

Space for Needs and Dreams



Chances and Challenges within the Drive System Development for Autonomous Vehicles

Werner Siebert (Head of Driving System Functions) & Nils Hartnack (Head of Driving System Function Development)

Aachen | 6. October 2026



Nutzfahrzeuge

Autonomous driving will redefine the future of mobility

Agenda



Autonomous driving will redefine the future of mobility

Werner Siebert

- Advantages of Autonomous Driving
- Autonomous Driving in the MaaS Context
- SAE L4 MaaS/TaaS vs. SAE L2+/L3 Private Use
- Example Autonomous Driving Test Fleet (Hamburg)
- System safety is ensured through extensive testing by Volkswagen Commercial Vehicles



Challenges in Drive System Development for Autonomous Vehicles

Nils Hartnack

- Overview of the drive System of the autonomous ID.Buzz AD
- From commanded motion to a verified vehicle response – sample error
- Independent monitoring closes the gap between command integrity and physical response
- A closer look at the DAM's operating principles
- DAM turns a physical acceleration deviation into a qualified failure state
- VSS combines functional evidence and platform health for vehicle monitoring
- VSS combines four tasks that go beyond simple signal forwarding
- Tracing the chain from the physical response via the DAM and the VSS to the MRM

Autonomous driving will redefine the future of mobility

Advantages of Autonomous Driving



Safer Roads

e.g., road accidents cost approximately 340 billion USD per year in the United States



Time Savings

e.g., people spend an average of 52 hours per year searching for parking in Hamburg



Addressing Climate Change

e.g., the transportation sector accounts for 28% of local emissions in Hamburg



Mitigating the Driver Shortage

e.g., due to the shortage of qualified drivers, only half of Germany's public transport services were available without restrictions.



Bringing People Together

e.g., the share of single-person households in Hamburg has increased to 54% and continues to grow.

Autonomous driving will redefine the future of mobility

Autonomous Driving in the MaaS Context



Private Cars



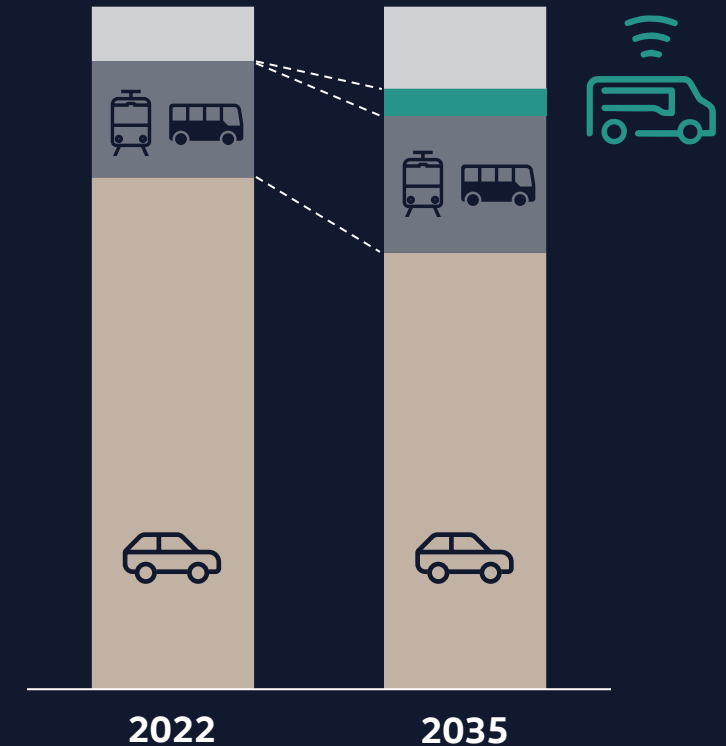
Traditional Public
Transportation

Autonomous vehicles

bridge the gap between private cars and traditional public transportation

- Provide high flexibility and comfort without the need for vehicle ownership
- Lower operating costs compared to traditional public transportation
- Increase traffic efficiency through optimized route planning
- Complement public transportation where mobility gaps exist today

Public Transportation (Passenger Kilometers)



Autonomous driving will redefine the future of mobility

SAE L4 MaaS/TaaS vs. SAE L2+/L3 Private Use

SAE L2+/L3 Private Use

The driver is responsible for passenger safety



Ego intelligence



Due to system limitations, control handover to the driver is required



VS

SAE L4 MaaS/TaaS



The vehicle, control center, and system are responsible for passenger safety



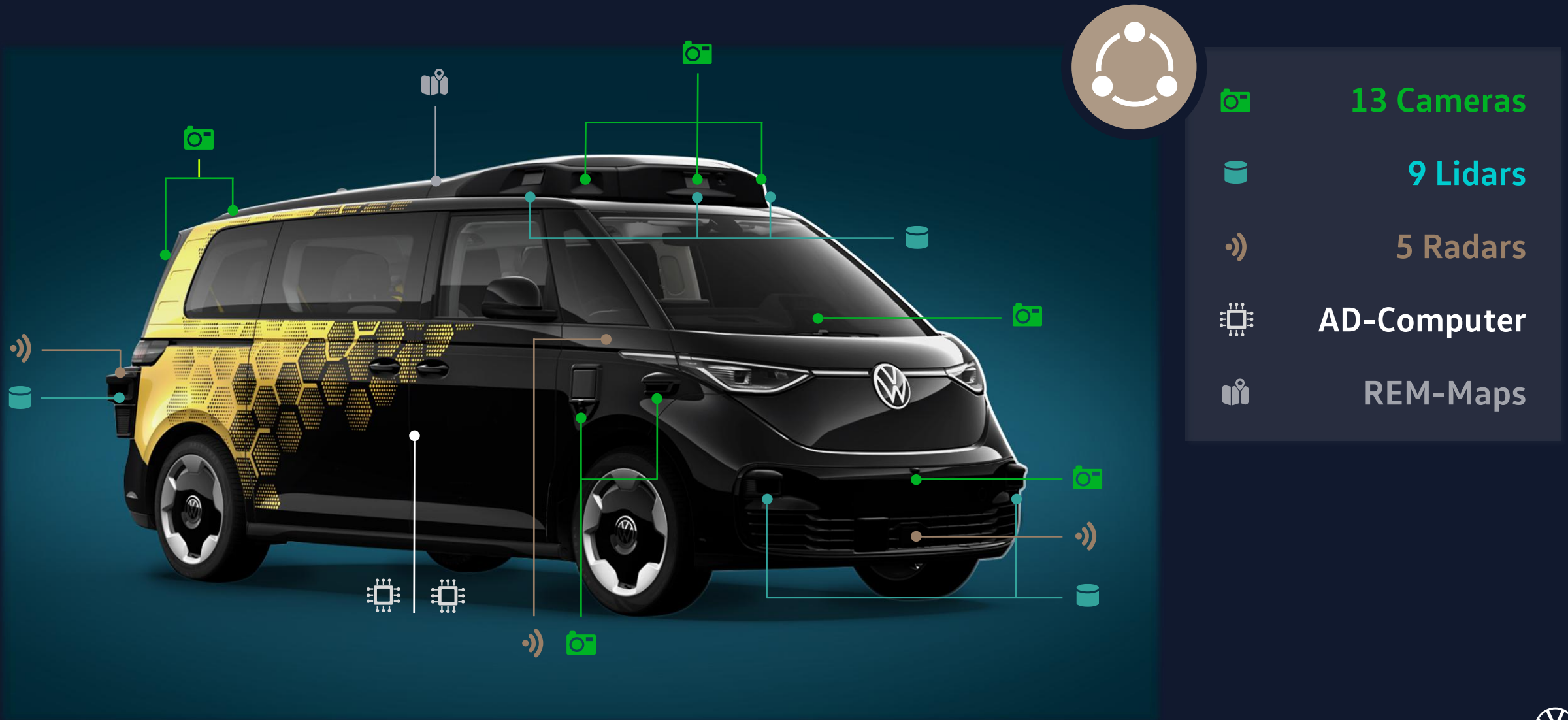
Ego and fleet intelligence for a highly efficient and scalable fleet



Remote guidance for rare and ambiguous traffic situations

Autonomous driving will redefine the future of mobility

Example Autonomous Driving Test Fleet (Hamburg)



Autonomous driving will redefine the future of mobility

System safety is ensured through extensive testing by Volkswagen Commercial Vehicles



Simulation

Test Facility in Wolfsburg



Proving Ground Tests

Munich Proving Ground



Road Tests

Germany & USA

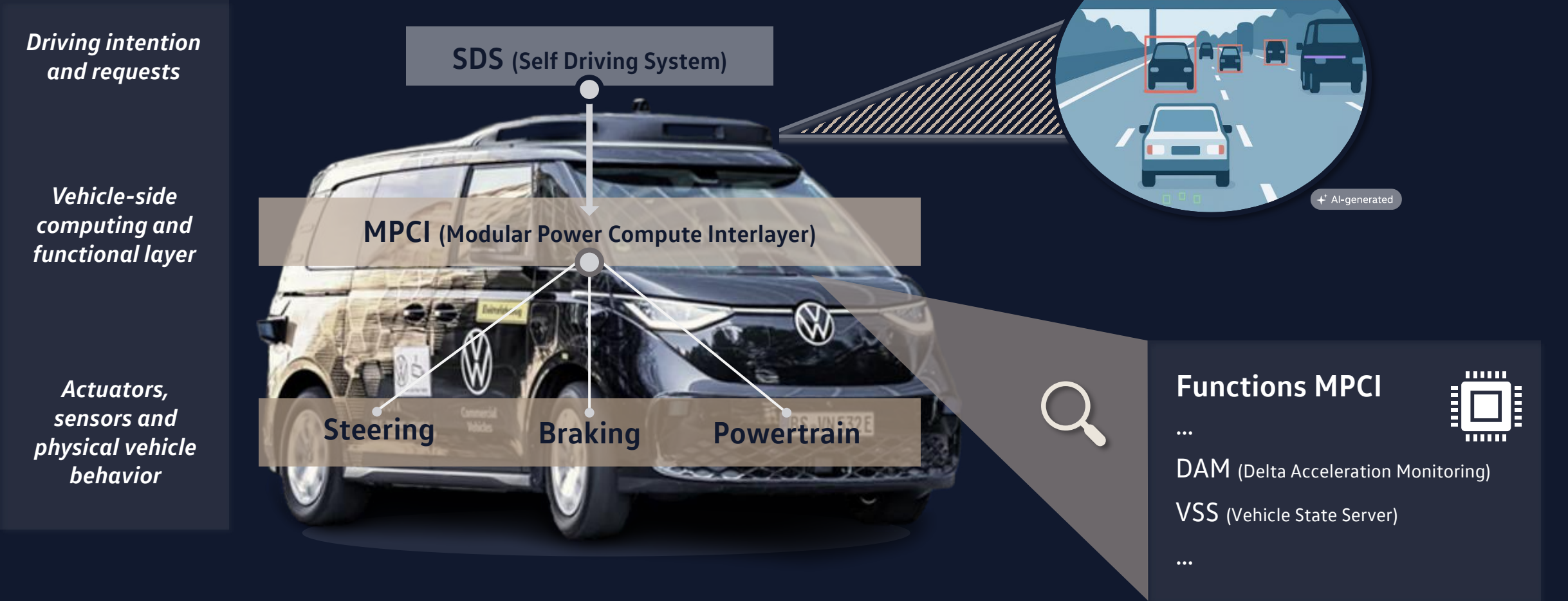


Autonomous mobility at Volkswagen



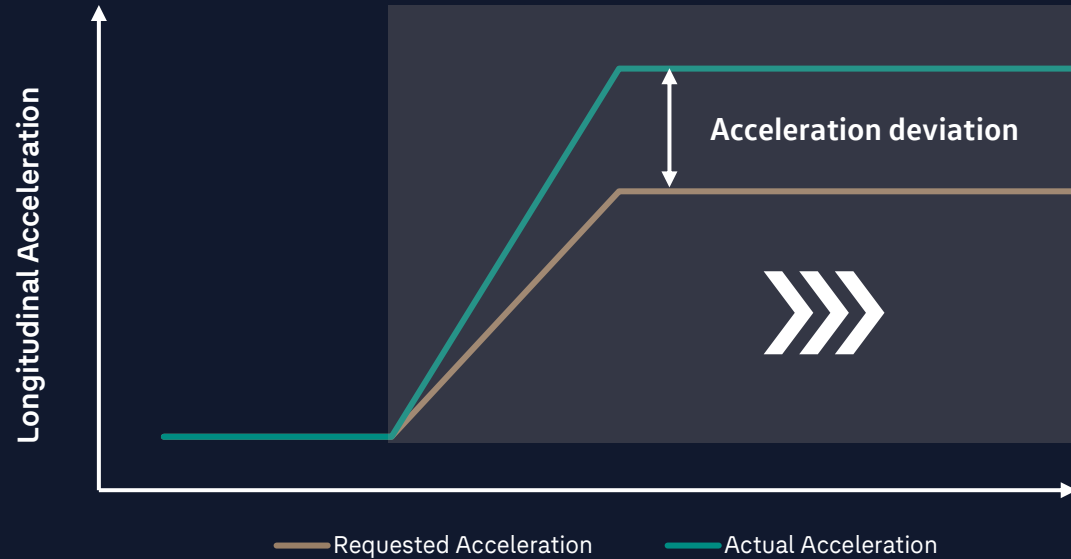
Challenges in Drive System Development for Autonomous Vehicles

Overview of the drive System of the autonomous ID.Buzz AD



Challenges in Drive System Development for Autonomous Vehicles

From commanded motion to a verified vehicle response – sample error



Requested longitudinal acceleration

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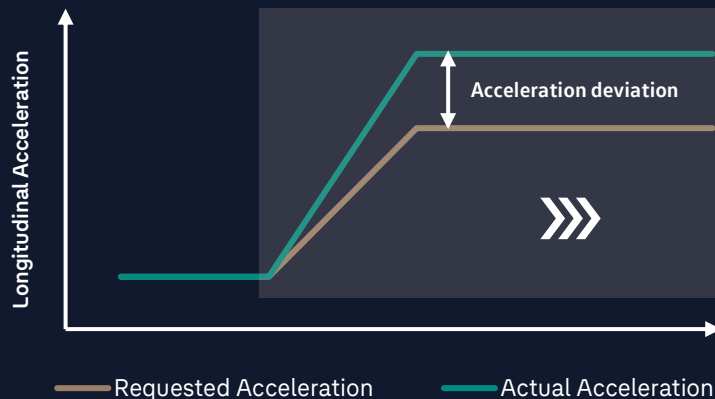
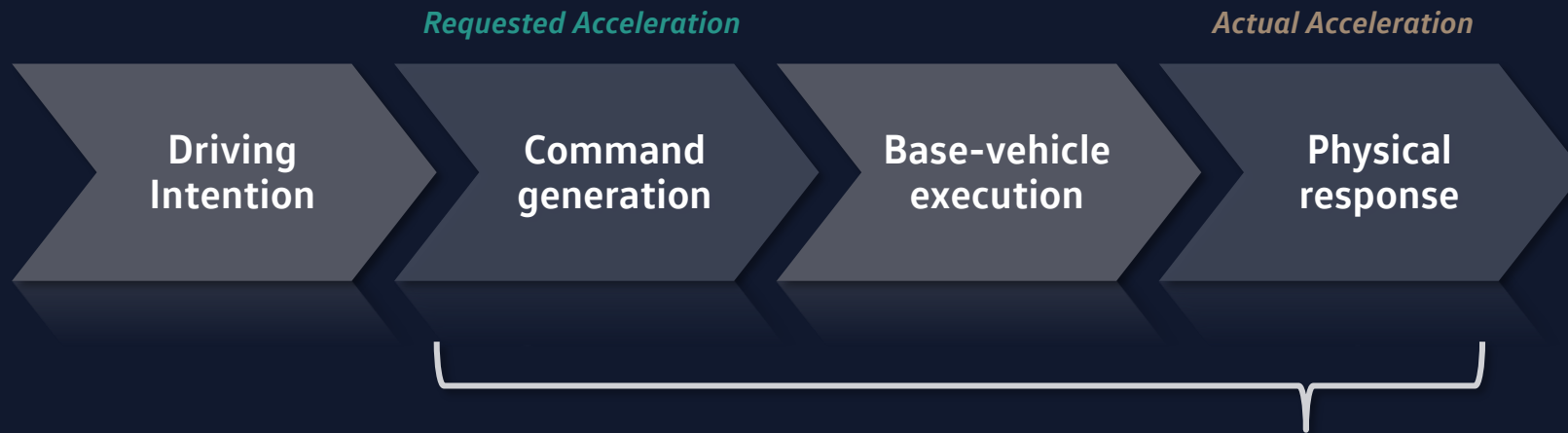
Actual longitudinal acceleration

(Actual longitudinal acceleration is higher than requested)

How is a **deviation** detected, and how does it trigger a **risk-minimizing reaction**?

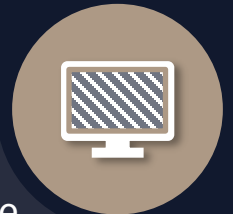
Challenges in Drive System Development for Autonomous Vehicles

Independent monitoring closes the gap between command integrity and physical response



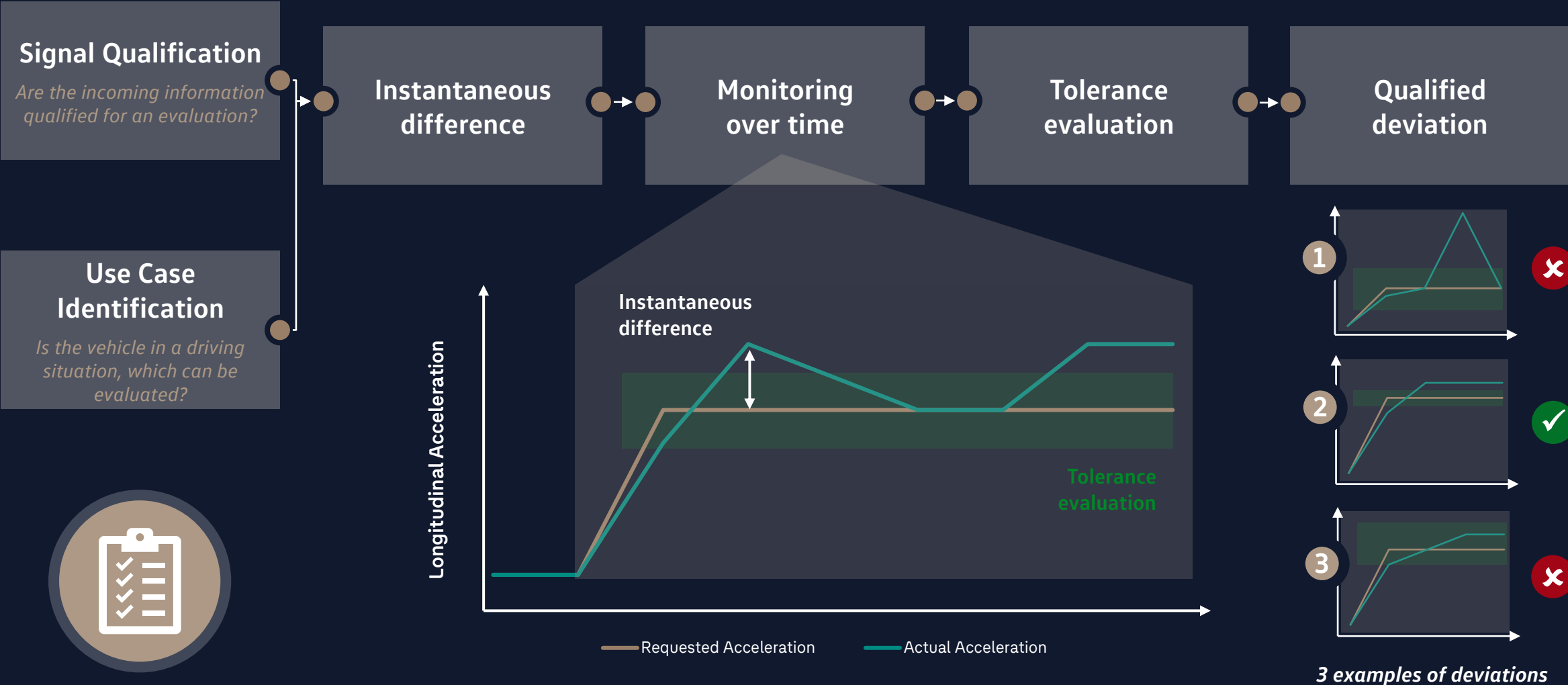
The **DAM** monitors whether the **actual** vehicle acceleration (actual value) corresponds to the **requested acceleration** (target value).

"Monitoring the command is not equivalent to monitoring its physical effect."



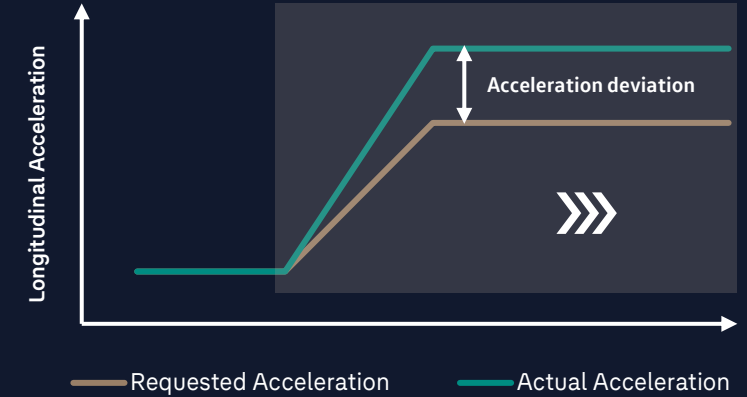
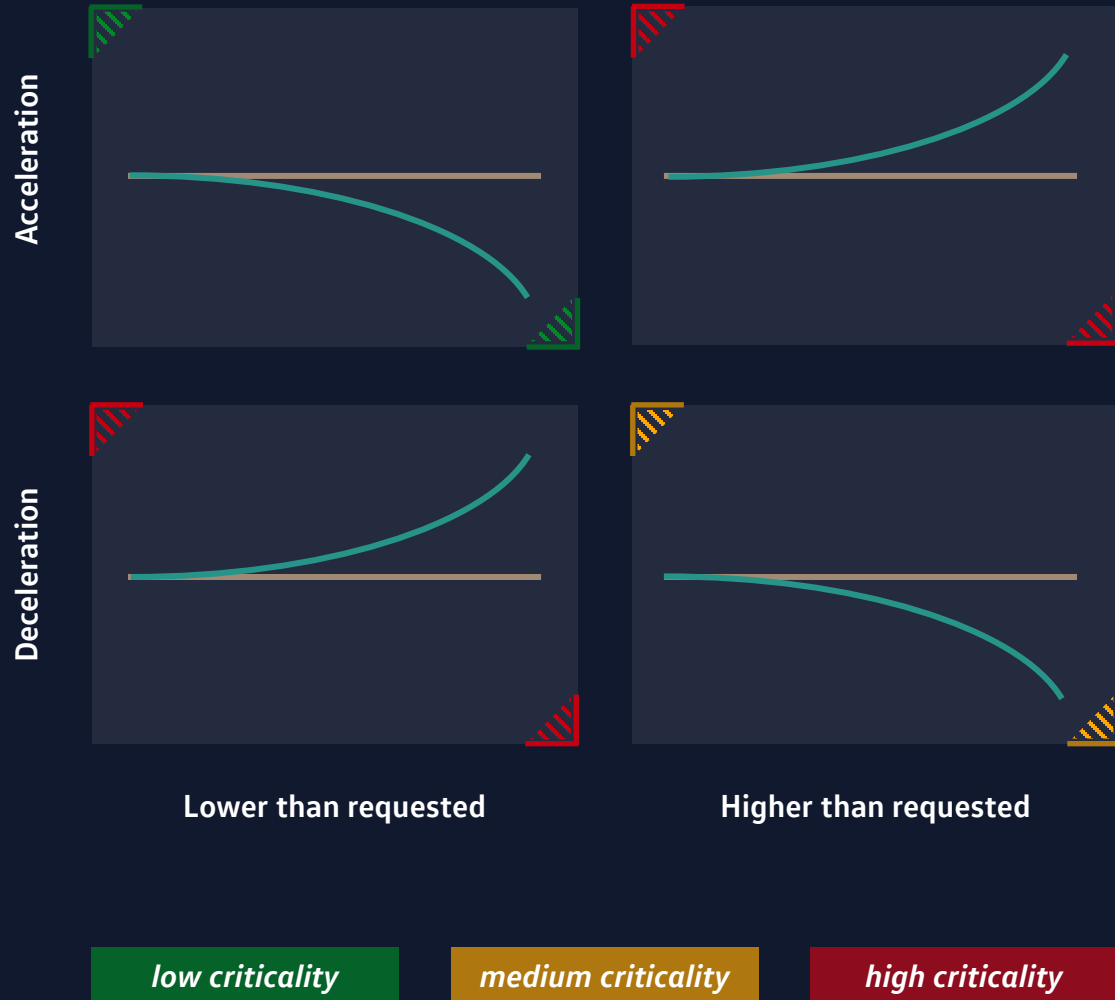
Challenges in Drive System Development for Autonomous Vehicles

A closer look at the DAM's operating principles



Challenges in Drive System Development for Autonomous Vehicles

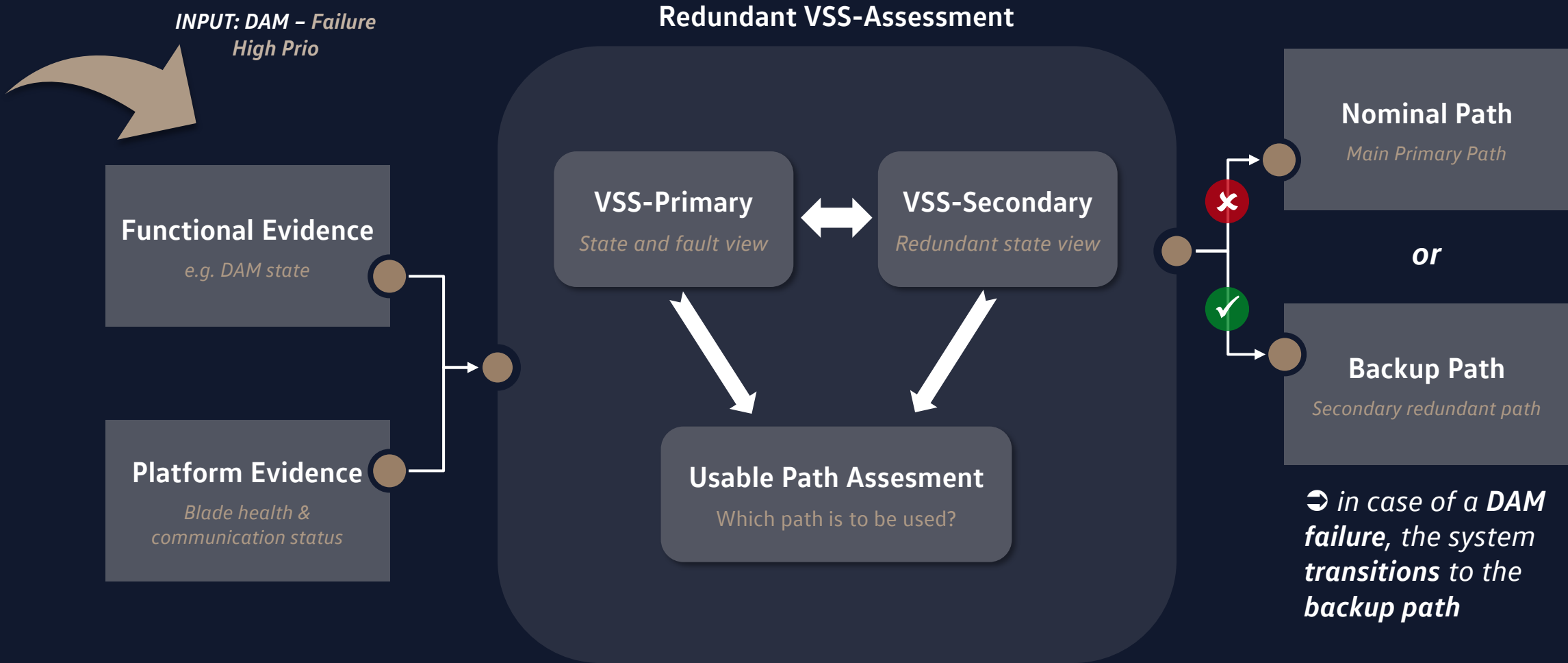
DAM turns a physical acceleration deviation into a qualified failure state



- Failure: **Actual acceleration** exceeds the **requested acceleration**, resulting in a **high-criticality fault** ("**Failure High Prio**")
- For such faults causing excessive acceleration, the corresponding **detection requirements** require an **ASIL D safety classification**.

Challenges in Drive System Development for Autonomous Vehicles

VSS combines functional evidence and platform health for vehicle monitoring



Challenges in Drive System Development for Autonomous Vehicles

VSS combines four tasks that go beyond simple signal forwarding



State Arbitration

Distributed vehicle states

- Longitudinal motion
- Lateral motion
- Vehicle speed
- Actuator states



Capability Consolidation

Individual actuator potentials

- Acceleration capability
- Deceleration capability
- Lateral-control capability



Error Handling and Diagnosis

System health and fault status

- Function failures
- Monitoring results
- Communication failures
- Internal failures



Path Selection

Operational path assessment

- Path availability
- Vehicle states
- Actuator capabilities
- Redundancy information

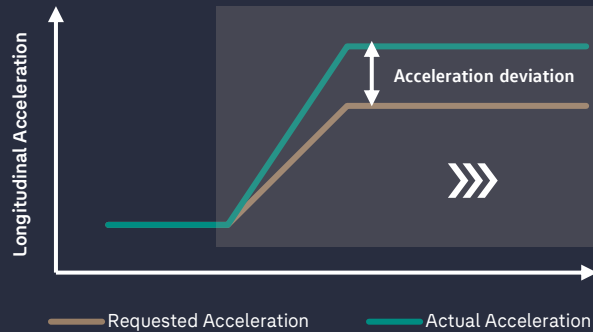
VSS does more than distribute information. It arbitrates states, consolidates capabilities, handles failures, and selects paths.

Challenges in Drive System Development for Autonomous Vehicles

Tracing the chain from the physical response via the DAM and the VSS to the MRM

Physical vehicle response

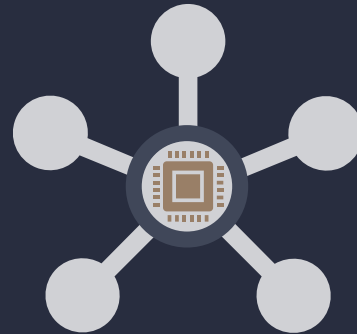
DAM Failure:
High Prio



DAM verifies the physical response, not only the generated command

VSS analyses and consolidates vehicle capabilities

VSS selecting the secondary Backup Path



VSS combines functional and platform evidence before retaining or switching the path

MRM
(Minimal Risk Maneuver)

Powertrain deactivation /
vehicle in a safe state



MRM + powertrain deactivation

A physically observed deviation results in a safe, transparent, and predictable vehicle response within a few steps.

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