

Application of DDS on modular Hardware-in-the-loop test benches at Audi

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Topics

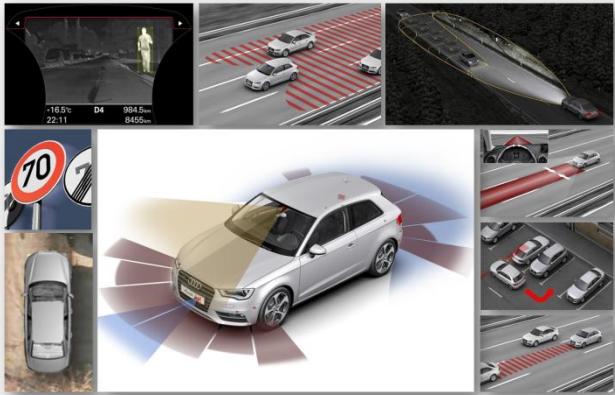
- ▶ Rapidly increasing Requirements for Testing
- ▶ Overview Hardware-in-the-loop-Testing
- ▶ Next generation modular HIL test benches
 - ▶ Goals
 - ▶ Challenges
 - ▶ Ideas
- ▶ Why DDS?
- ▶ Application at Audi: Theory meets practice

Topics

- ▶ **Rapidly increasing Requirements for Testing**
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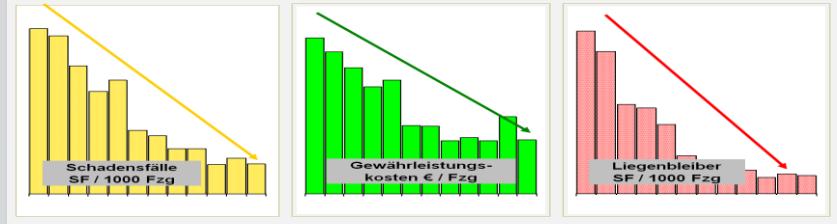
Rapidly increasing Requirements for Testing

Functions



Complexity

Quality

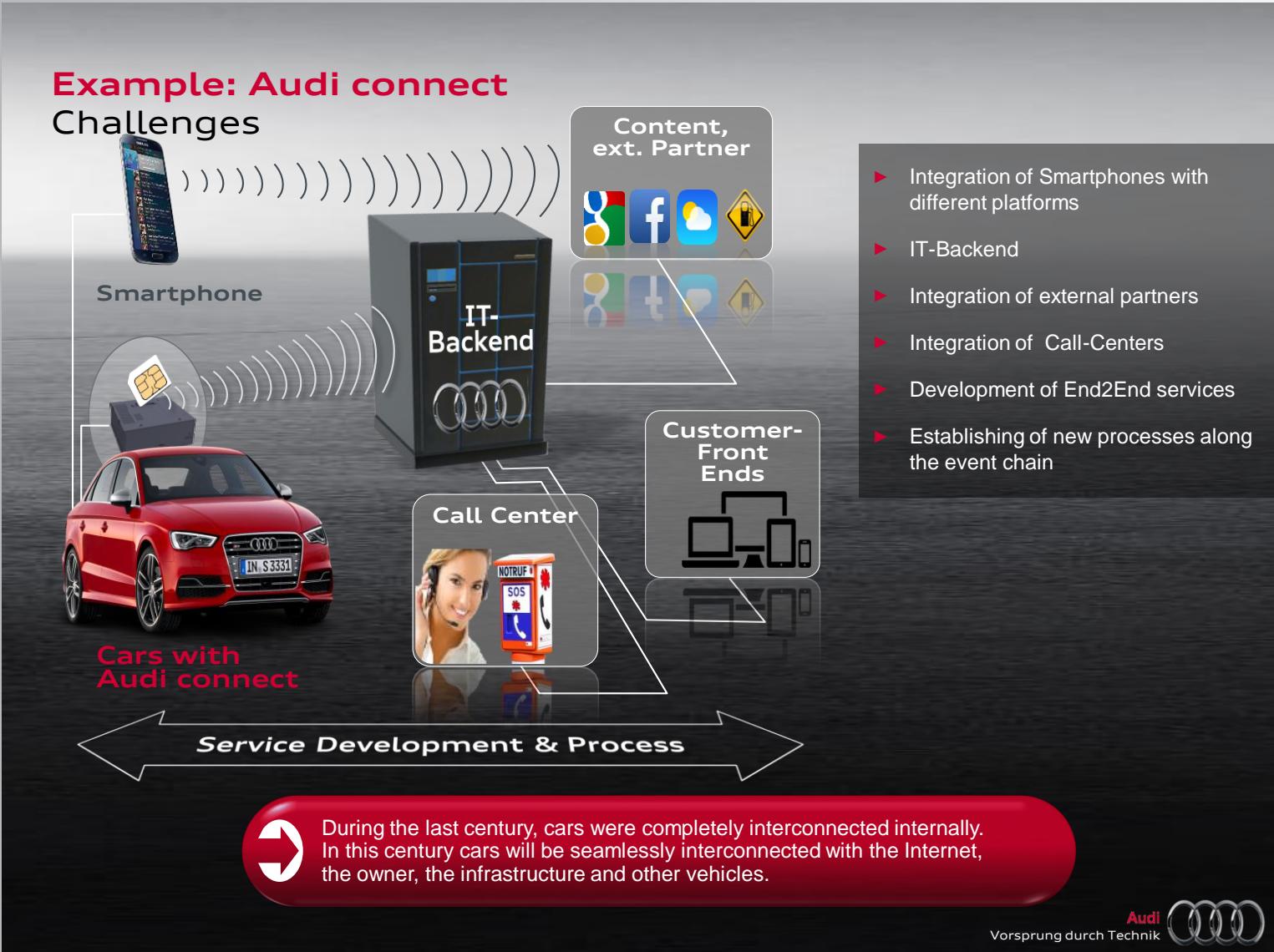


Integration and Test



Efficiency

Changing Requirements for Testing



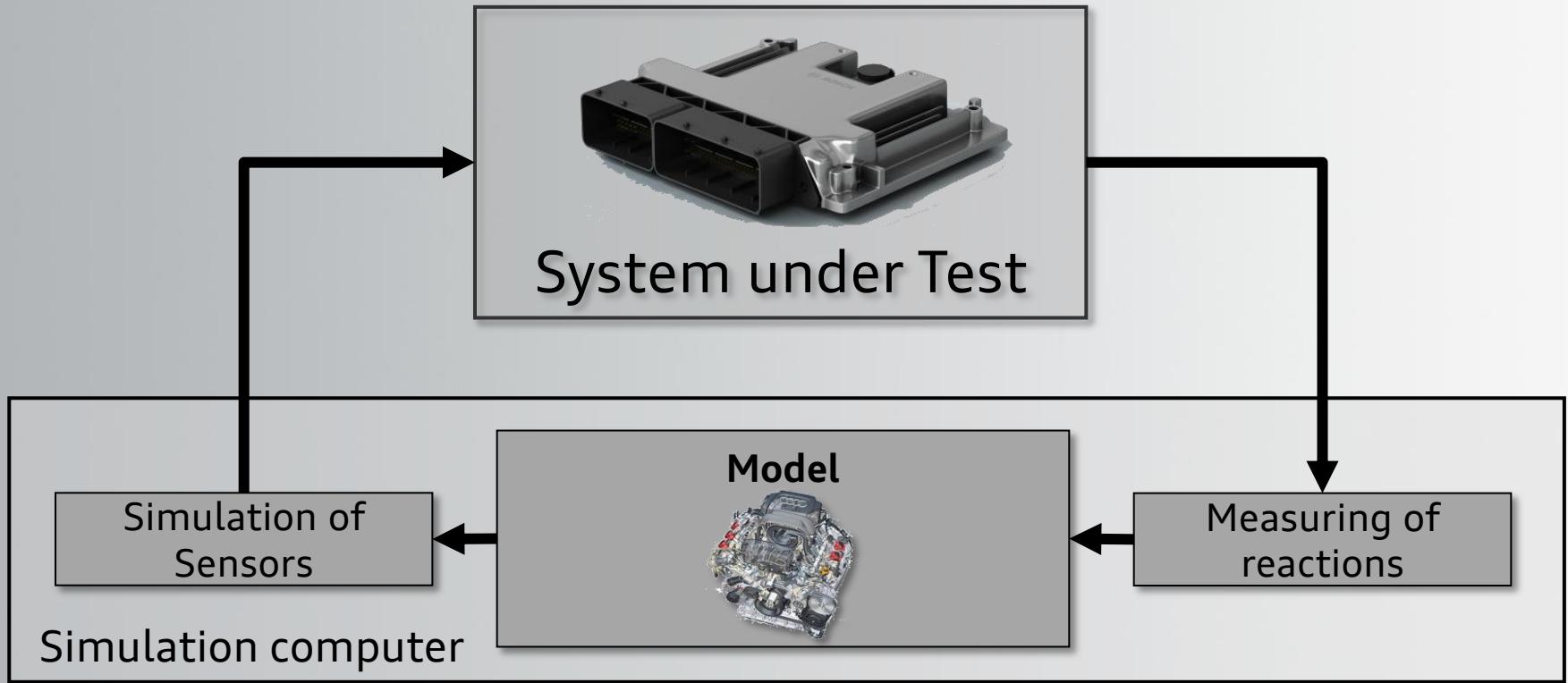
Source:

Ricky Hudi : "Trends und zukünftige Herausforderungen der E/E-Entwicklung"
18. Internationalen Fachkongress "Fortschritte in der Automobil-Elektronik"

Topics

- ▶ Challenges of vehicle development
- ▶ **Overview Hardware-in-the-loop-Testing**
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- ▶ Conclusion

Overview Hardware-in-the-Loop



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Overview and History

Stage 1: Separation of

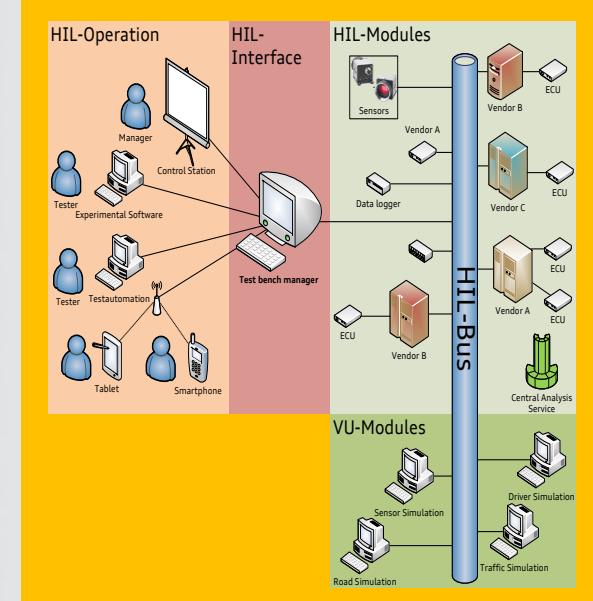
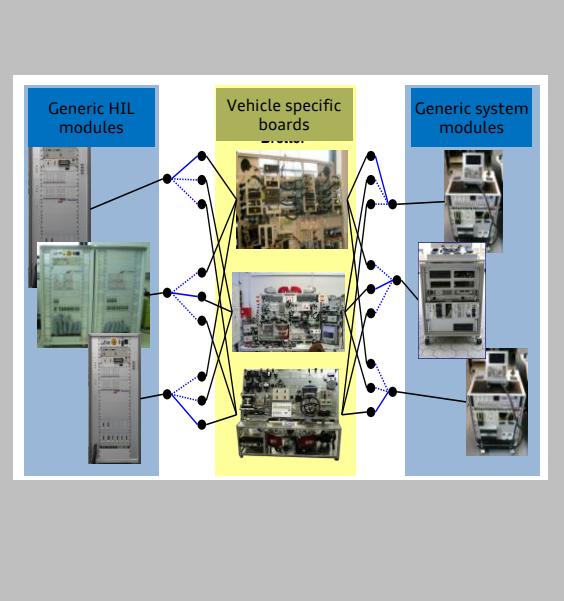
- ▶ Computation nodes and
- ▶ ECUs

Stage 2:

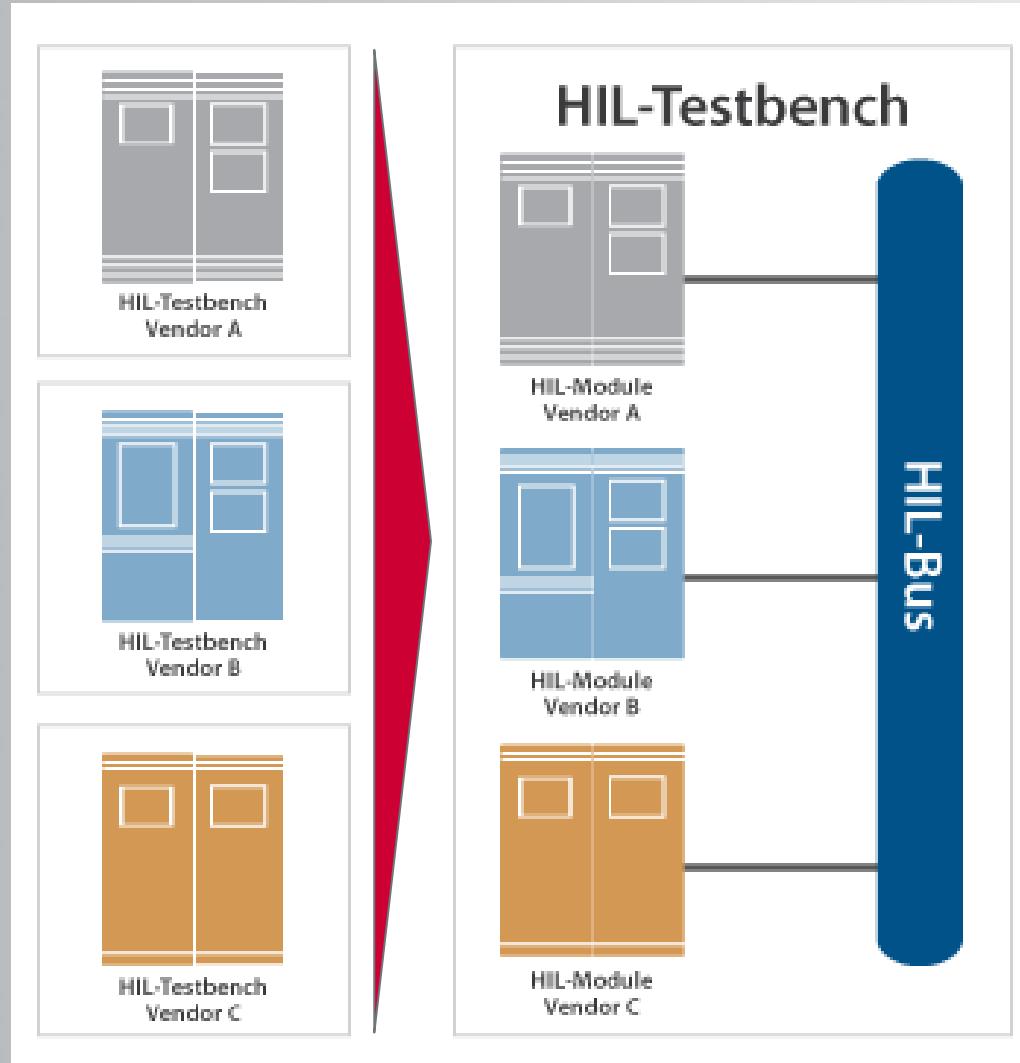
- ▶ Modular Simulink models

Stage 3: Bus-based test benches

- ▶ Multiple suppliers
- ▶ Abstraction for users

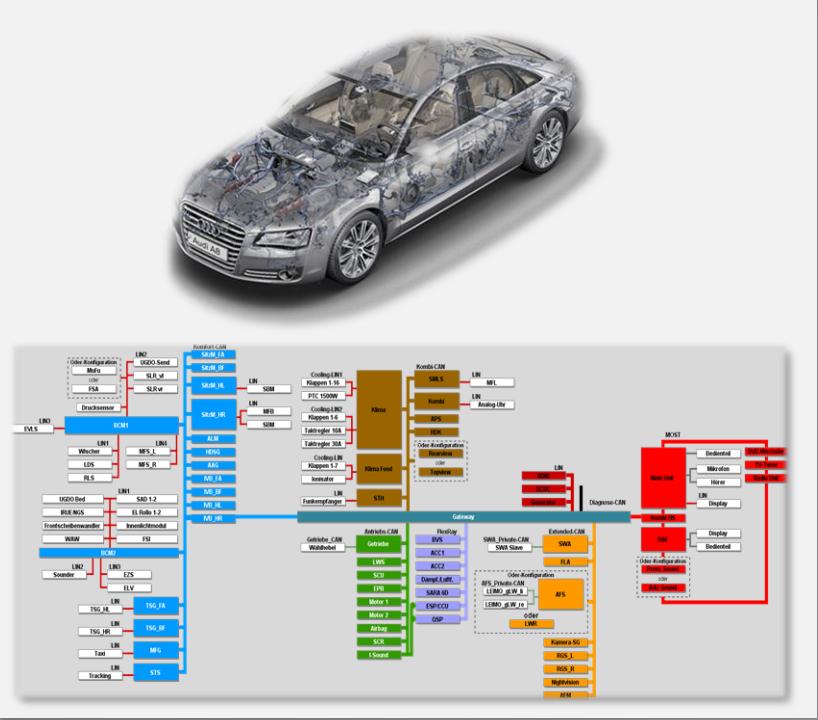


Goal

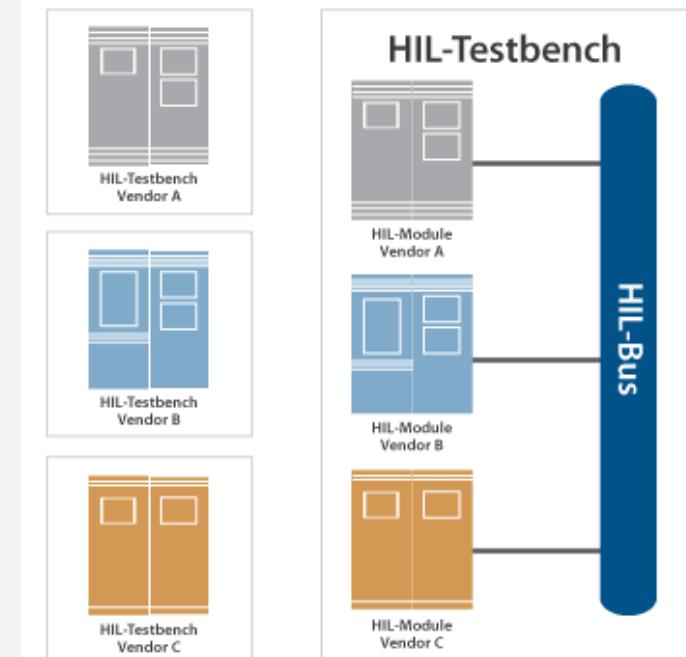


Modularization and bus based test benches

Complex and interconnected vehicle architecture



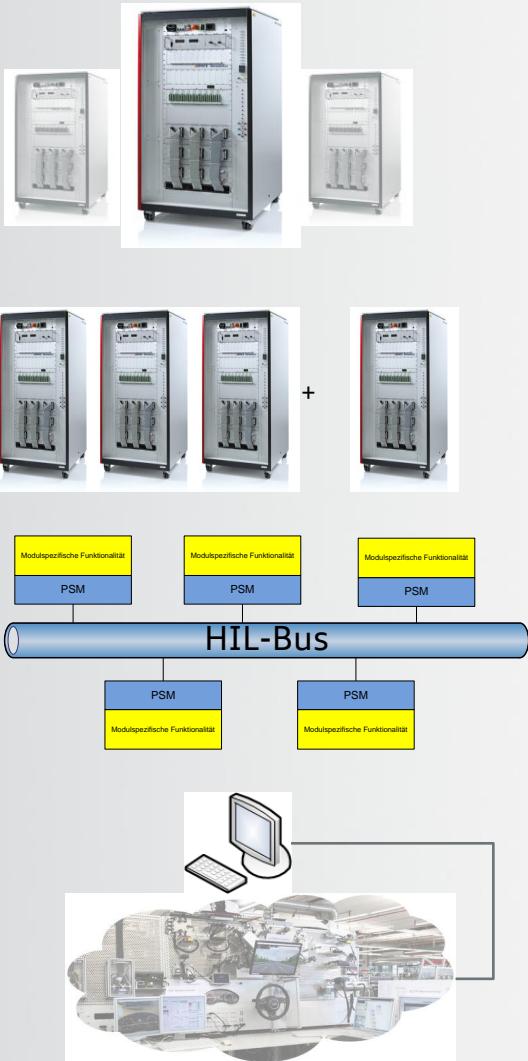
Complex and interconnected test bench architecture



Audi started the project: modular HIL next generation

Basic ideas of the mHIL NG project

- ▶ Best-in-Class approach
- ▶ Modular and scalable platform
- ▶ Standardized bus system and middleware
- ▶ Logical abstraction of test stand



Main challenges of modularization

Diversity



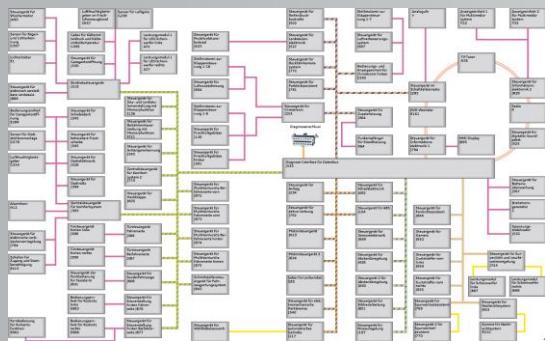
Scalability



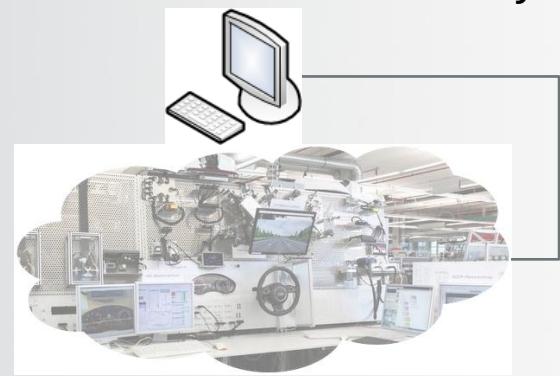
User Interaction



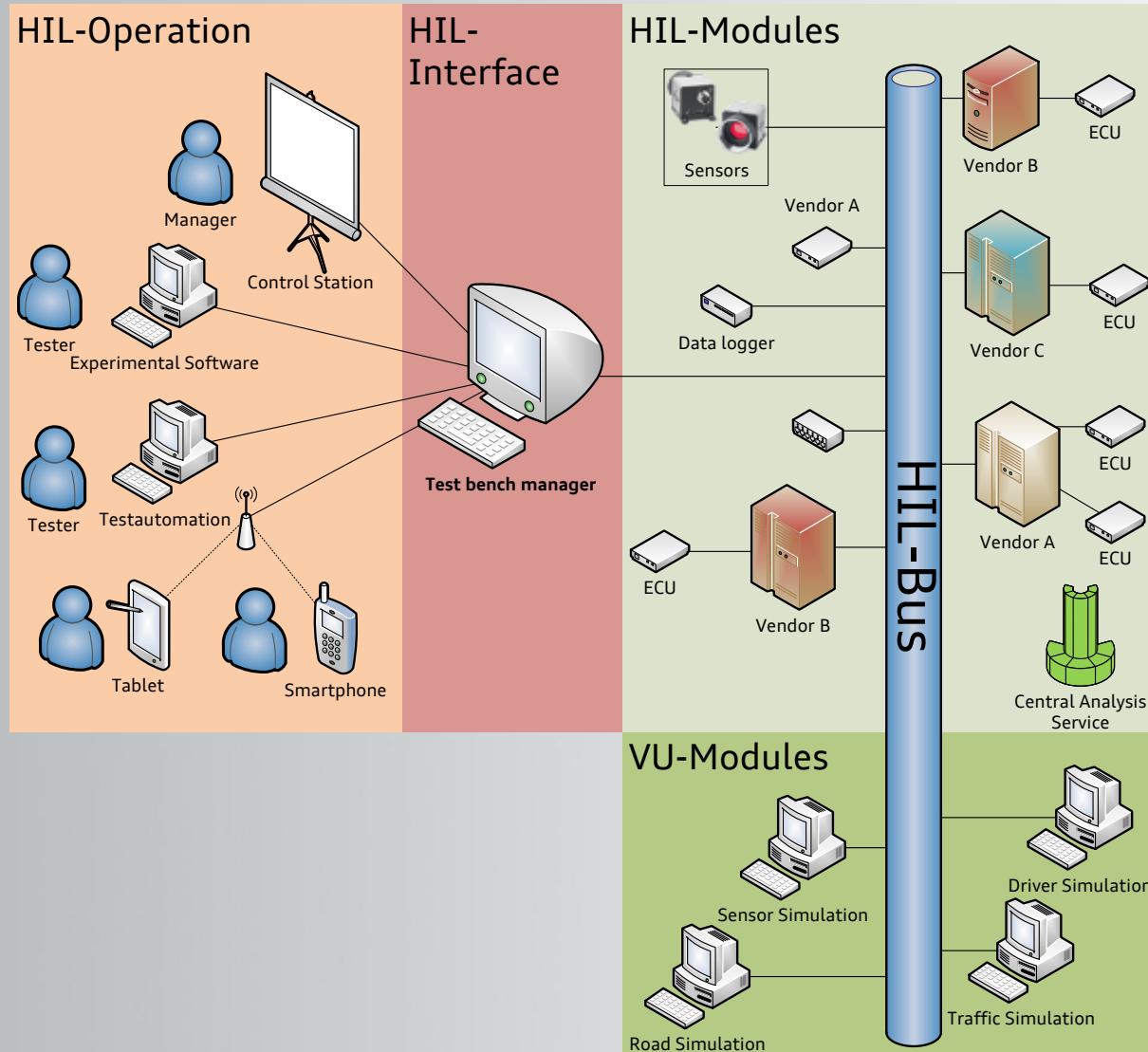
Complexity



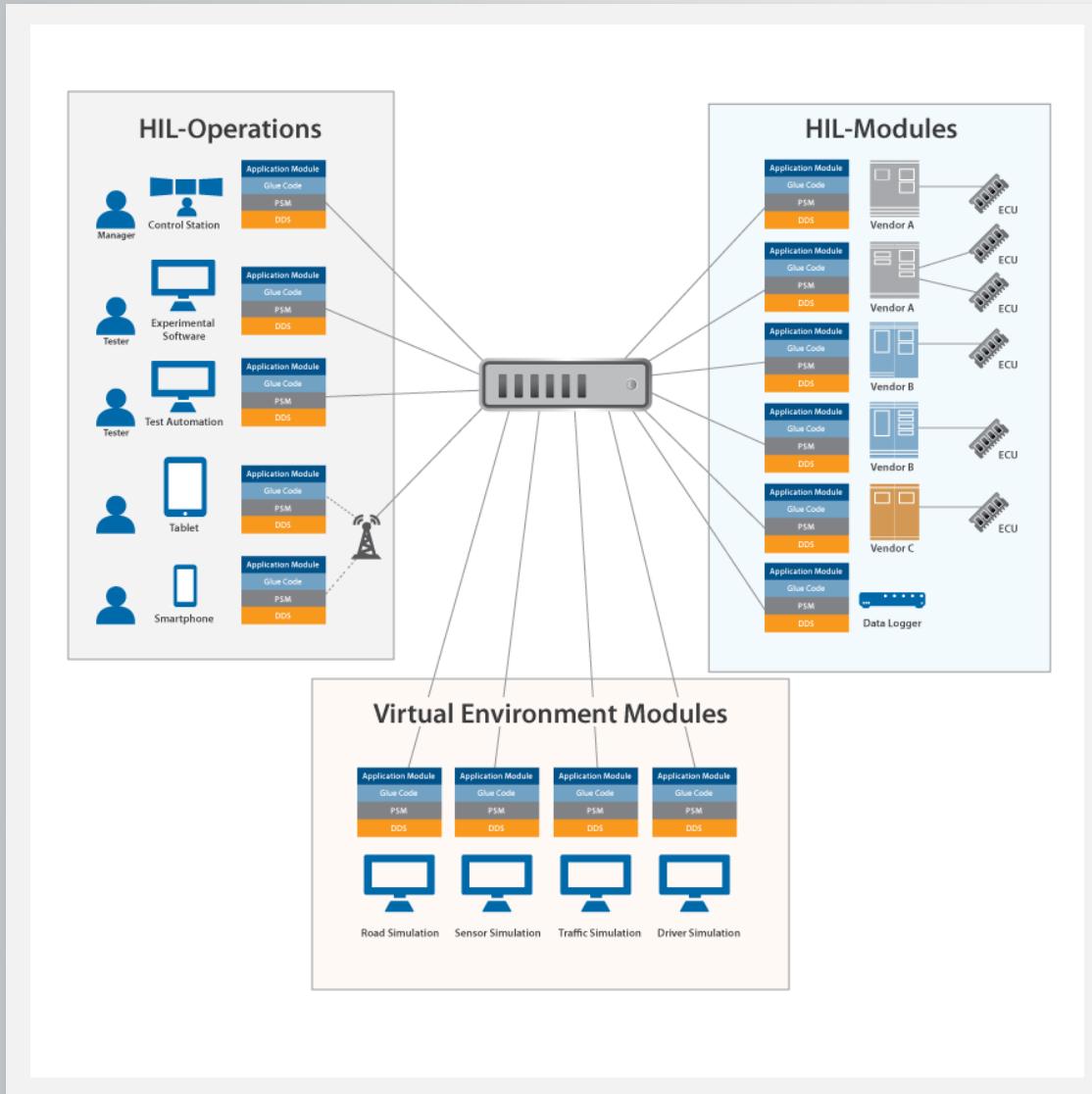
Abstraction and flexibility



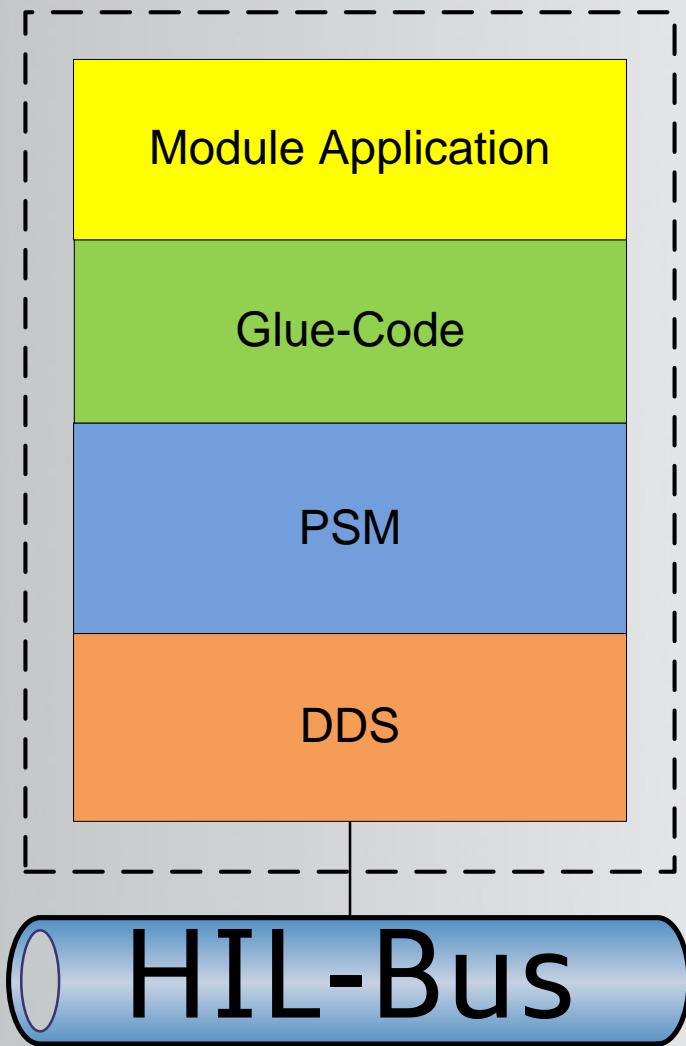
Logical architecture



Physical architecture



Test Bench Manager (PSM)



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Why Audi has chosen RTI DDS?

► Key requirements for Audi HIL-Bus middleware technology

- ▶ Open standard
- ▶ Real-time capable
- ▶ Scalable
- ▶ Field proven to be reliable

► Why RTI DDS?

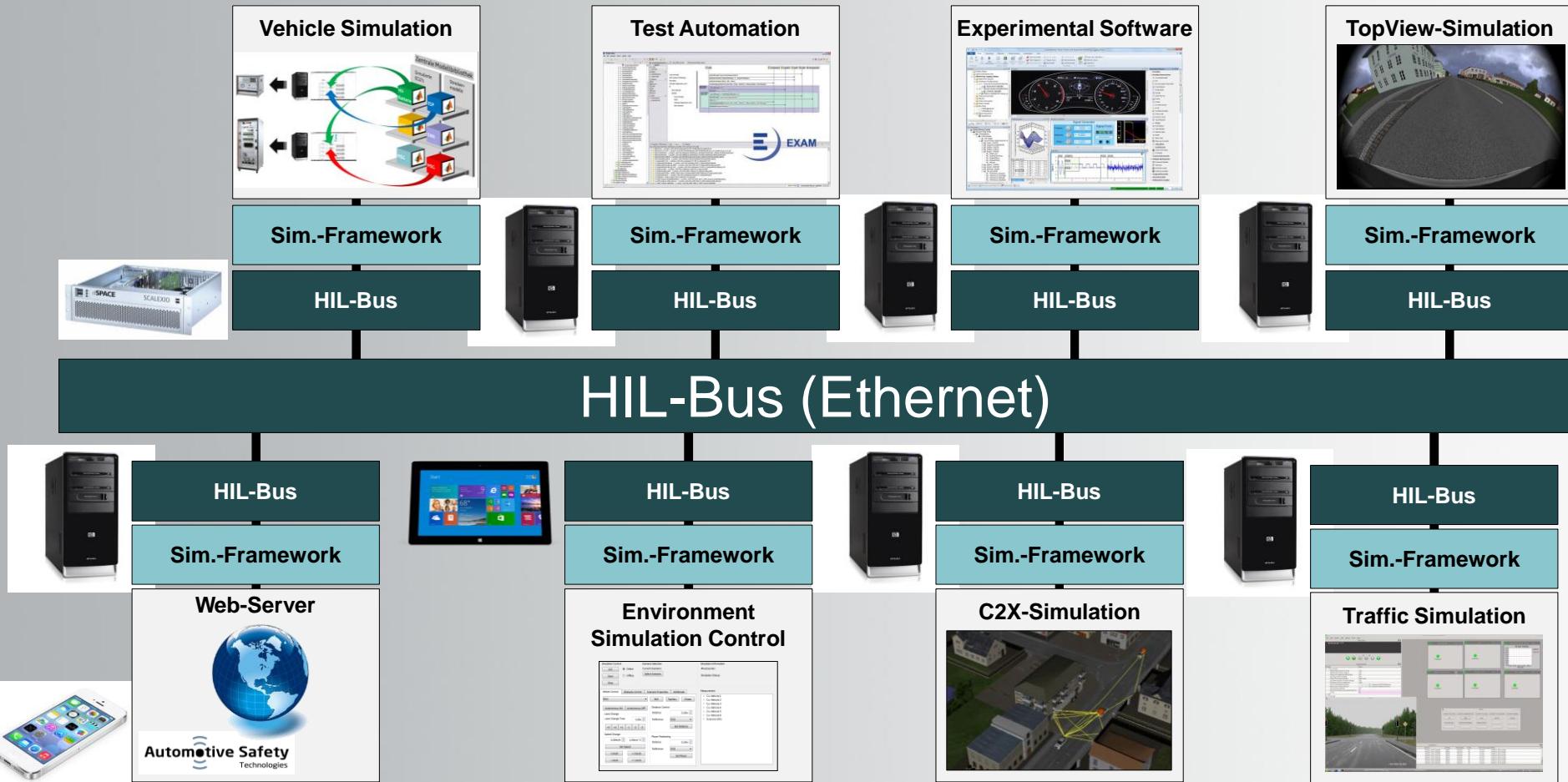
- ▶ Based on OMG DDS standard
- ▶ Real-time capable and data-centric
- ▶ Compatible with standard Ethernet hardware and protocols
- ▶ Highly decoupled modular development capabilities
- ▶ Plug and play capable
- ▶ Established in aerospace and military
- ▶ Open license model

Topics

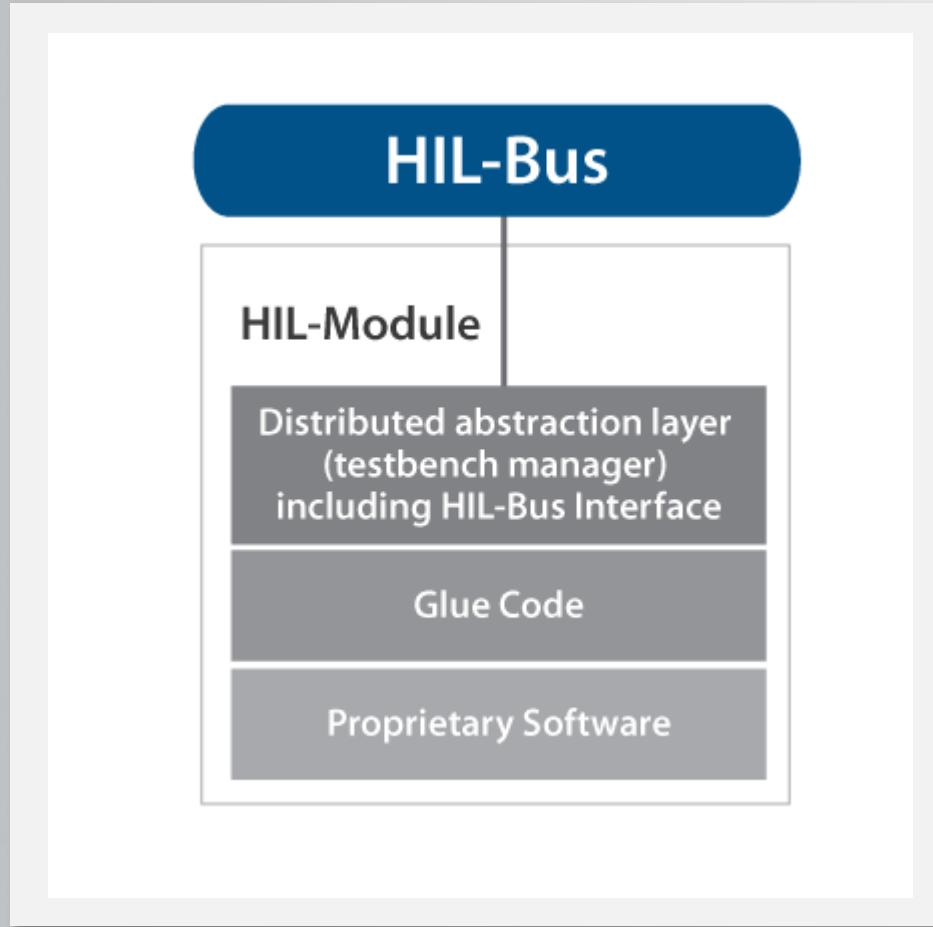
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Application at Audi: Theory meets practice

Demonstrator



Integration of DDS-Interface



Thank you for your attention.

