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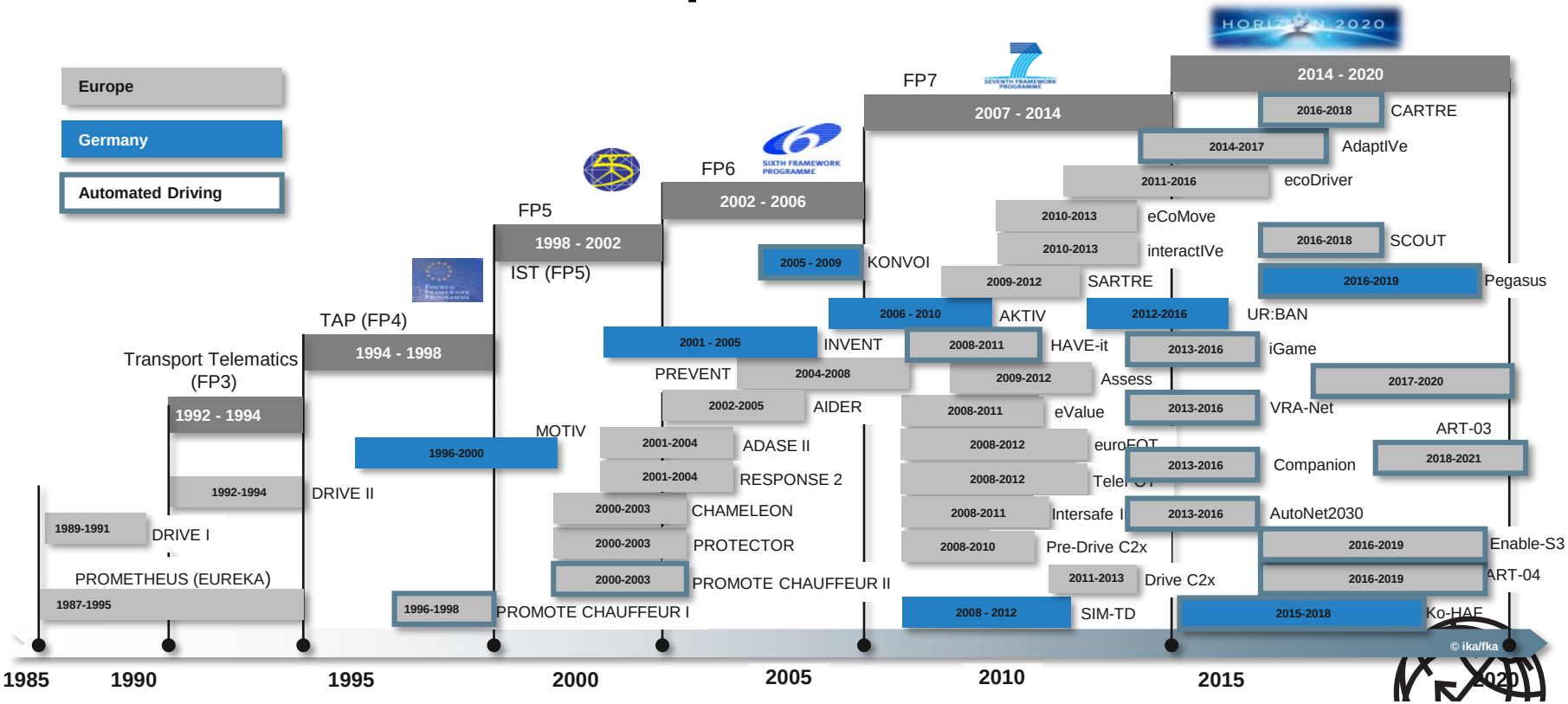
TS91
Sensors for Automated Vehicles

State of the Art Analysis for Connected and Automated Driving within the SCOUT Project

Overview on European Research



SCOUT

Coordination and Support Action

Safe and Connected Automation in Road Transport

Partner

BMW, Bosch, CLEPA, CRF, Fraunhofer LBF, NEC, NXP, Renault, SERNAUTO, Telecom Italia, VDI / VDE-IT, ika

Duration

07/2016 – 07/2018

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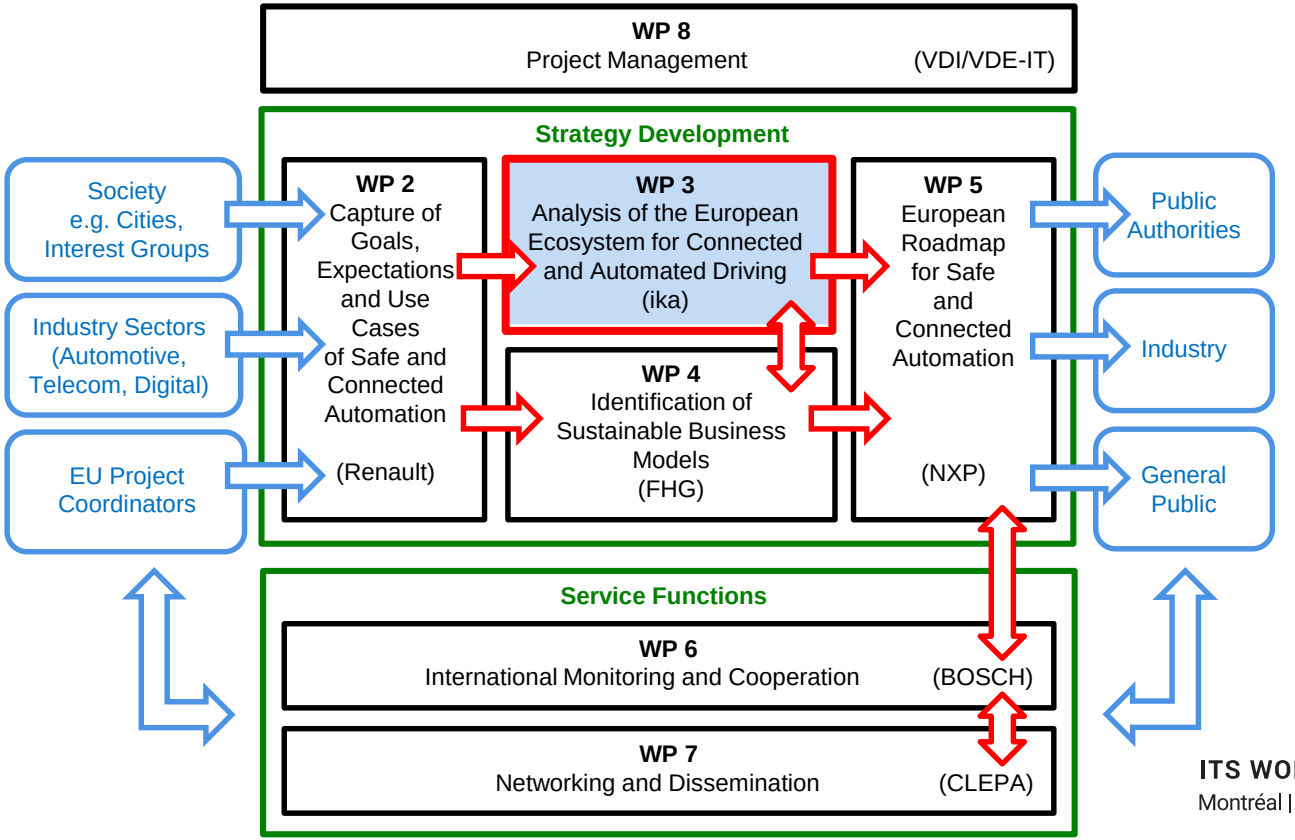
SCOUT - Structure and Responsibilities



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State of the Art Analysis

Objectives

- Record the state of the art in technical and non-technical enablers and anticipate future evolutions

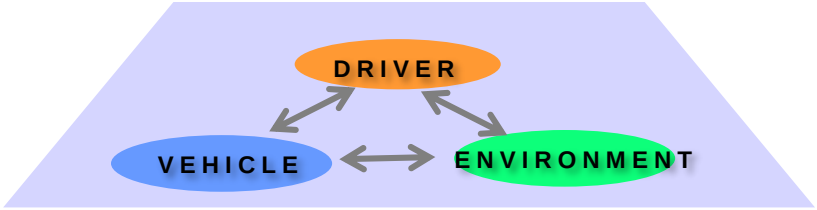
- Identify current and future gaps and challenges from technical, societal, economic, policy, legal and regulatory perspectives in comparison to the vision created in SCOUT

- Enable the anticipation of future development paths of the European ecosystem of connected and automated driving

5-layer model on Automated Driving

- Each factor of Automated Driving is addressed by using the 5-layer model
  - Societal
  - Legal
  - Economics
  - Human factors
  - Technology

- Each layer is divided into
  - Vehicle
  - Driver
  - Environment



- A holistic approach is necessary on the way towards Automated Driving
  → none of these factors can be removed

- Focus on **technical** and **legal** layer

Structuring Automated Driving

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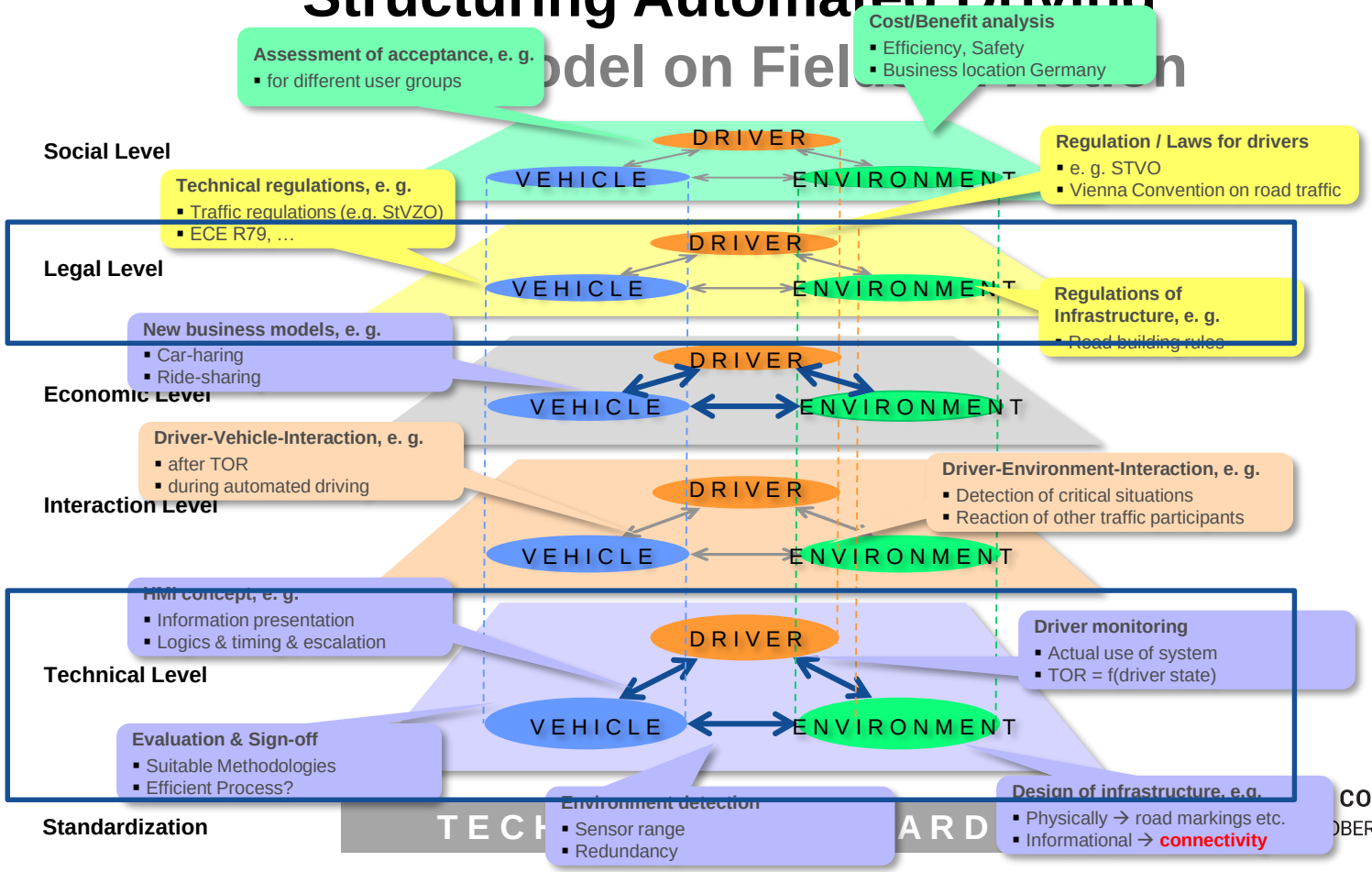
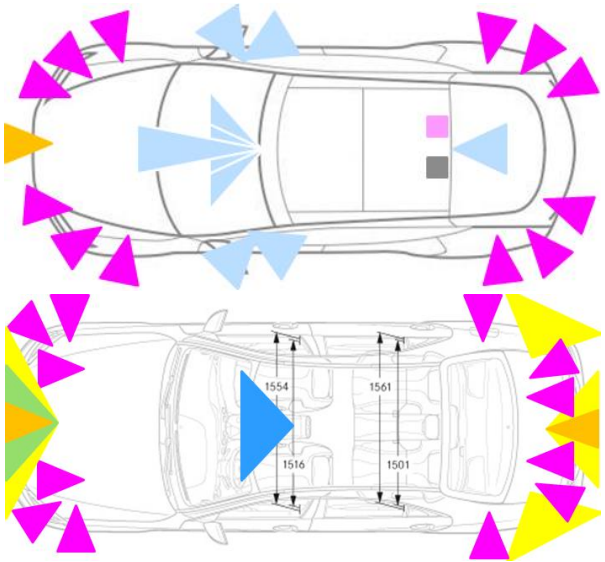


Technical Layer

- Sensor Overview
  - In-Vehicle Sensors
  - Sensor Fusion
  - Sensor set-ups
- Navigation and Localization
  - Maps
  - Current Location
- Connectivity
  - Overview of 5G
  - 5G-PPP Automotive Vision
- Security

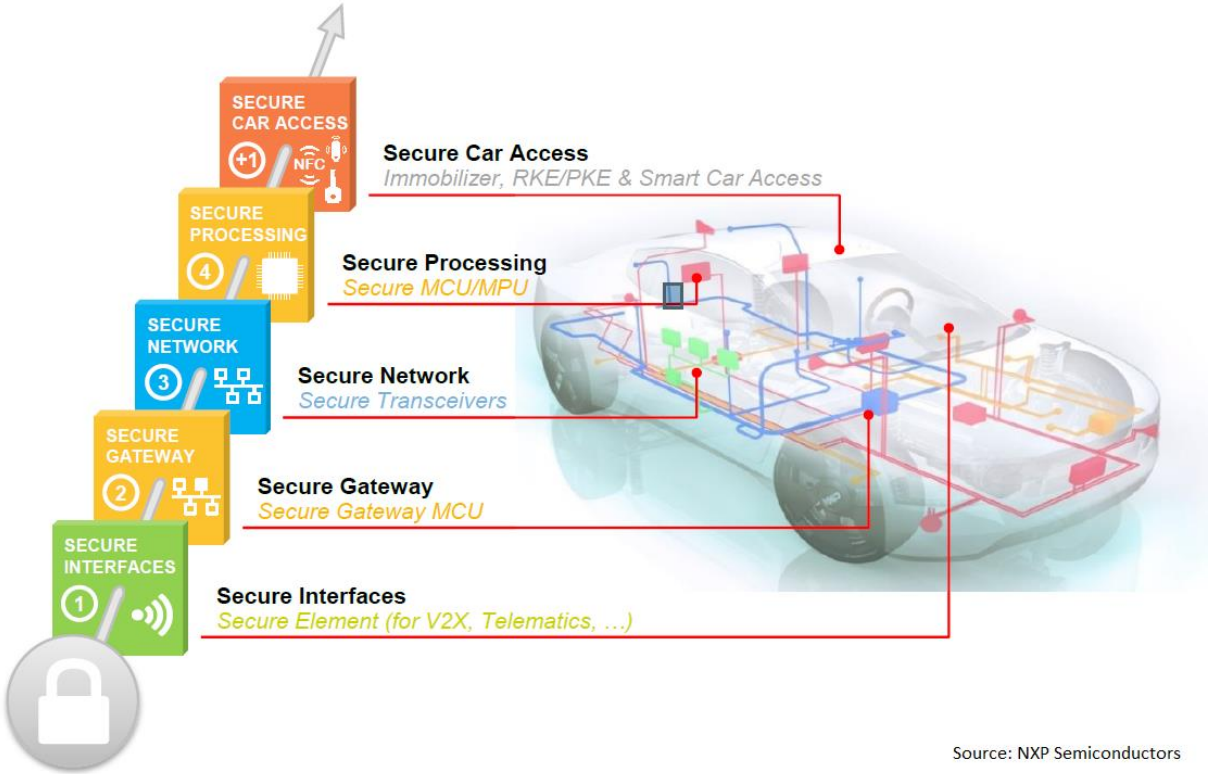
Sensor Setup			
Radar - Short Range	Radar - Long Range	GPS	Lidar / Laser
Camera - Mono	Camera – Stereo	V2X – Sensor	
Ultrasonic	Infrared	Maps	



Example: Tesla Model S

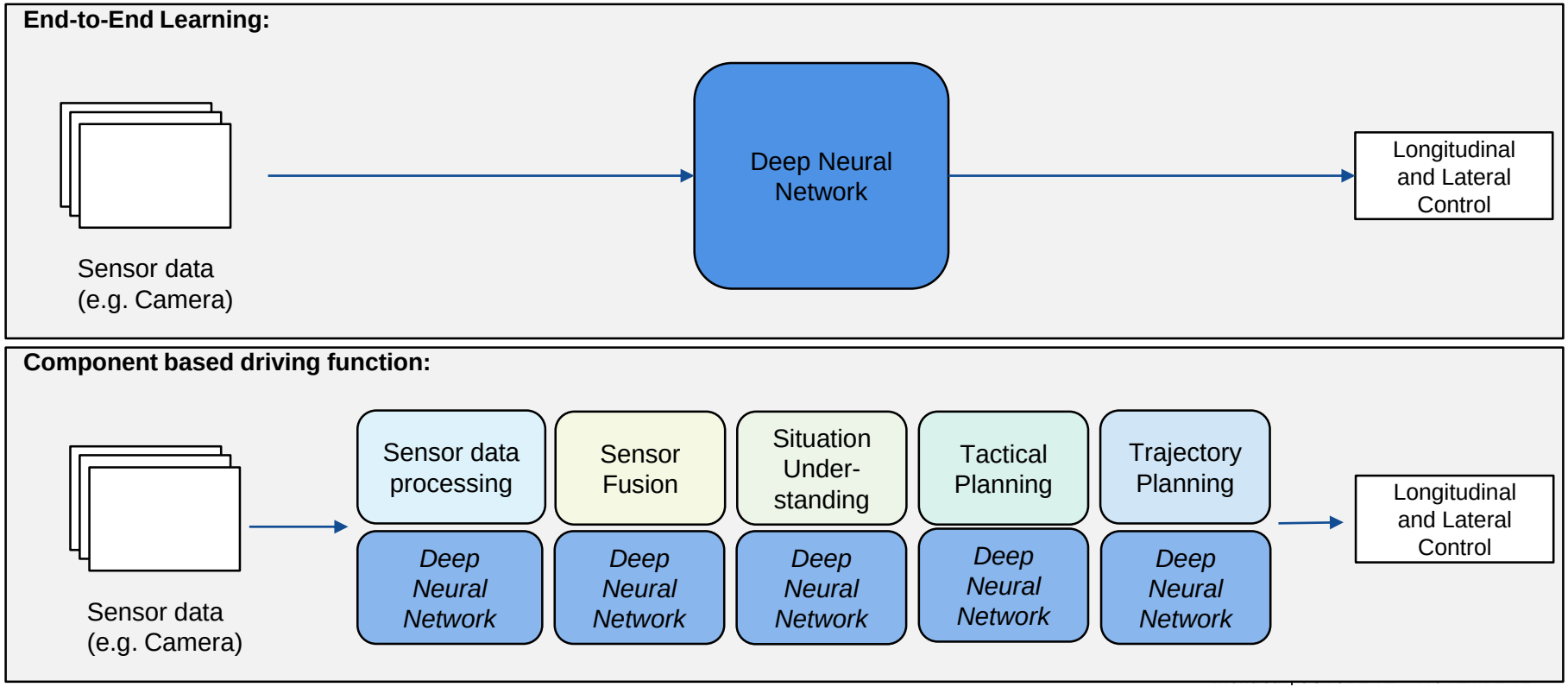
Example: Mercedes S-Class

Technical Layer



Source: NXP Semiconductors

Technical Layer



Legal Layer

- Legal status of connected and automated driving in Europe
  - Vienna Convention & United Nations Regulation UN-R 79
  - National Regulation
- International Regulation in several European member states
  - USA
  - Japan
  - South Korea
  - China
- Other regulation areas to be observed
  - Liability
  - Insurance
  - Personal Data Protection/Data Security
  - Type Approval
  - Other national regulations revolving around automated driving

Legal Layer
Example: Legal status in Europe/Germany

- Vienna Convention on Road Traffic (1968)
- Spring 2014: proposals for amendments → changes integrated
- National vs. international law

Germany

- January 2017: German Federal Ministry of Transport Proposal presented a legislative proposal to amend the “Straßenverkehrsgesetz” in order to establish a first legal basis for automated driving in public space
- New laws on „highly and fully automated cars“ valid since June 21, 2017
- Ethics Committee on Automated Driving → Final report from June 20

- **→ Available legal boundary conditions for Level 3 vehicle automation**

Legal Level - Current State of the Art

Level 3 Systems are already legal in Germany

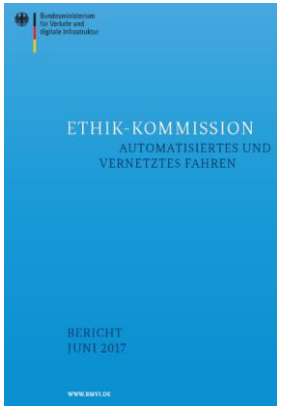
- New law on Level 3 vehicle automation valid since June 21st 2017 in Germany
- Driver is allowed to get out of the driving loop, but needs to take over if required by the system or if he detects a danger
- Data needs to be recorded of take over requests and take over situations (to be deleted after 6 month)
- This data is to be analysed in order to determine the cause of accidents
- In total the law is not clear in all points and will need to be analysed more accurately in case of any legal problems after an accident
- Evaluation of the law in 2019

→ Certification of Level 3 Systems are possible

Social Level - Current State of the Art

German Ethics Commission on Automated Driving

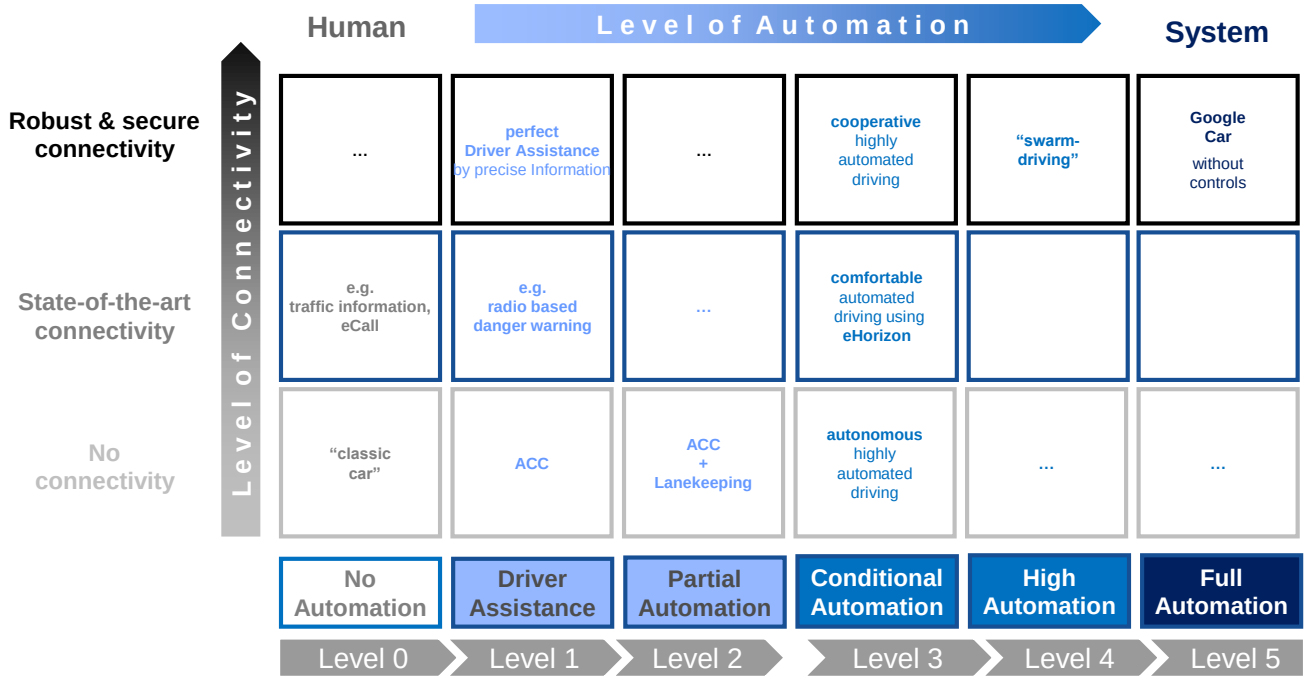
- Ethics Committee on Automated and Connected Driving issued final report on June 20, 2017
- 14 independent experts involved
- 20 ethical rules for Automated and Connected Driving established
  - Main conclusions:
    - Protection of humans has highest priority
    - No evaluation between human lives (one vs. many, young vs. old etc.)
    - No ethical decisions are to be programmed into system (dilemma situation)



→ **The Ethics need to be taken into account**

Next Steps in SCOUT

- SWOT analysis of the connected and automated driving ecosystem in Europe



Thank you!