



December 15th, 2014.

THE WAY TO HIGHLY AUTOMATED DRIVING.

DR. WERNER HUBER, HEAD OF DRIVER ASSISTANCE AND PERCEPTION AT BMW GROUP RESEARCH AND TECHNOLOGY.

**BMW
GROUP**

Research and Technology



AUTOMATION IS AN ESSENTIAL FEATURE OF THE INTELLIGENT CAR OF THE FUTURE.

Improved traffic and driving safety.

- Always safe, with and without automation.
- Active safety as the next big stroke in vehicle safety.



Increased driving comfort.

- Automation of annoying tasks.
- Gaining valuable time in boring situations.

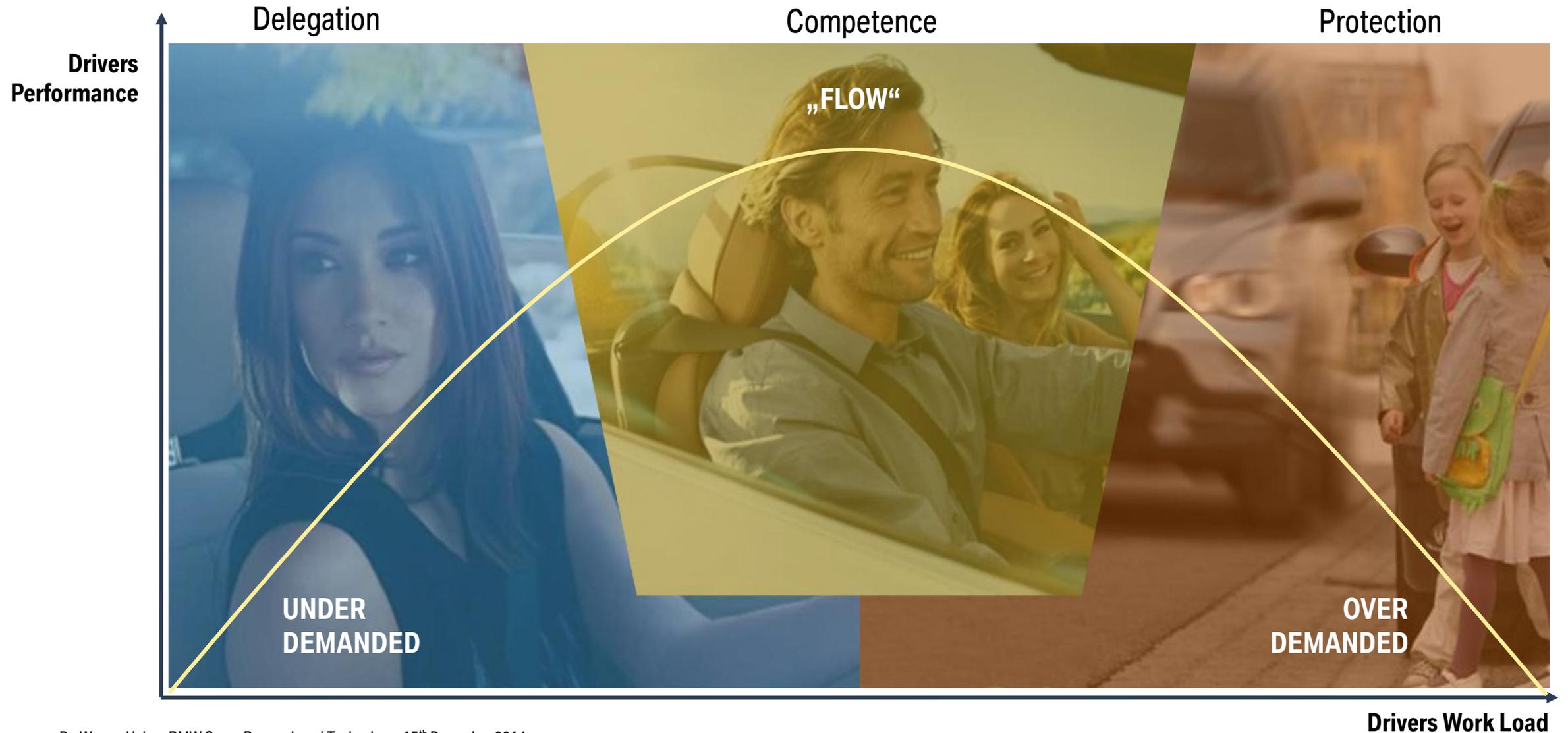


Expanded offer of mobility services and increased driving efficiency.

- Mobility offers e. g. for older or disabled people.
- Optimized utilization of the infrastructure.



AUTOMATED DRIVING IS CONSEQUENTLY ORIENTED TOWARDS THE NEEDS OF OUR CUSTOMERS.



ROLES OF THE AUTOMATED CAR IN THE FUTURE.



Valet Parking



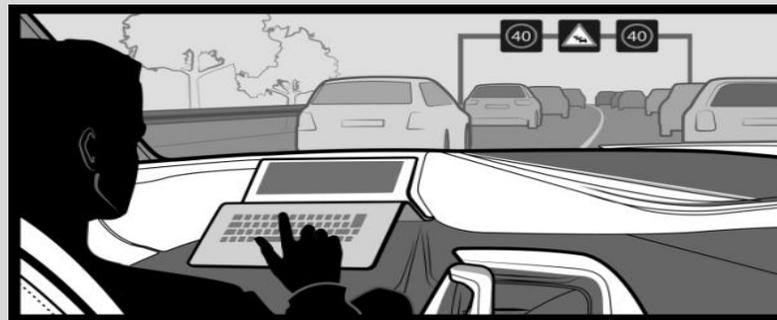
Emergency Stop Assistant



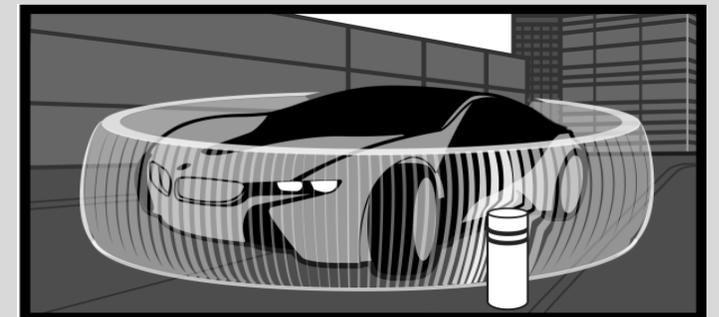
Driving instructor



Neighborhood taxi (v_{\max} 40km/h) within new mobility concepts

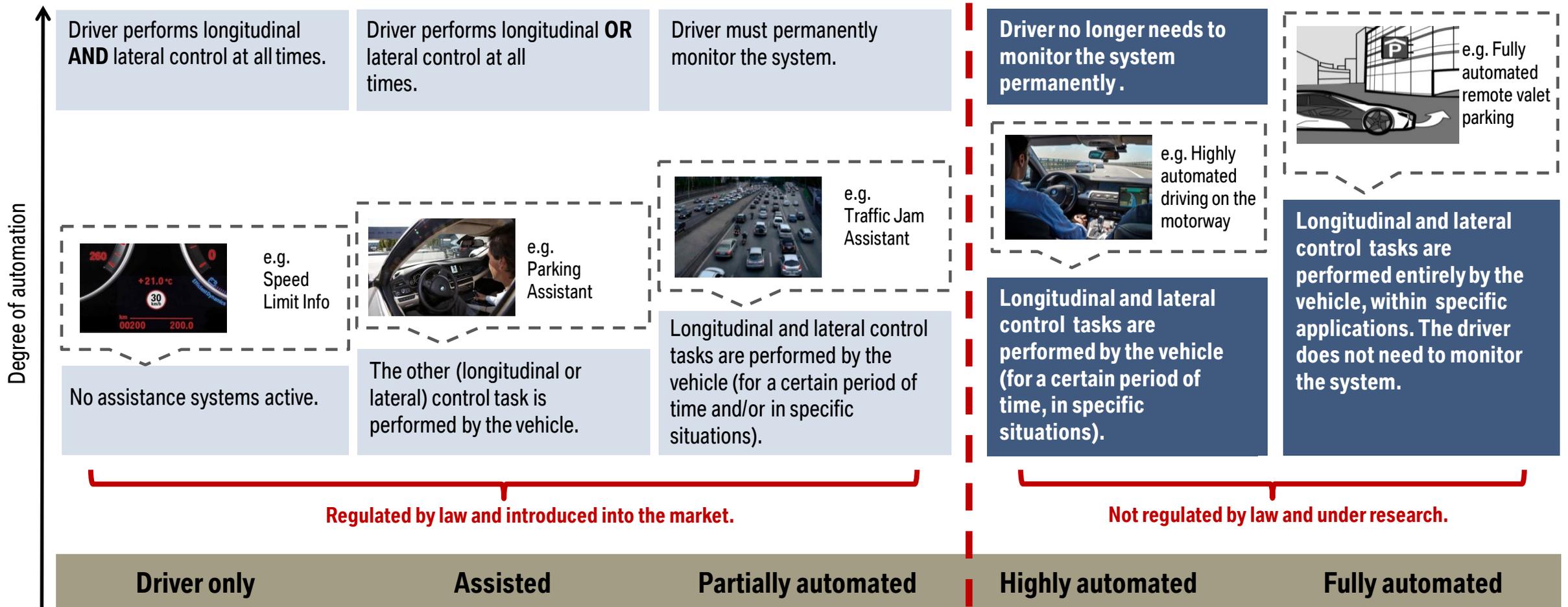


Long-distances chauffeur up to 130km/h

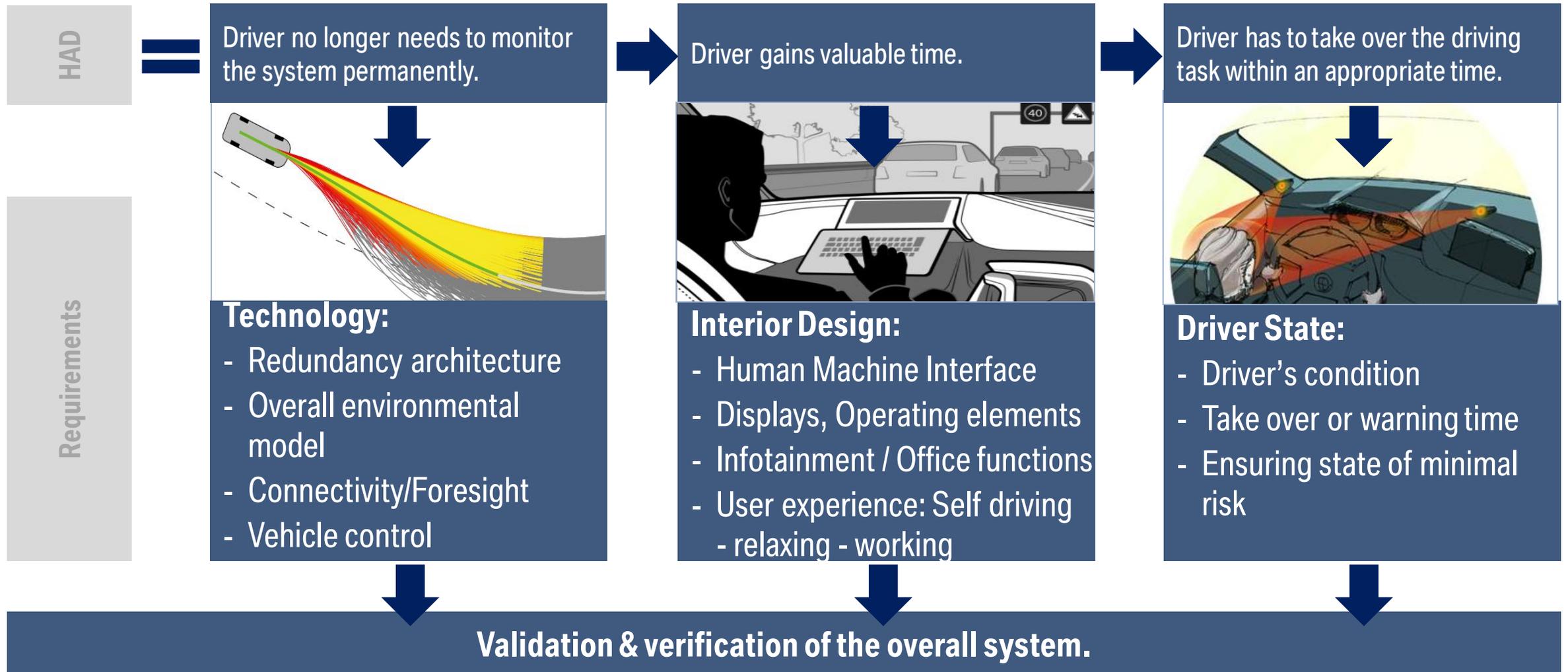


Guardian angel

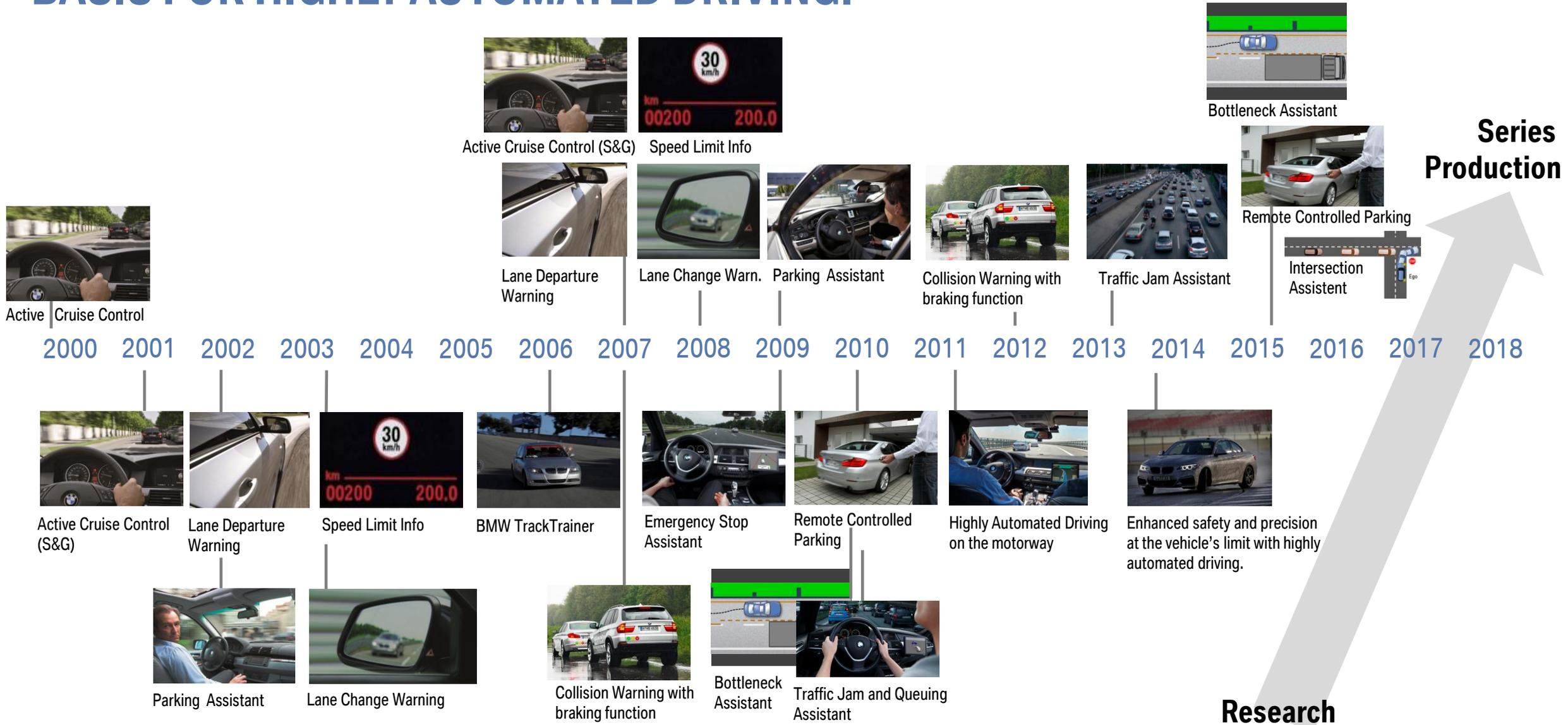
THE TRANSITION BETWEEN PARTIALLY AND HIGHLY AUTOMATED DRIVING REPRESENTS A MAJOR STEP. FULLY AUTOMATION IS THE SUPREME DISCIPLINE.



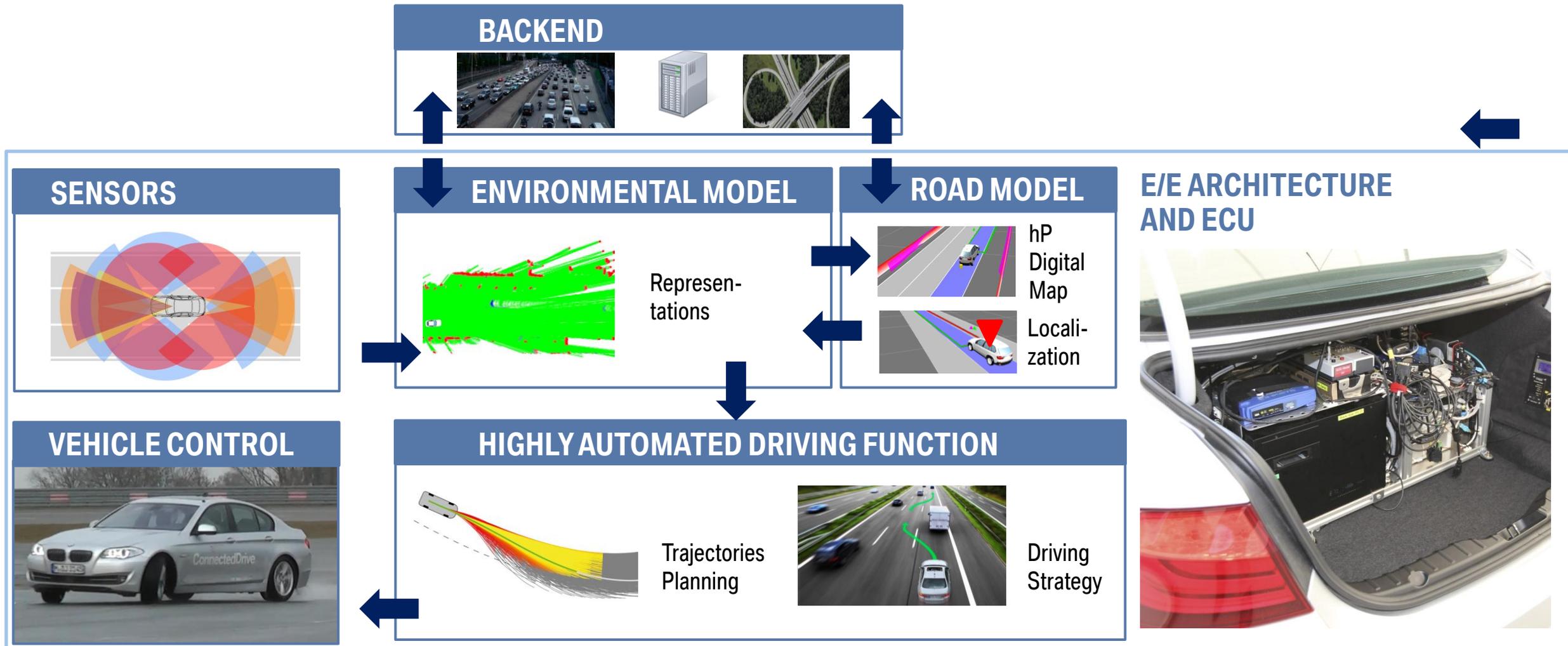
HIGHLY AUTOMATED DRIVING NEEDS AN HOLISTIC APPROACH.



LONG-TIME EXPERIENCE IN DRIVER ASSISTANCE SYSTEMS OFFERS THE BASIS FOR HIGHLY AUTOMATED DRIVING.



MASTERING THE BASIC TECHNOLOGIES IS THE FIRST STEP TOWARDS HIGHLY AUTOMATED DRIVING.



ENHANCED SAFETY AND PRECISION AT THE VEHICLE'S LIMIT WITH HIGHLY AUTOMATED DRIVING.



FUNCTION.

- The research prototype can follow a predefined path to the vehicle's limit robustly, reliably and with high accuracy.
 - Also in ambitious traffic situations where the car tends to oversteer or to understeer the system is able to stabilize the car with precise steering and braking intervention.
 - The function is the basis for an exact tracking of optimized trajectories in a highly automated driving mode.
 - Safety systems will also benefit.
- ⇒ **In the future, BMW Group's highly automated cars will handle every driving situation up to the vehicle's limits with maximum safety and comfort.**
- ⇒ **For the BMW Group, in emergency situations precise and reliable vehicle control at the physical limit is the next important step to offer a continuous and emotional highly automated driving experience.**

MODIFICATIONS IN REGULATORY LAW AND ROAD TRAFFIC REGULATIONS ARE NECESSARY.

REGULATORY LAW

- **Currently, highly automated driving systems are not admissible in many countries due to conflicts with regulatory requirements.**
- **For example, corresponding systems are not in line with ECE-R 79 (Steering Equipment) and ECE-R 48 (Lighting).**

ROAD TRAFFIC REGULATIONS

- **Highly automated driving seems to contradict regulations of Vienna Convention on Road Traffic of 1968:**
 - Art. 5: Every vehicle shall have a [human] driver who shall at all times be able to control his vehicle.
 - Art. 13: Every [human] driver shall in all circumstances have his vehicle under control.
- **Newly inserted paragraph now denies conflict with the above mentioned regulations "when ... systems can be overridden or switched off".**
- **The scope of this new paragraph and its impact on automated driving still needs clarification.**

PRODUCT LIABILITY

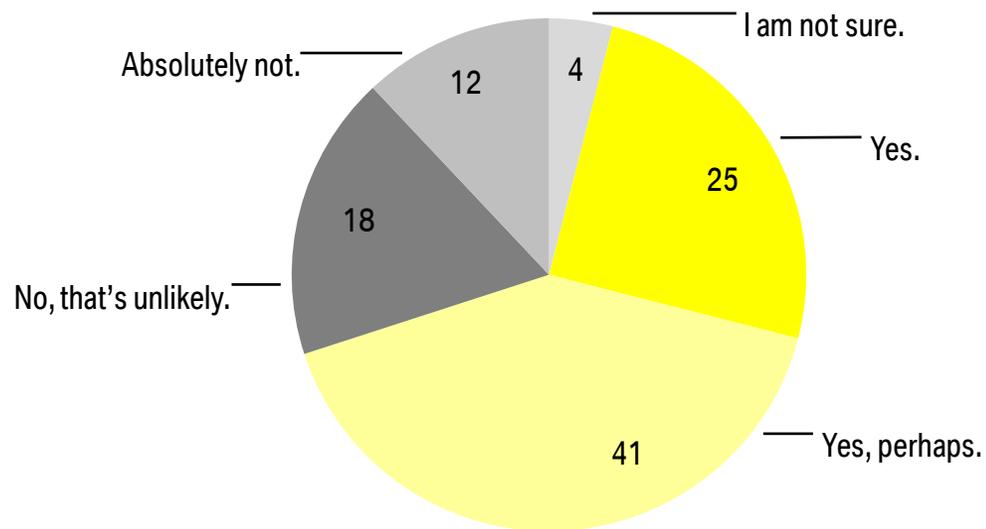
- **Highly automated driving will be evaluated under existing product liability laws. No special liability law for automated driving expected.**
- **Higher liability risk for manufacturer which „intrudes“ into traditional driver's area of responsibility.**
- **Period of legal uncertainty until judgments of higher courts dealing with highly automated driving systems have been rendered.**

Discussions about changes of regulatory law and road traffic regulations are ongoing on national and international level (e.g. German Ministry of Transport, UN ECE).

FIRST STUDIES SHOW THAT HIGHLY AUTOMATED DRIVING WILL BE ACCEPTED BY THE CUSTOMER BUT WE ALSO HAVE TO CONVINCE THE SOCIETY.

“The industry is developing autonomous vehicles. Could you imagine driving such a car if you were able to intervene in the case of an emergency?”

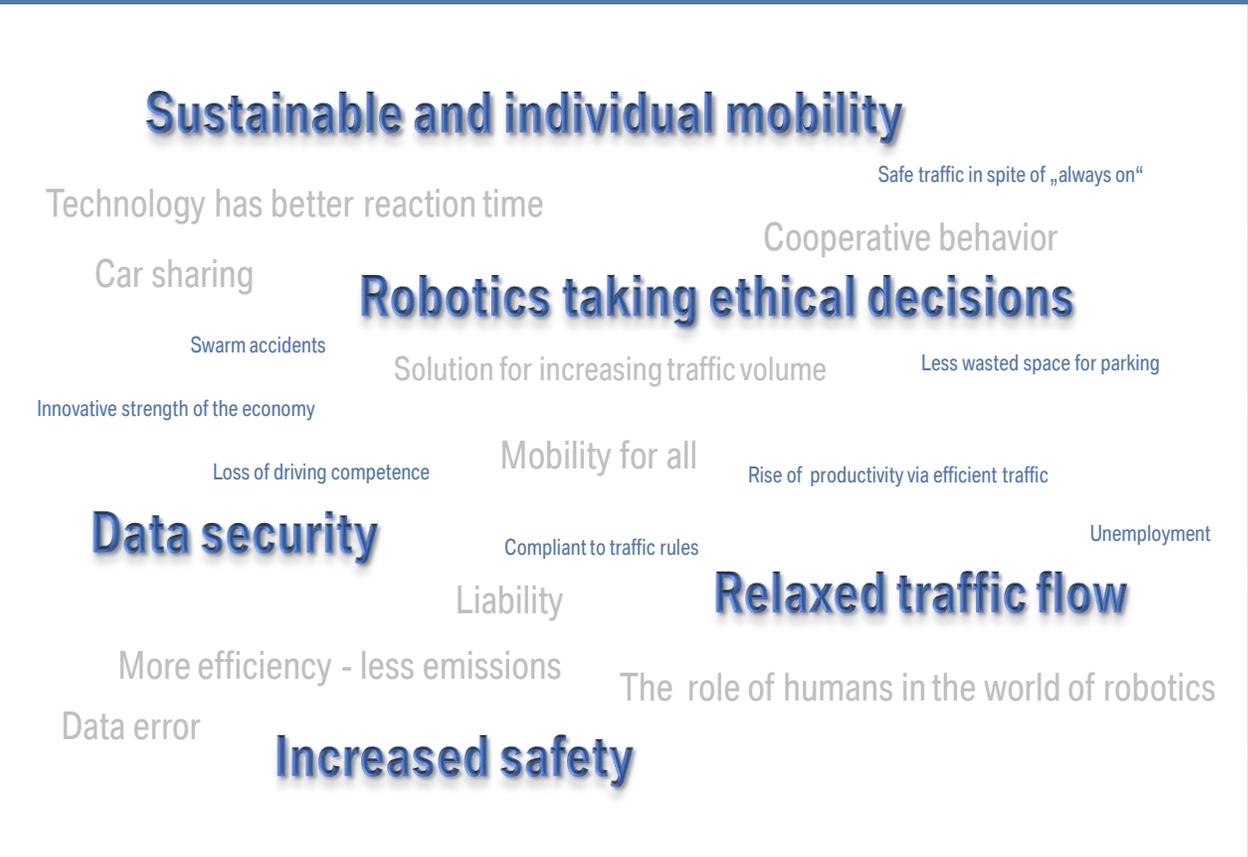
Results of a survey of 1,000 customers with a German driver's license:



>> For two thirds of the drivers an autonomous car would be an option.

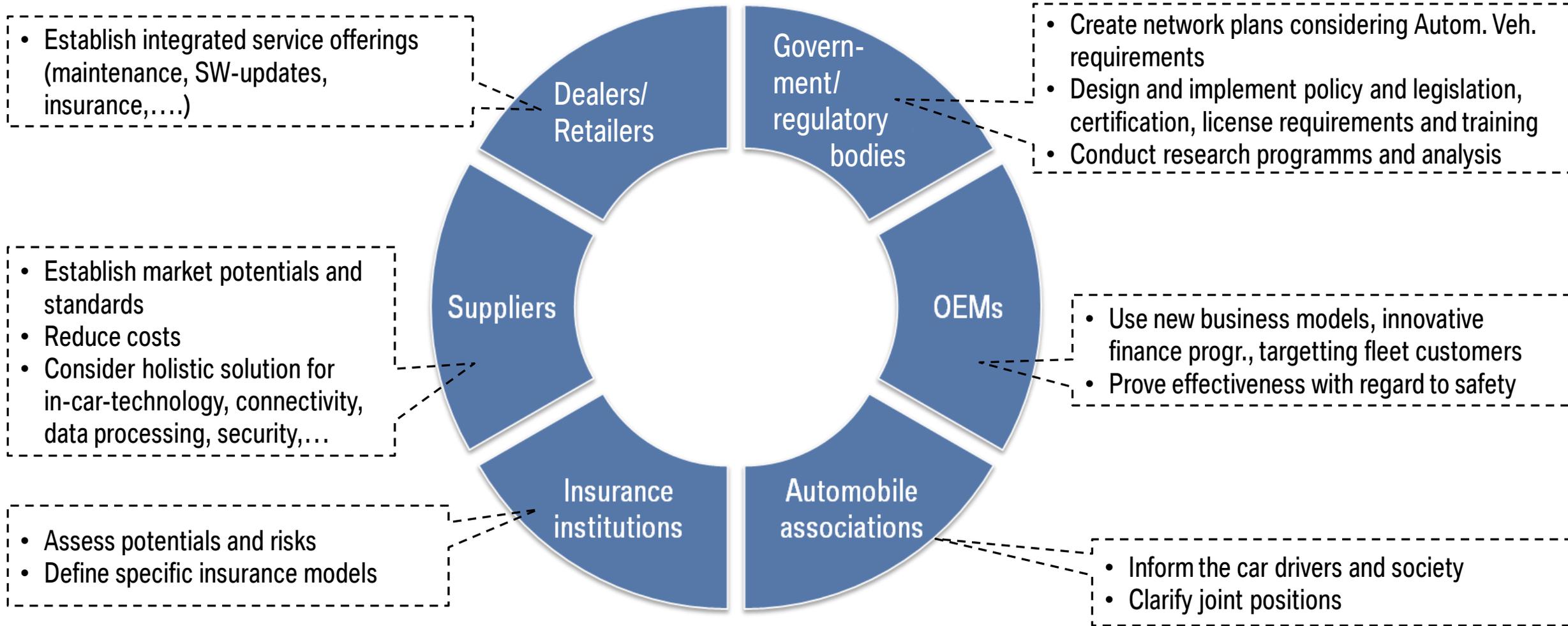
(Source: Ernst & Young GmbH, Study „Autonomous Driving“, 2013, provided by research partner Continental AG)

The society's hopes and concerns:



(Source: BMW Group Research and Technology, Online-Media Analysis „Social perception of highly automated driving“)

HIGHLY AUTOMATED DRIVING NEEDS A JOINT COLLABORATION AND CLEAR ROLE OF ALL KEY PLAYERS.



SUMMARY.

- **With highly automated driving we can shape the future of accident-free and sustainable individual mobility.**
- **For the rollout of the industrialization a controllable technology is necessary, the whole package must be profitable and the suppliers must be capacitated.**
- **The society has to be informed and prepared.**
- **Regulations are needed and the common political procedure has to be continued**
- **A joint collaboration of all key players is necessary.**