped into the following three main categories:
  - Safety (and security)
  - Mobility
  - Environment



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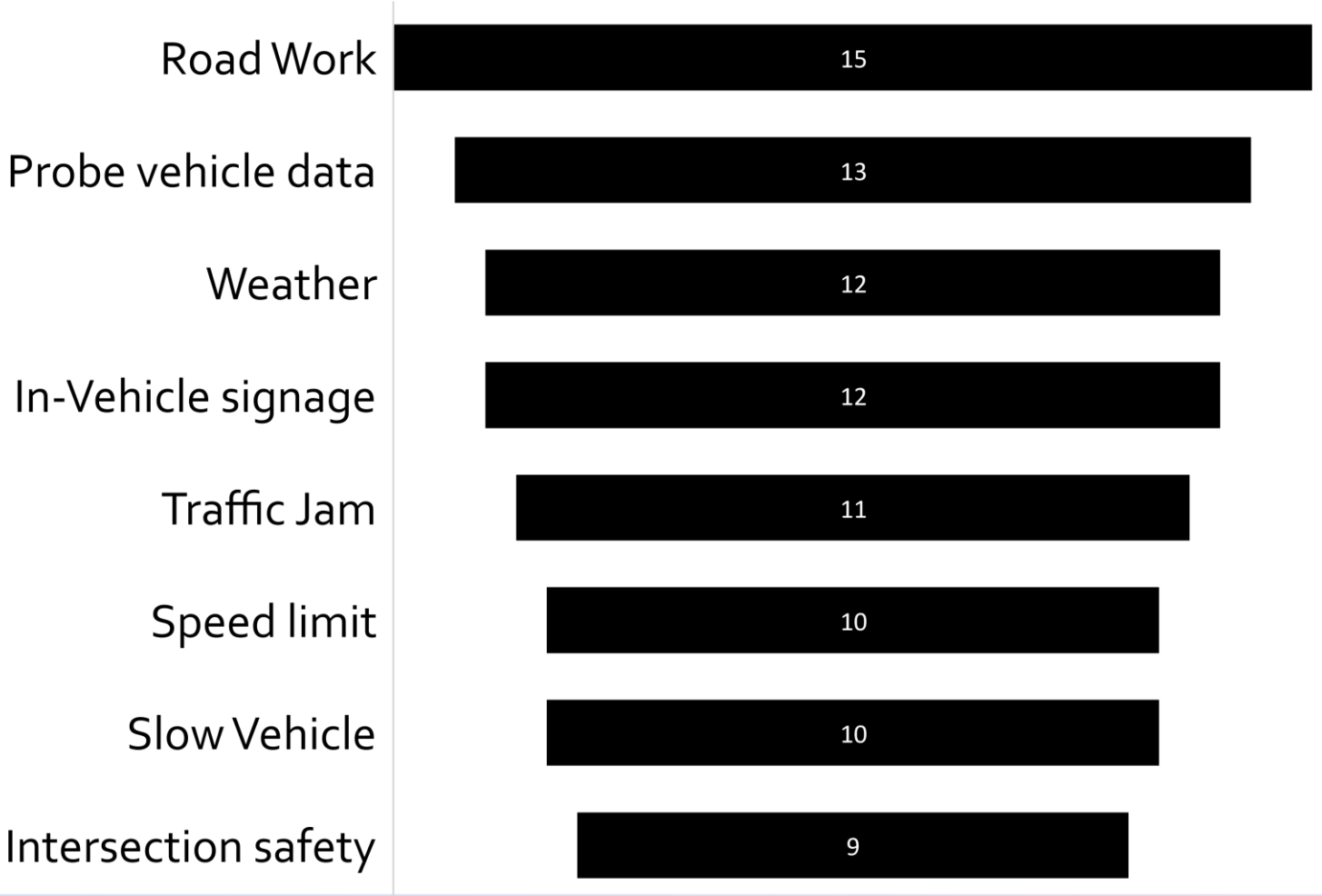
TF B.1

Services provided to users

- Priority of emergency vehicles
- Protection of vulnerable users



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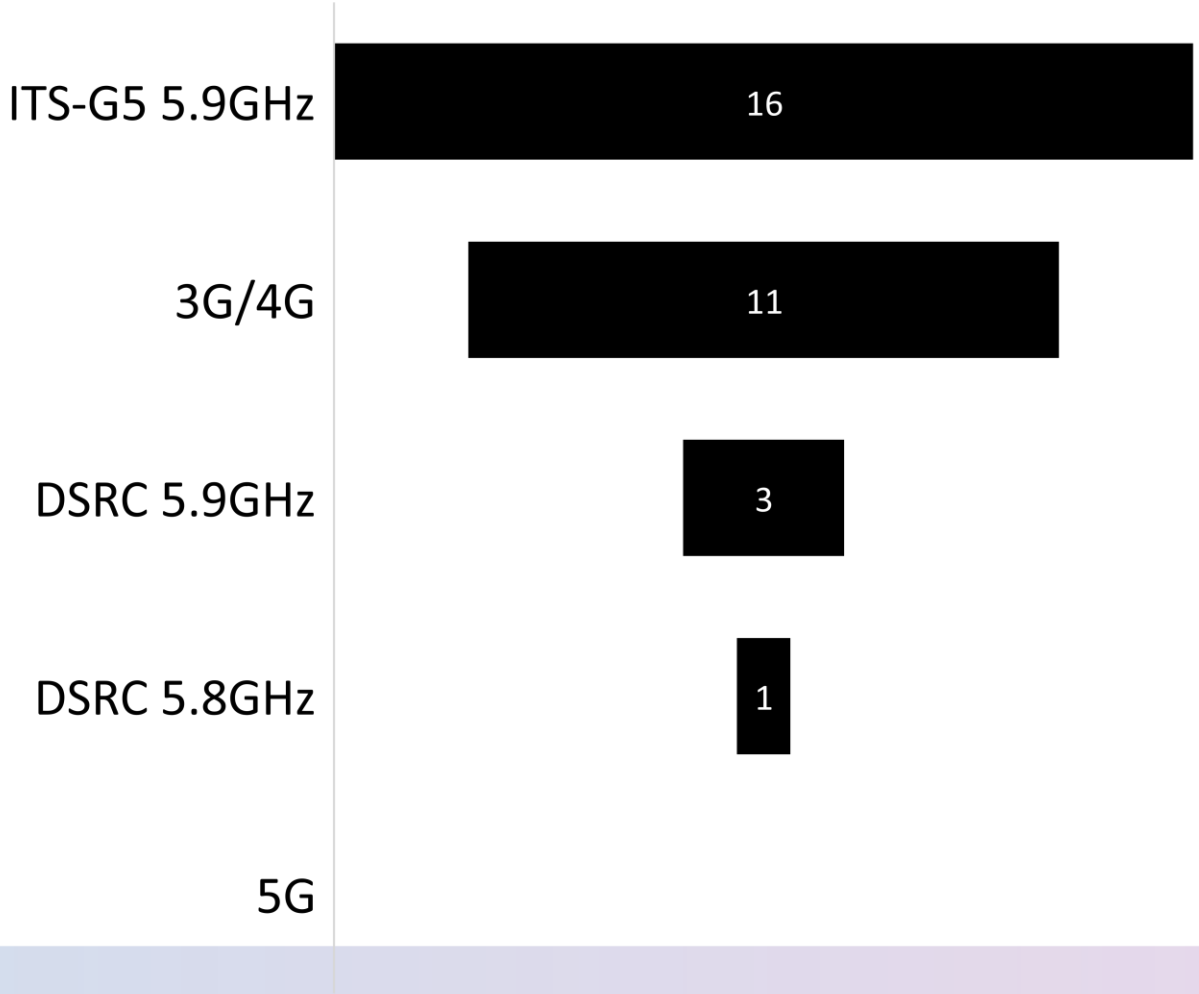
Communication Standard

- ITS-G5 in Europe (it's not 5G!!)
- 5.9/5.8 GHz DSRC in Asia



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Task Force B.1
Opportunities and Challenges

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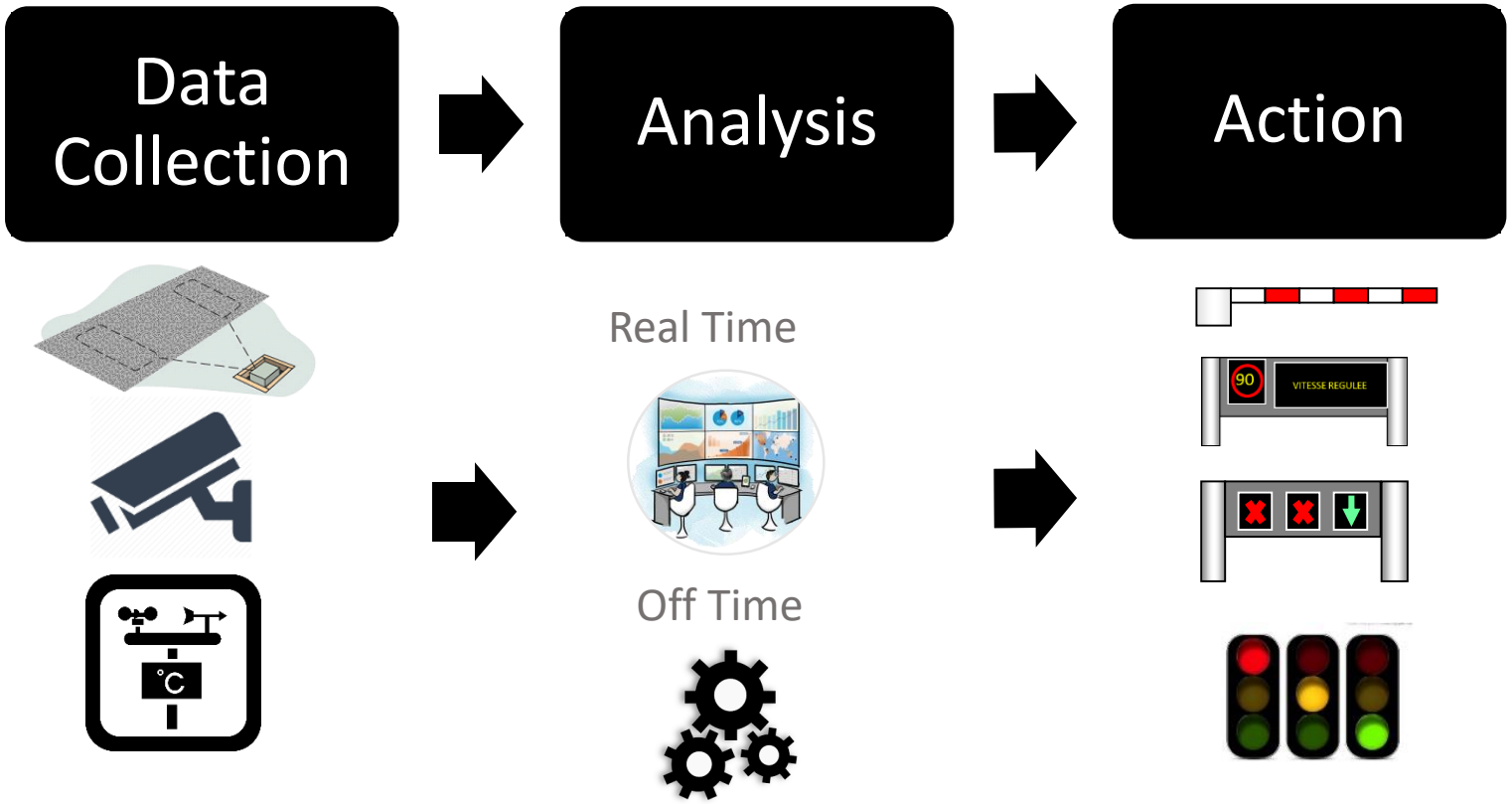
TF B.1 - Opportunities

Why investing in Connected technology

Today



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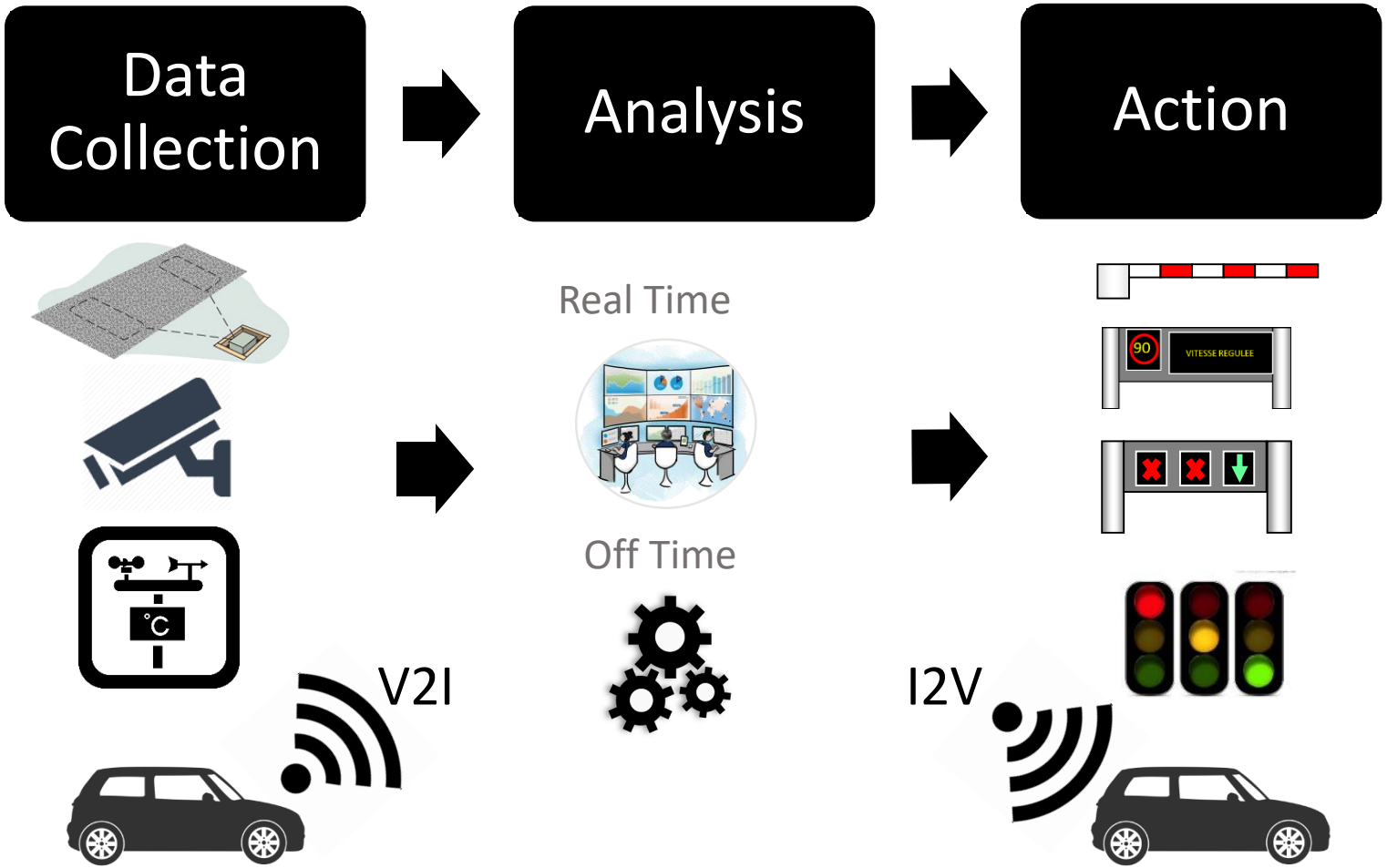
Why investing in Connected technology

With Connected technology



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Why investing in Connected technology

With Connected technology

Data Collection → Analysis → Action

Services	Data
Basic - PVD	Speed, position
Extended - PVD	Speed, position, +++

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TF B.1 - Opportunities

Why investing in Connected technology

With Connected technology

Data Collection → Analysis → Action

Services	Messages
GLOSA	Green Light Optimal Speed Advisory
RWW	Road Works Warning
IVSL	In vehicle speed limit
IVS	In vehicle Signage – virtual VMS

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GLOSA example

- GOAL – Increasing mobility. Providing advice to optimize the way vehicles approach and pass through an intersection.

Challenges of the implementation

- Services to deploy first
- Interoperability
- High penetration path
- Business models
- Choice of technology
- Access to quality data
- Security, privacy and data protection
- Operator’s organization

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TF B.1 - Challenges

Services to deploy first (from EU C)

#	Day 1 Services			Bundle
1	Emergency electronic brake light	V2V	Safety	1
2	Emergency vehicle approaching	V2V	Safety	1
3	Slow or stationary vehicle(s)	V2V	Safety	1
4	Traffic jam ahead warning	V2V	Safety	1
5	Hazardous location notification	V2I	Motorway	2
6	Road works warning	V2I	Motorway	2
7	Weather conditions	V2I	Motorway	2
8	In-vehicle signage	V2I	Motorway	2
9	In-vehicle speed limits	V2I	Motorway	2
10	Probe vehicle data	V2I	Motorway	2
11	Shockwave damping	V2I	Motorway	2
12	GLOSA / Time To Green (TTG)	V2I	Urban	3
13	Signal violation/Intersection safety	V2I	Urban	3
14	Traffic signal priority request by designated vehicles	V2I	Urban	3

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Services to deploy second (from EU C)

#	Day 1.5 Services	Bundle		
1	Off street parking information	V2I	Parking	4
2	On street parking information and management	V2I	Parking	4
3	Park & Ride information	V2I	Parking	4
4	Information on AFV fueling & charging stations	V2I	Smart Routing	5
5	Traffic information and smart routing	V2I	Smart Routing	5
6	Zone access control for urban areas	V2I	Smart Routing	5
7	Loading zone management	V2I	Freight	6
8	Vulnerable road user protection (pedestrians and cyclists)	V2Others	VRU	7
9	Cooperative collision risk warning	V2V	Collision	8
10	Motorcycle approaching indication	V2V	Collision	8
11	Wrong way driving	V2I	Wrong Way	9

Interoperability

- To ensure that the same standards and specifications are used when deploying systems and hardware
- Between provinces and with US States
- Significant coordination is required between road operators, car manufacturers and Telco carrier to ensure interoperability;
- The relationship between the required technology and the services being deployed (both now and in the future) needs to be understood.

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Choice of Technology

Short Range Communication (DSRC)

PROS	CONS
Most suitable to broadcast tactical information that needs to be spread **quickly** and **very near** to the information location.	Requires a large network of RSU, which implies **significant investment** and the need for **open standards** in order to limit technological obsolescence

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Choice of Technology

Long Range Communication (3G/4G)

PROS	CONS
Highly suited to strategic information broadcasts and the coverage and capacity of cellular networks are growing as technology continues to evolve	Restricted data transmissions rates can be an obstacle in some locations for users

Choice of Technology

Wide area broadcast (Digital Audio Broadcasting +)

PROS	CONS
it is already generally widespread and installed in most parts of the world	This communication technology requires specific devices

Due to the varying requirements for different CV services and applications, the open hybrid approach may be the most appropriate scenario to allow future growth.

TF B.1 - Challenges

Access to Quality Data

- Quality requirements
- Collection processes
- Quality assurance processes and attributes
- Data accessibility

Opened and shared the data sources among the different CV players would bring many benefits

- Improvements to data quality through cross checking
- Comparisons and validations
- Support for a wider range of existing and new applications through the aggregation of different datasets
- The generation of new data-related revenue streams

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Task Force B.2 - Automated vehicles : challenges and opportunities for road operators

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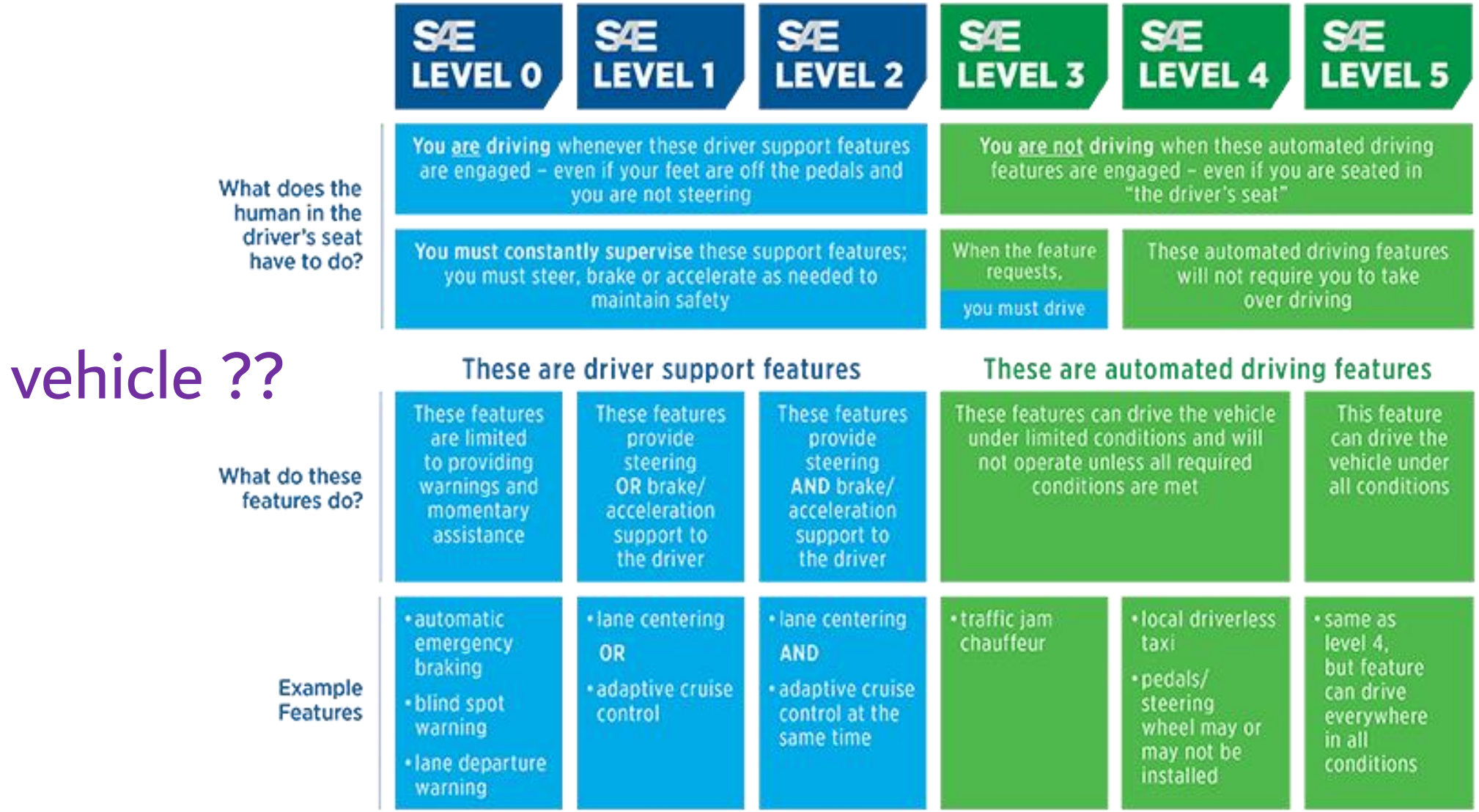
Automated vehicle ??

SAE J3016™ LEVELS OF DRIVING AUTOMATION



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TF B.2

Automated vehicle - report structure

- From a road operator's point of view, challenges and opportunities
  - Physical Infrastructure
  - Digital Infrastructure
    - Connectivity
    - Digital maps and positioning
    - Data
  - Road Network Operation
  - Responsibility and Financing
  - Social Issues

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Conclusion

Conclusion

- Many opportunities offered by CV technology for road operators,
  - In terms of road safety, road network operations, traffic information, asset management….
- The question is where to start ?
  - Based on experience from the various pilot from all over the world
    - Start small and learn by doing
    - Deploy a few of the most mature services (Day1 services)
    - The section in the report on the pros and cons of each technology can help make the best choice

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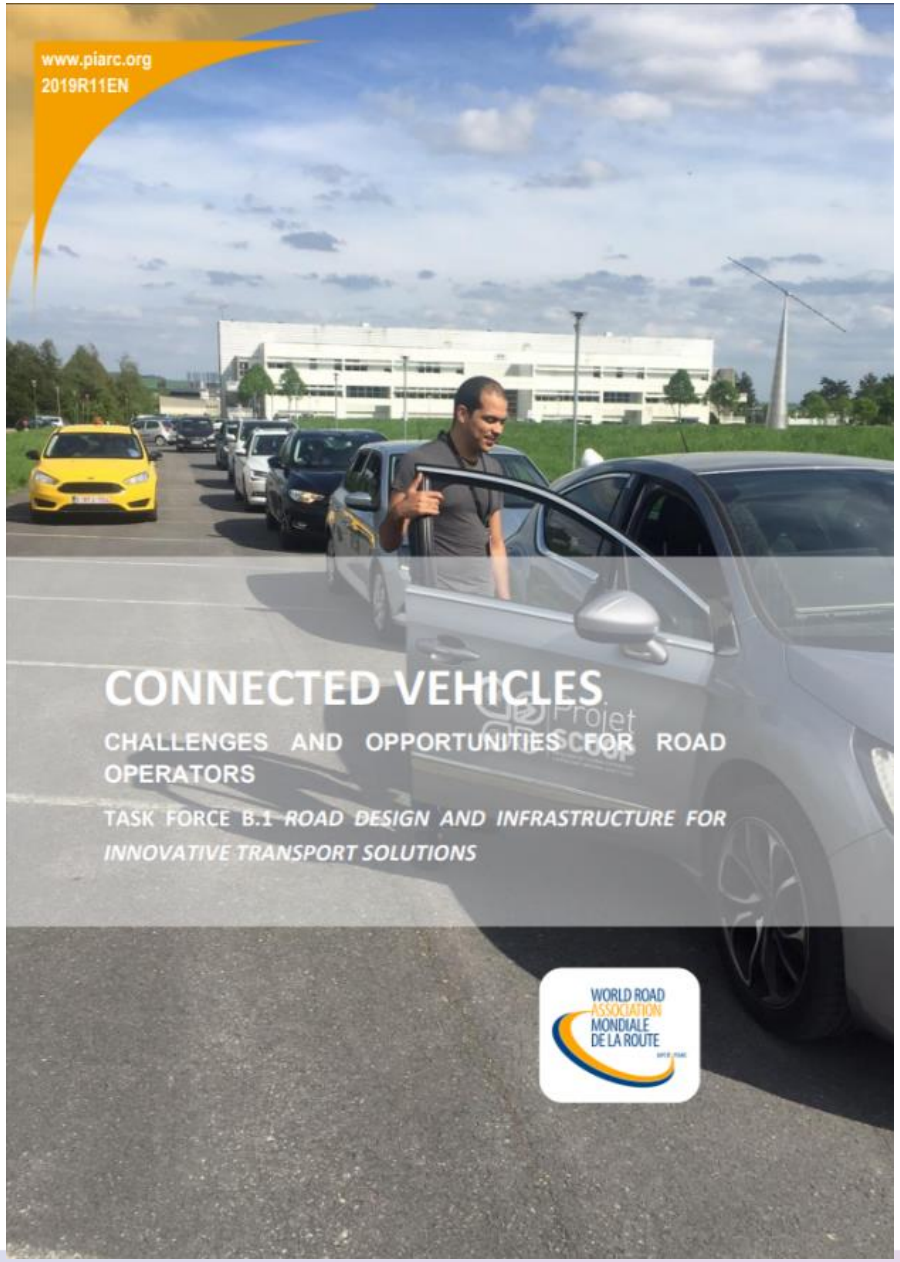
Conclusion

- Security and privacy are important challenges that must be tackled with appropriate experts
- But the key point is not technical, it is to involve all relevant stakeholders and consider seriously the social aspect
- Road operators cannot deploy the technology by themselves, they need to work in close relationship with car manufacturers and telecom carrier who will be delivering the service to the driver

The Report

- The final report of theTF B.1 is available on: https://www.piarc.org/en/publications/technical-reports/
- Search for : 2019R11EN



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Thanks for your Attention !

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