



**Mehr Wert.
Mehr Vertrauen.**

**Add value.
Inspire trust.**

An example of future technical inspection for automated driving

Dr. Housseem Abdellatif,
Global Head Autonomous Driving & ADAS
TÜV SÜD Mobility

A grayscale background image showing a hand pointing at a screen, with a pen or stylus visible on the right side.

“ IN GOD WE TRUST,
ALL OTHERS MUST
BRING DATA.”

+ W. EDWARD DEMING

The 5 Levels of Driving Automation

For on-road vehicles

		Human driver	Automated system		
		Steering and acceleration/ deceleration	Monitoring of driving environment	Fallback when automation fails	Automated system is in control
Human driver monitors the road	0 NO AUTOMATION				N/A
	1 DRIVER ASSISTANCE				SOME DRIVING MODES
	2 PARTIAL AUTOMATION				SOME DRIVING MODES
Automated driving system monitors the road	3 CONDITIONAL AUTOMATION				SOME DRIVING MODES
	4 HIGH AUTOMATION				SOME DRIVING MODES
	5 FULL AUTOMATION				

Source SAE International

Automation of driving is claimed to increase the road safety



Automation per se is based on data processing. Automated decision making rely on data and information



Do we need to inspect the data to make sure that the automation takes the right decisions to increase road safety?



What is needed in terms of data and data access to enable safety inspection?

A Simple Example of Automated Driving: Active Cruise Control

1. Constant speed control



2. Deceleration control

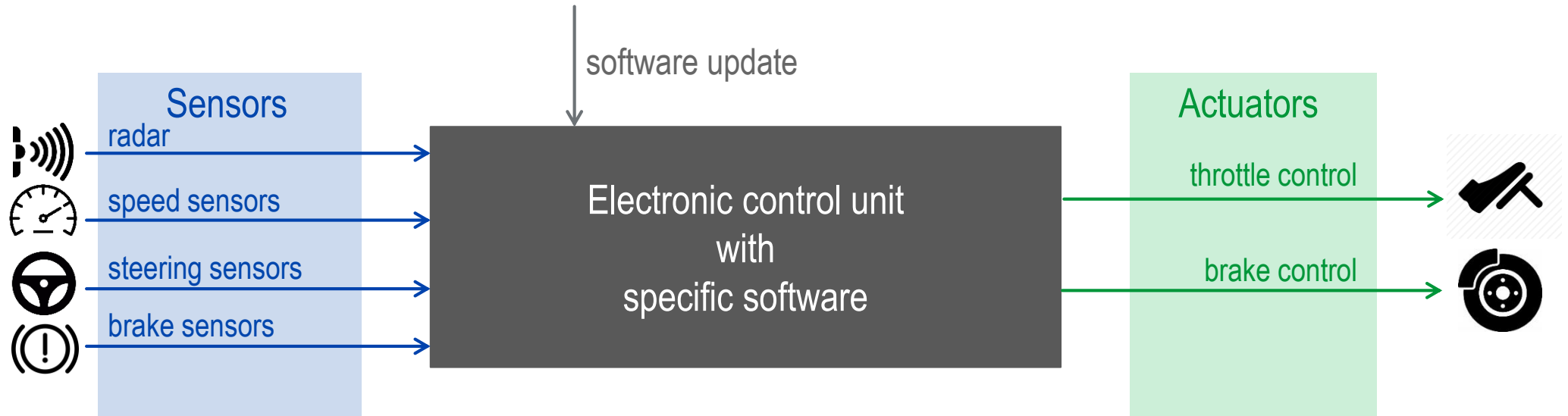


3. Acceleration control

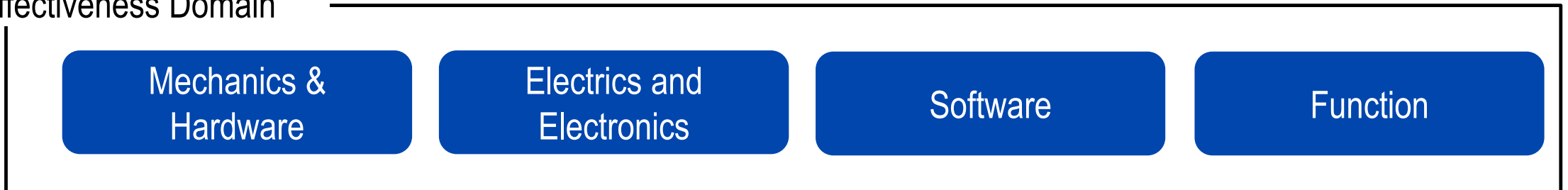


Source suzuki, parkers.co.uk

How Does it Work?

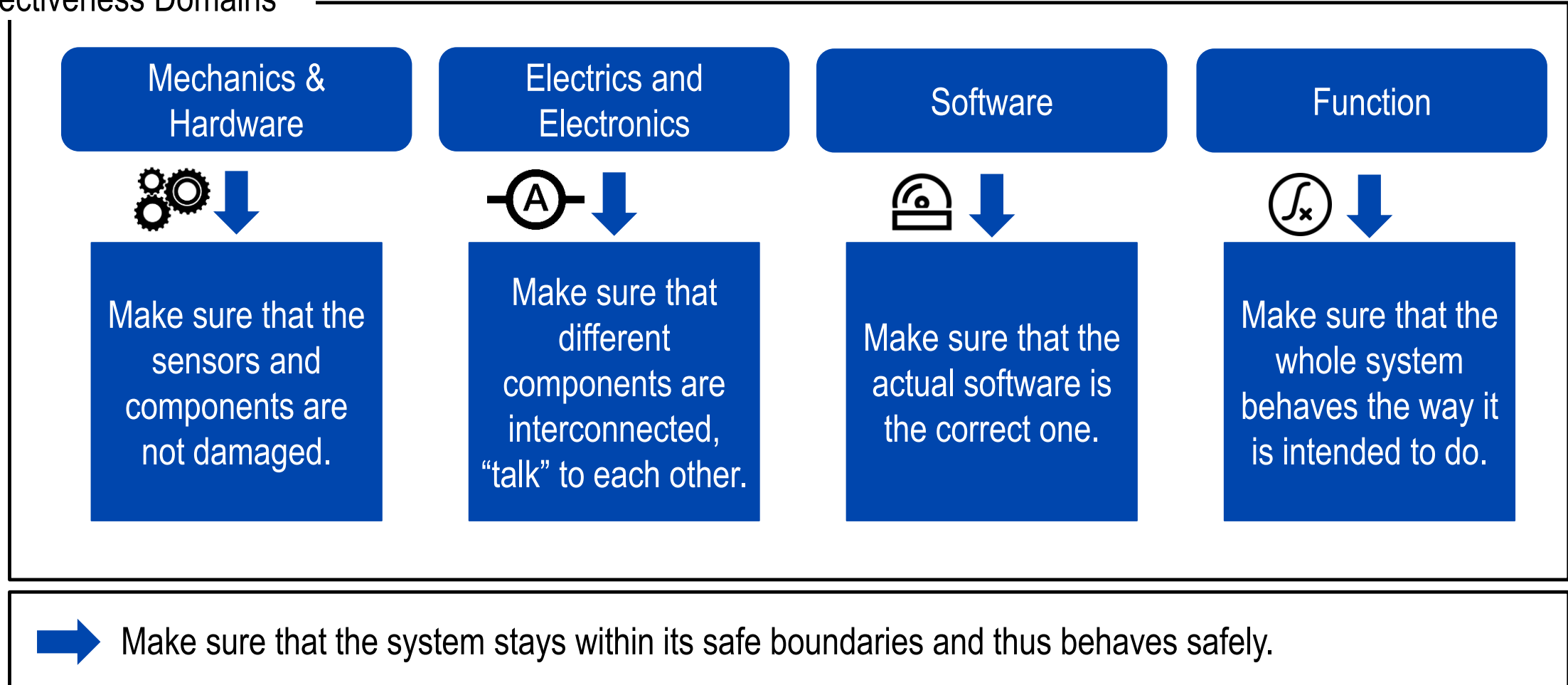


Effectiveness Domain



What is the Aim of Inspecting Automated Driving

Effectiveness Domains



Inspection of Automated Driving: Blackbox testing with access to the right data

Mechanics & Hardware	<ul style="list-style-type: none"> - Sensor specification - Sensor calibration status - Brake specification - Throttle specification 	<ul style="list-style-type: none"> - Sensor damage inspection - Brake inspection - Throttle inspection
Electrics & Electronics	<ul style="list-style-type: none"> - Electrics and Electronics diagrams - Sensor on/off status - Actuator on/off status - ABS status 	<ul style="list-style-type: none"> - Sensors plausibility checks - Brake, throttle plausibility checks - Sensors, actuators on/off checks - Sensor to ECU communication checks - Actuator to ECU connection checks
Software	<ul style="list-style-type: none"> - Software number - Software update number - Software hash tags - CallID, ValID 	<ul style="list-style-type: none"> - Software integrity checks - Software actuality checks
Function	<ul style="list-style-type: none"> - History of activation, deactivation - History of alarms - History of emergency brakes - Brake status signals - Calibration status of radar sensors 	<ul style="list-style-type: none"> - Deterioration of functionality - ECU Calibration of sensors - Plausibility against hardware status

Conclusions

- Inspection should focus on safety relevant topics
- Access to necessary data should be ensured
- Necessary data can be provided in 4 categories
 - Mechanics & Hardware
 - Electrics & Electronics
 - Software
 - Functionality
- Necessary data and necessary data access should be defined in the type approval regulation
- Inspection will be the natural extension of the type approval
- Harmonize homologation, PTI and market surveillance



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**“THERE IS NO SUBSTITUTE FOR
KNOWLEDGE.”**

W. EDWARD DEMING

**Thank you for your
attention!**

Dr. Housseem Abdellatif
Global Head of Autonomous Driving & ADAS

Business Unit Automotive
TÜV SÜD Mobility
Daimlerstraße 11, 85748 Garching
Germany

Housseem.abdellatif@tuev-sued.de