

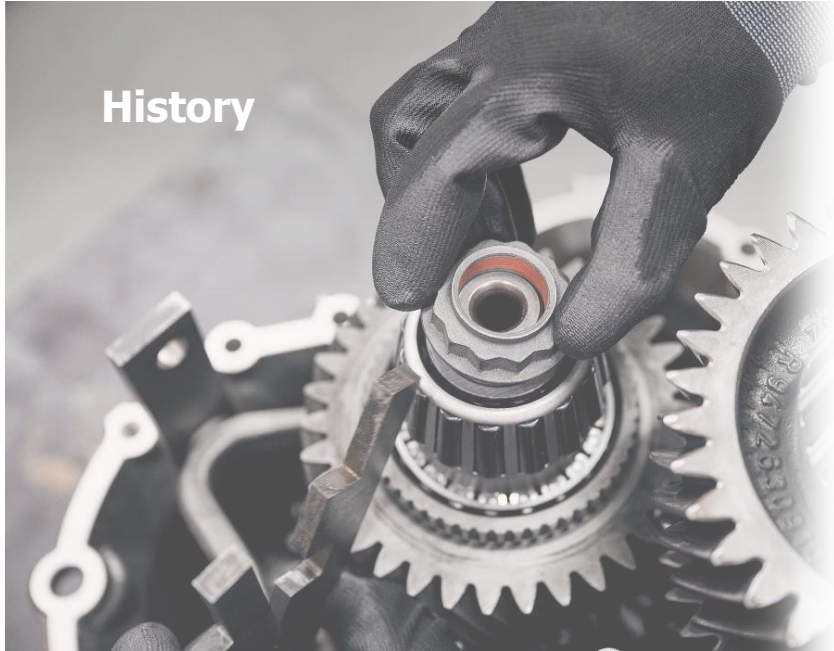
Process, Methods, Tools - The Key Enabler for Software-defined Vehicle

Dr. Christian Müller | VP Software Center | ZF Group

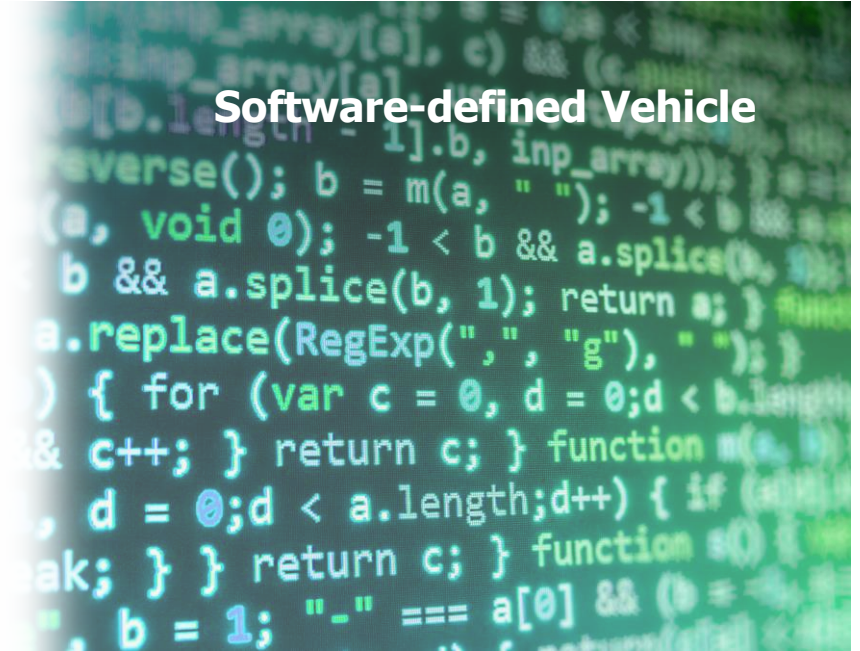


The Foundation for Future Success

History

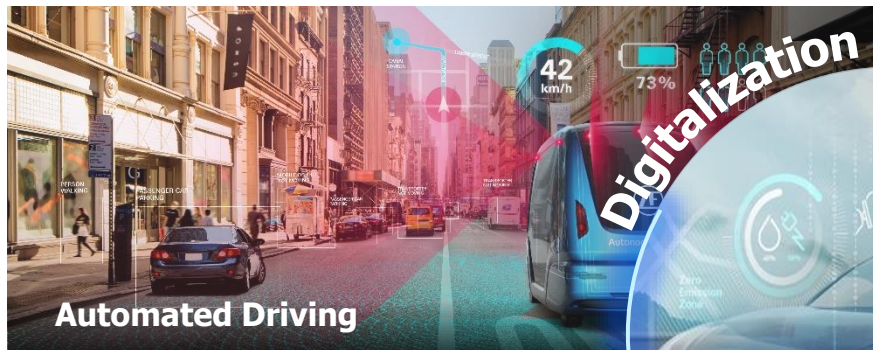


Software-defined Vehicle



Gears & mechanics enhanced by chips & software

Software is the Enabler for Next Generation Mobility

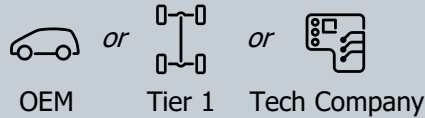


Change & Evolution



Evolution of Software Architectures to Implement Software-defined Vehicles

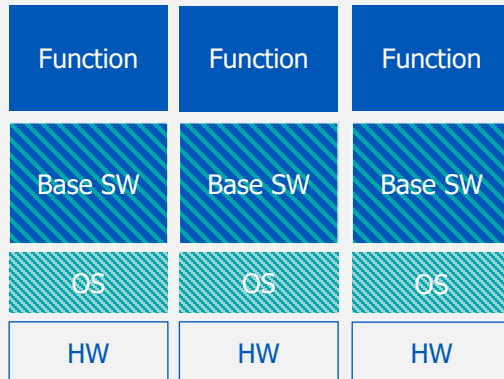
Signal-oriented Architecture



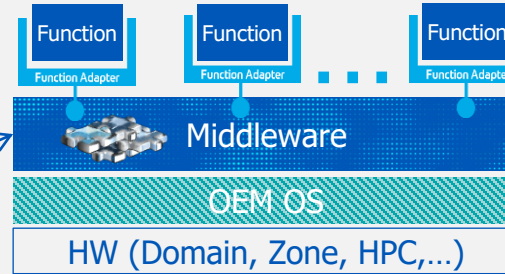
Signal- and Service-oriented Architecture



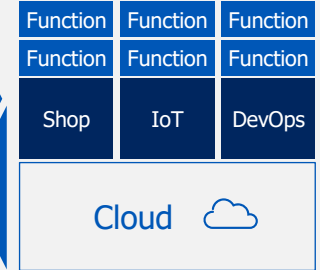
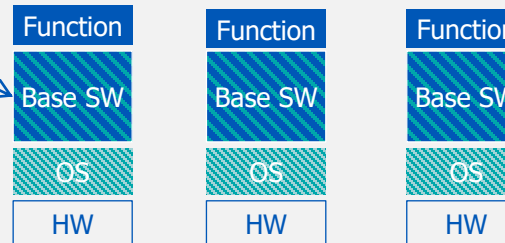
Monolithic Systems



Functions' Integration with standardized API



Smart / Sensors & Actuators

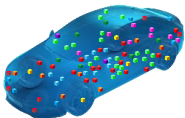


Hardware & Software Decoupled

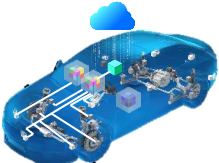
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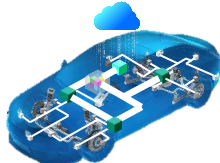
Impact of Changing E/E Architectures to Software Architectures



Distributed architecture



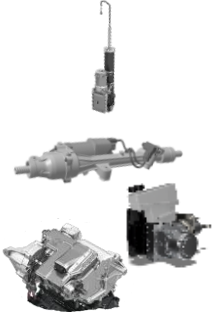
Domain-based E/E architecture



Zone / Cloud-oriented architecture

Domains / Zones / HPC Controllers

Actuators / Sub-systems



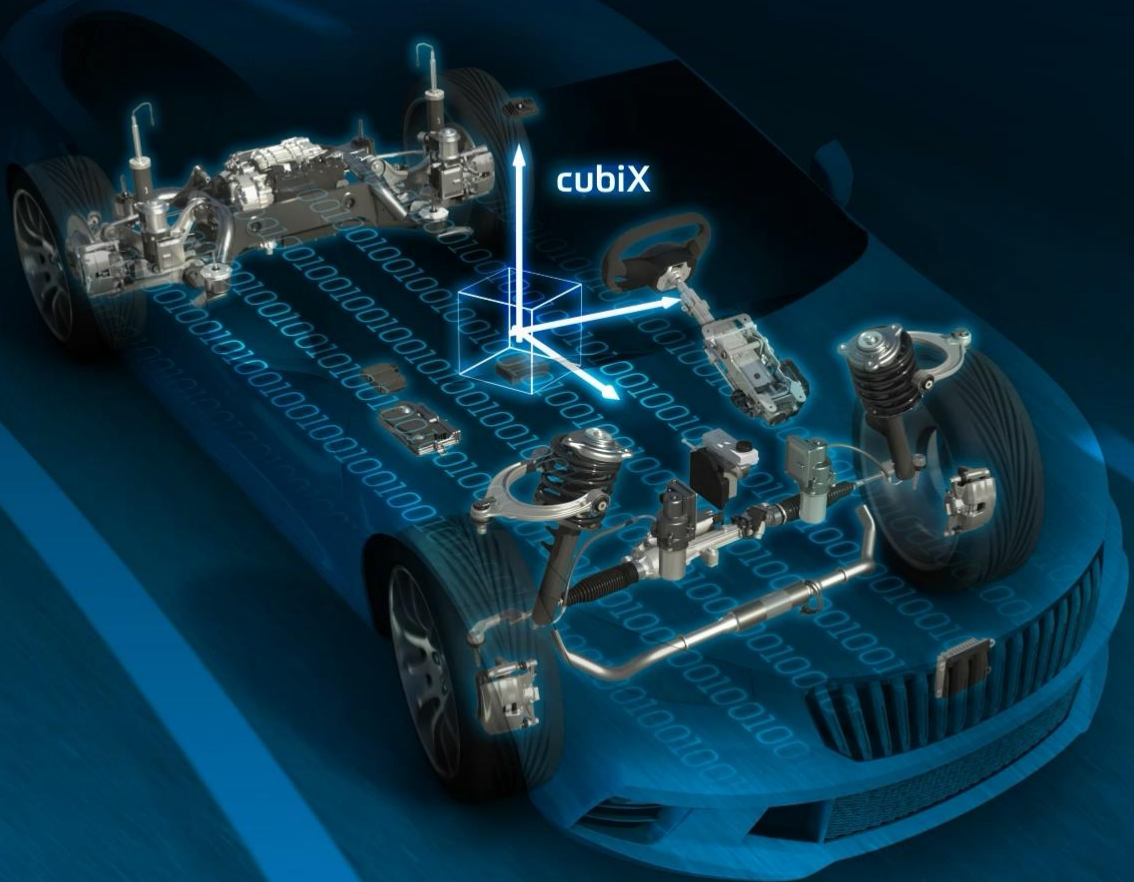
Functional Level

Power & Signal Distribution

Physical Level

- Software-defined vehicle
- Decoupled from HW & SW
- Service-oriented architecture
- Functions partitioning

Software Products in Serial Production: ZF cubiX

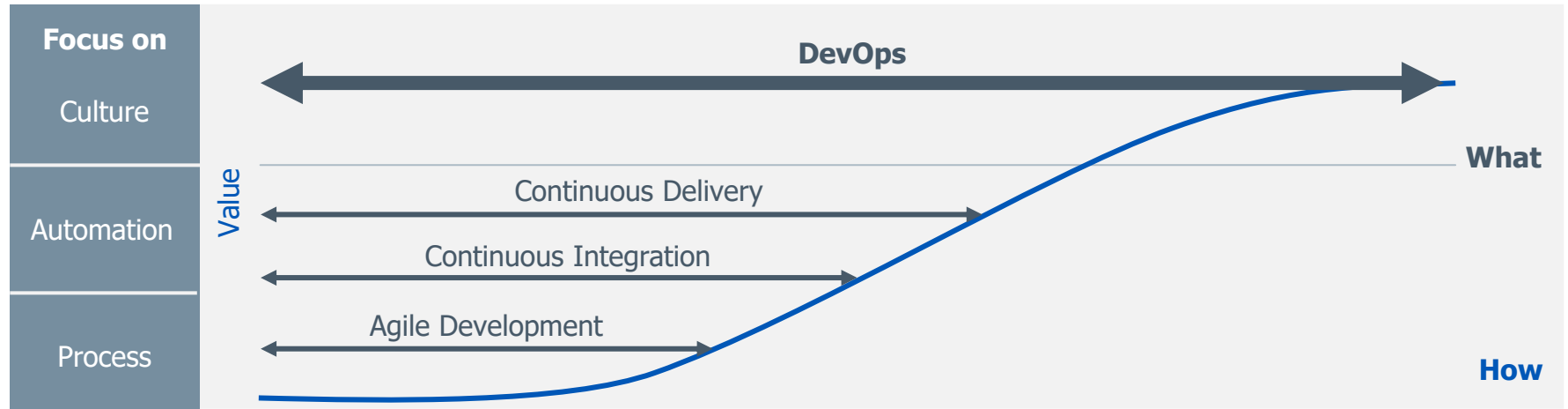
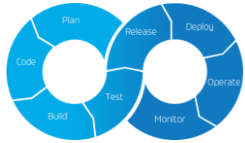


Process, Methods, Tools



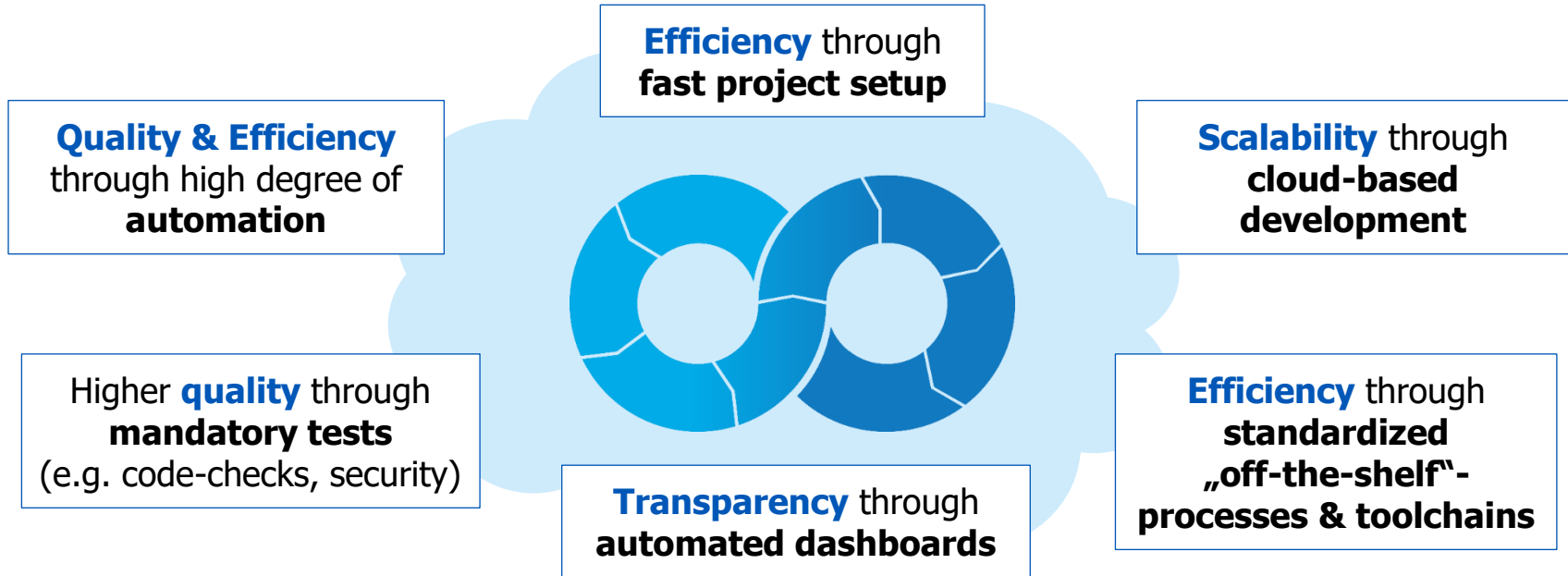
Key Enabler to Deliver Products for SdV

Consequent PMT Implementation Based on DevOps Principles



"DevOps is the union of people, process, and products to enable continuous delivery of value to our end users." Donovan Brown, Principal DevOps Manager – Microsoft

Benefits Through Cutting-edge Processes, Methods and Tools

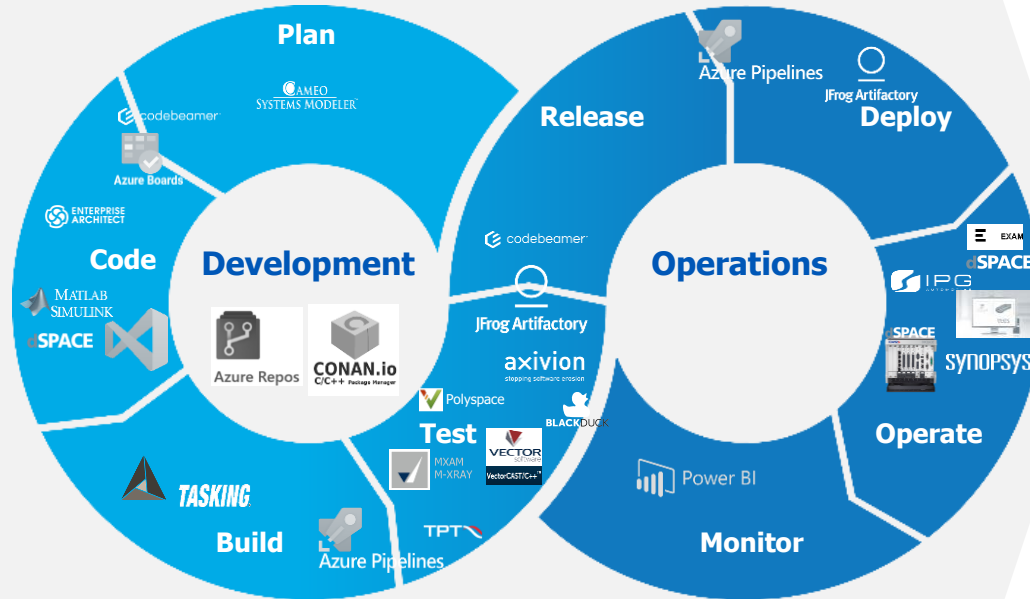


Working with a standard cloud-based DevOps environment boosts transparency, scalability, quality & efficiency.

Seamless Tool Architecture From Requirement to Operations

Expectations for modern toolchains:

- State of the art processes and methods
- Highly automated
- CI/CD ready
- High availability
- Cloud-native
- Efficient and flexible license models
- Continuous and seamless rollouts
- Fast optimization cycles
- Modularization and interoperability



Integration time

Today:



-44%

Future:



- Testing
- Documentation
- Build Time

GenAI



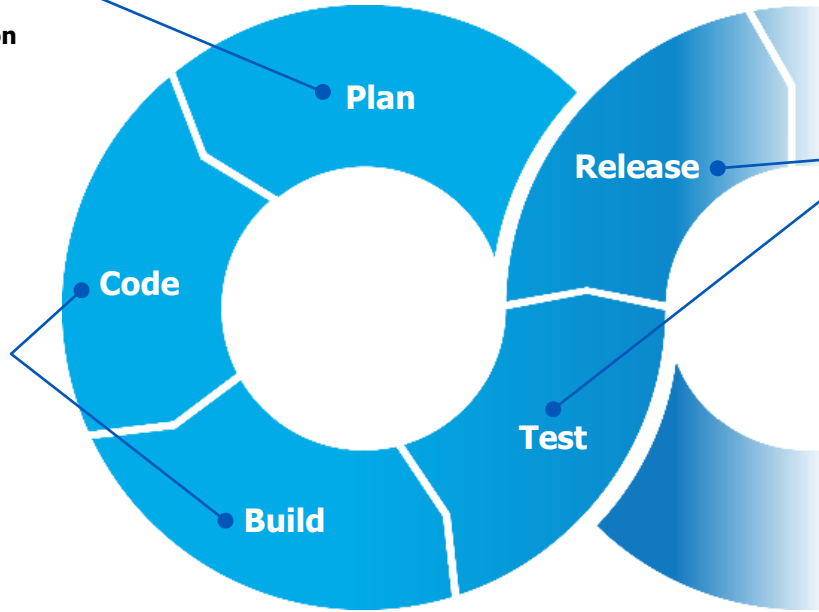
GenAI – Potentialities in the Software Development

Requirement Engineering

- 1 Requirement Classification
- 3 Requirement Writing
- 4 Traceability automation
- 1 Test Case Classification
- 1 Requirement Search

Software Development

- 4 Code Generation
- 1 Code Completion
- 2 Code Summarization
- 2 Code search
- 2 Code Comment Generation



Software Testing

- 2 Test generation
- 3 Generate Unit Test cases and codes
- 3 Integration Tests
- 3 Acceptance and Qualification Testing

Priority



In Conclusion

Change & Evolution



Software Defined Vehicle:

- Enhancing mechanics with chips & software
- Various cooperation models
- New E/E and new SW architectures

Hardware & Software Decoupled

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One car, many components:

- Software architectures to implement software-defined vehicles
- Modular approach to software and component integration

Process, Methods, Tools (PMT)



Seamless set of PMT – DevOps as key enabler:

- Agile development and higher robustness
- Improved international collaboration
- Higher efficiency, quality and transparency

GenAI



AI brings efficiency to a new level:

- Higher efficiency and consistent quality
- Up to 40-50% time and cost reduction



Agility & Modularity create success