Hermann Ilmberger

INTERACTIVE TESTING OF AUTOMOTIVE FUNCTIONS

UCAAT 2014

BMW GROUP

SOFTWARE IN THE CAR.
INNOVATION.

SOFTWARE IN THE CAR.
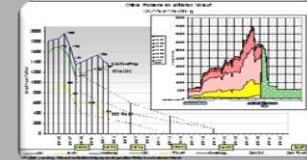# CHALLENGES.

- ➤ **In-vehicle software becoming more and more important.**

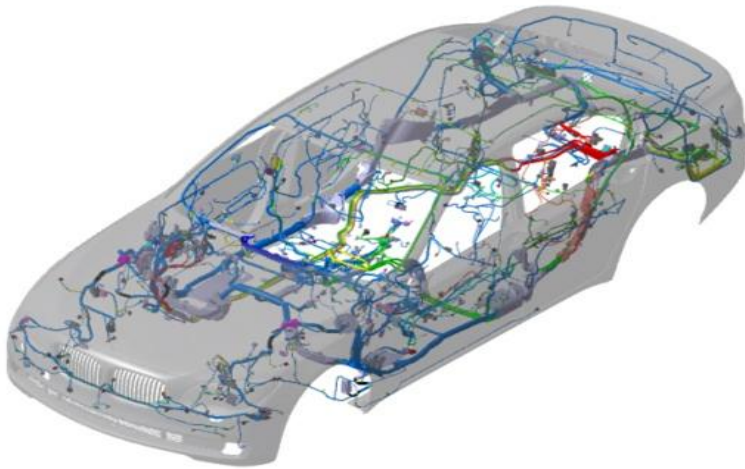- ➤ **Rapid cycles in hardware technology.**

- ➤ **Increasing connectivity.**

- ➤ **Rising consumption of electricity.**

- ➤ **Ensure product quality.**

SOFTWARE IN THE CAR.
BMW 7 SERIES.

7 series wiring harness	
No. of electric pins	3490
Total length of wiring	2751 m
No. of electric plugs	570
Wiring channels	16
Total weight	43 kg

On-board network	
ECUs	35 … 70
CPUs	ca. 180
GPUs	> 5
Buses	CAN, LIN, MOST, FlexRay, Ethernet
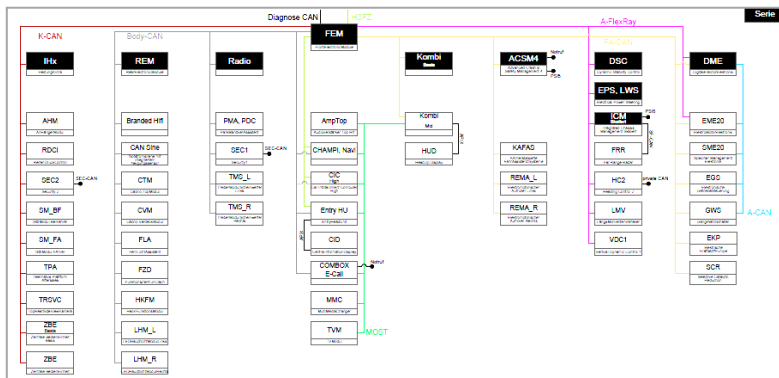
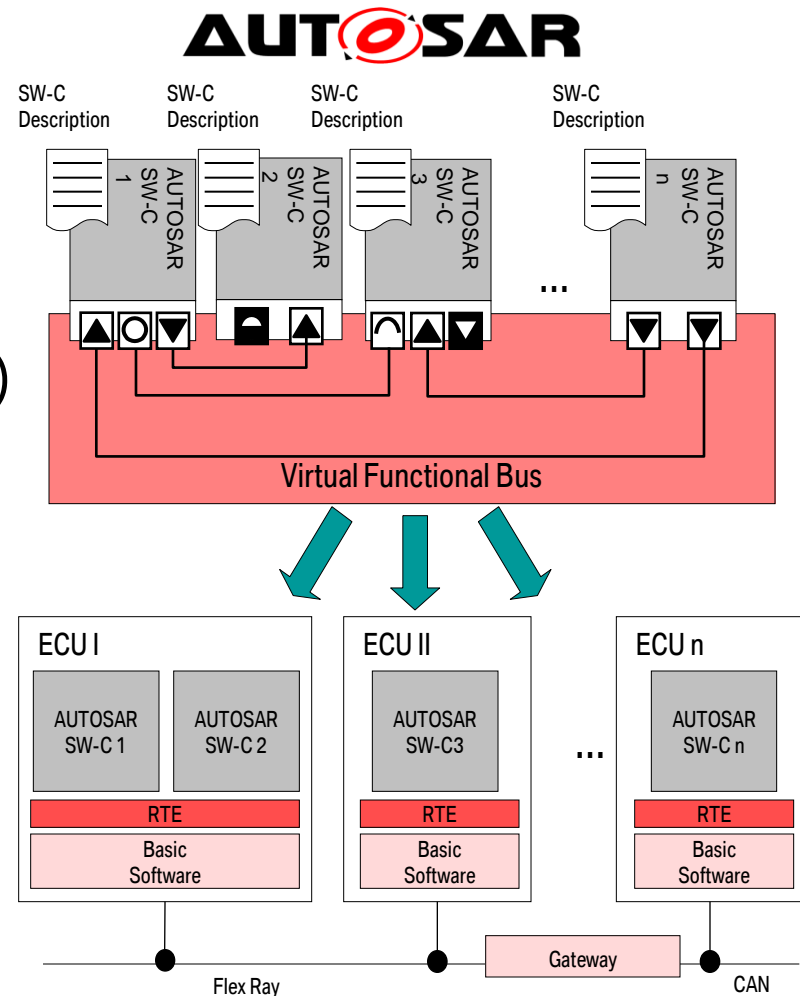| Miscellaneous	
Software	ca. 1 GB
Operating systems	Standard Core AUTOSAR GENIVI

SOFTWARE BUILDING BLOCKS.
AUTOSAR.

– Standard Basic Software.

– Software Components as hardware-independent building blocks.

– Standard description format for interfaces (sender/receiver, client/server) and lifecycle events.

– Well-defined SW-C communication via generated RTE.

BUILDING BLOCKS.
SOFTWARE LIBRARIES FOR PRODUCT FAMILIES.
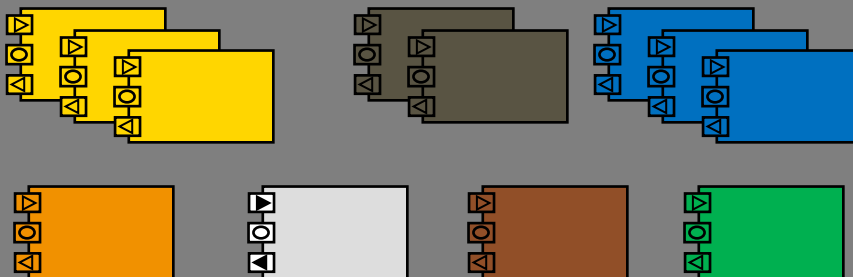

SW Library Driver Assistance

SW Library Basic Functions
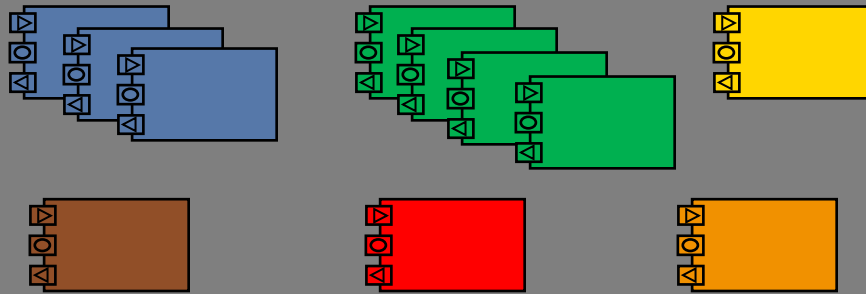
- Cruise Control.

- Traffic Jam Assistant.

- Speed Limit Info.

- Lane Departure Warning.

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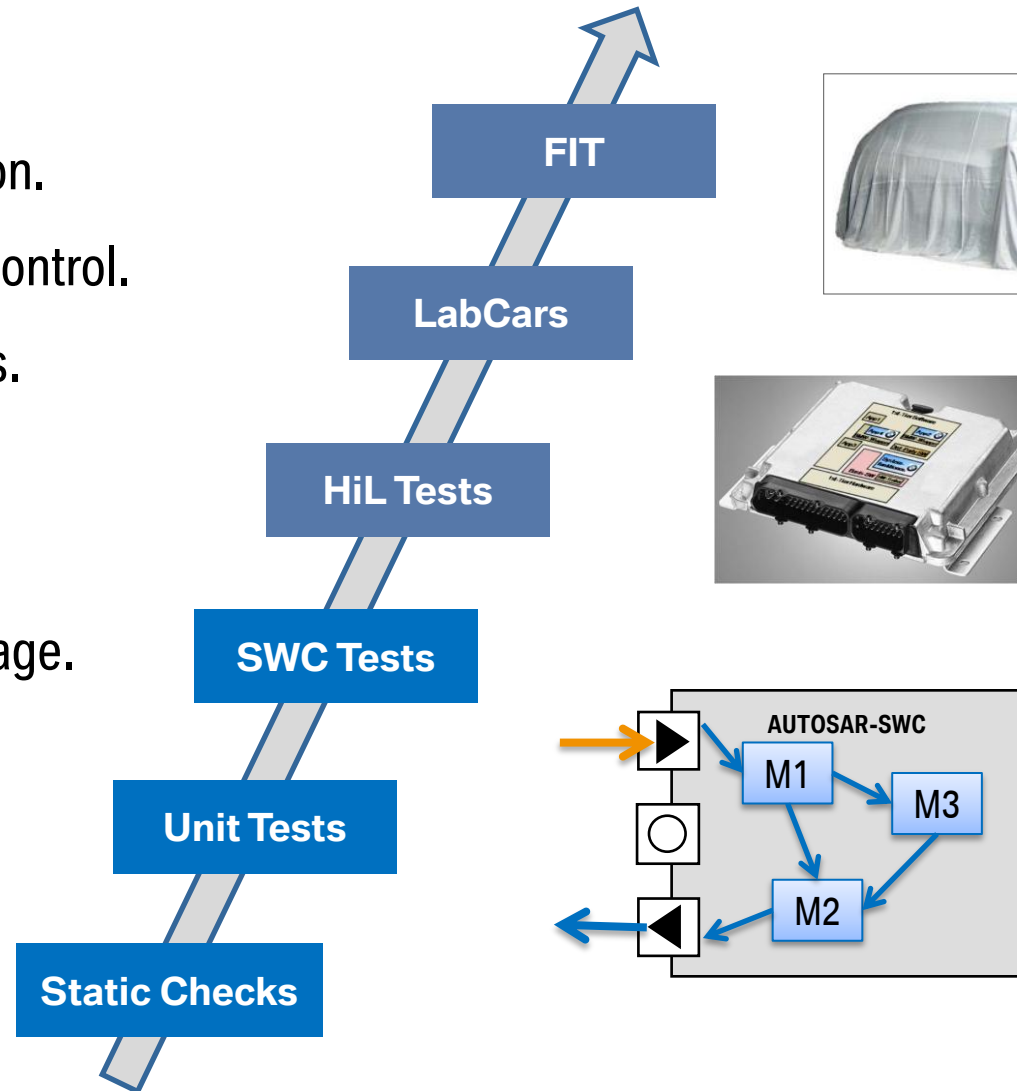
- Power Windows.

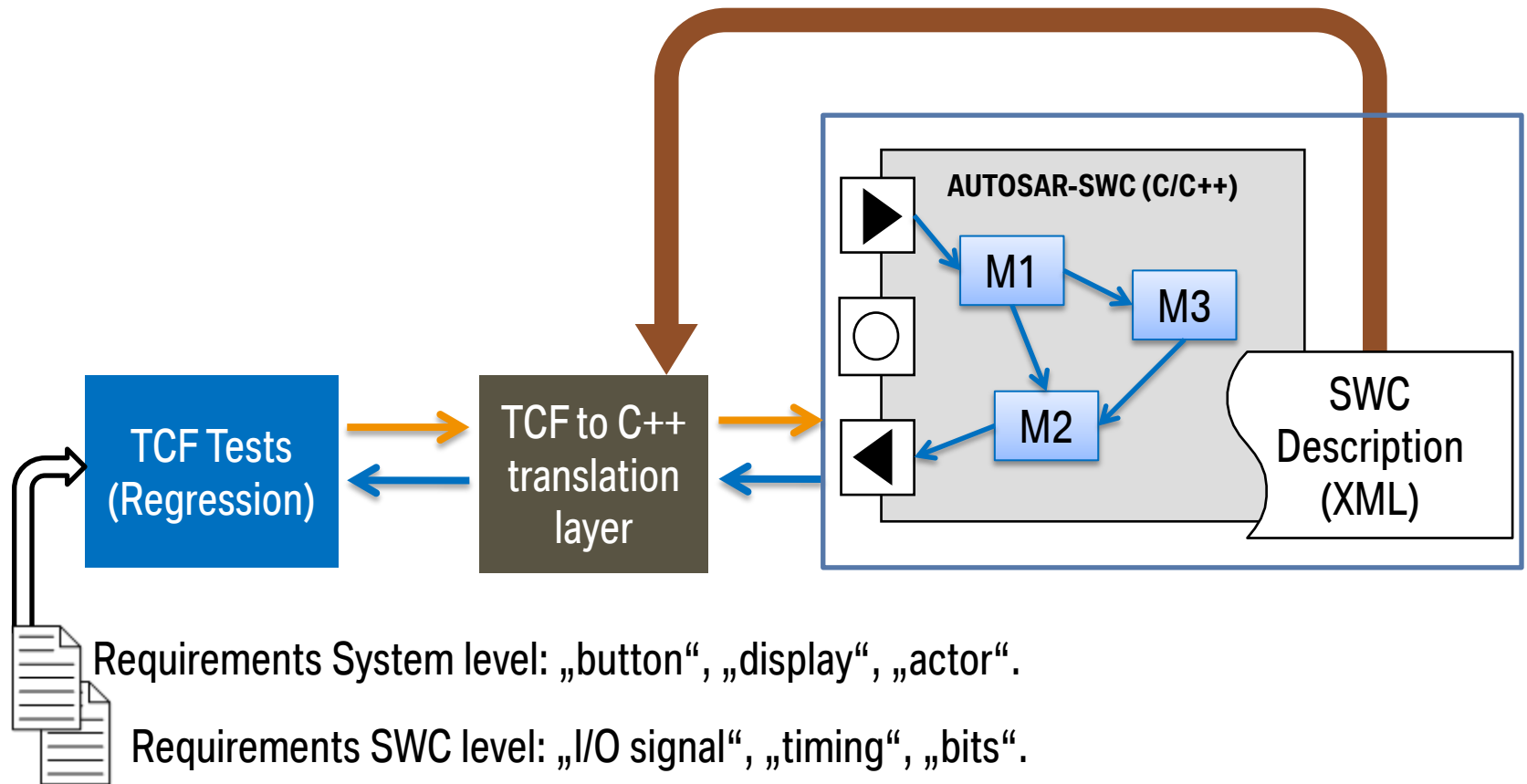- Light: Xenon, LED, Laser.

- Wiper.

- Comfort Access.

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QUALITY.

- Continous Integration.

- Continous Quality Control.

- Static Code Analysis.

- Resource Tracking.

- Code Coverage.

- Requirement Coverage.

- Code Reviews.

FIT

LabCars

HiL Tests

SWC Tests

Unit Tests

Static Checks

AUTOSAR-SWC

M1

M3

M2

SWC TESTS.
TESTING AGAINST REQUIREMENTS ON THE PC.

AUTOSAR-SWC (C/C++)

M1 → M3 → M2

TCF Tests (Regression)

TCF to C++ translation layer

SWC Description (XML)

Requirements System level: „button", „display", „actor".

Requirements SWC level: „I/O signal", „timing", „bits".

SWC TESTS.
DRIVING THE SWC ON THE PC.
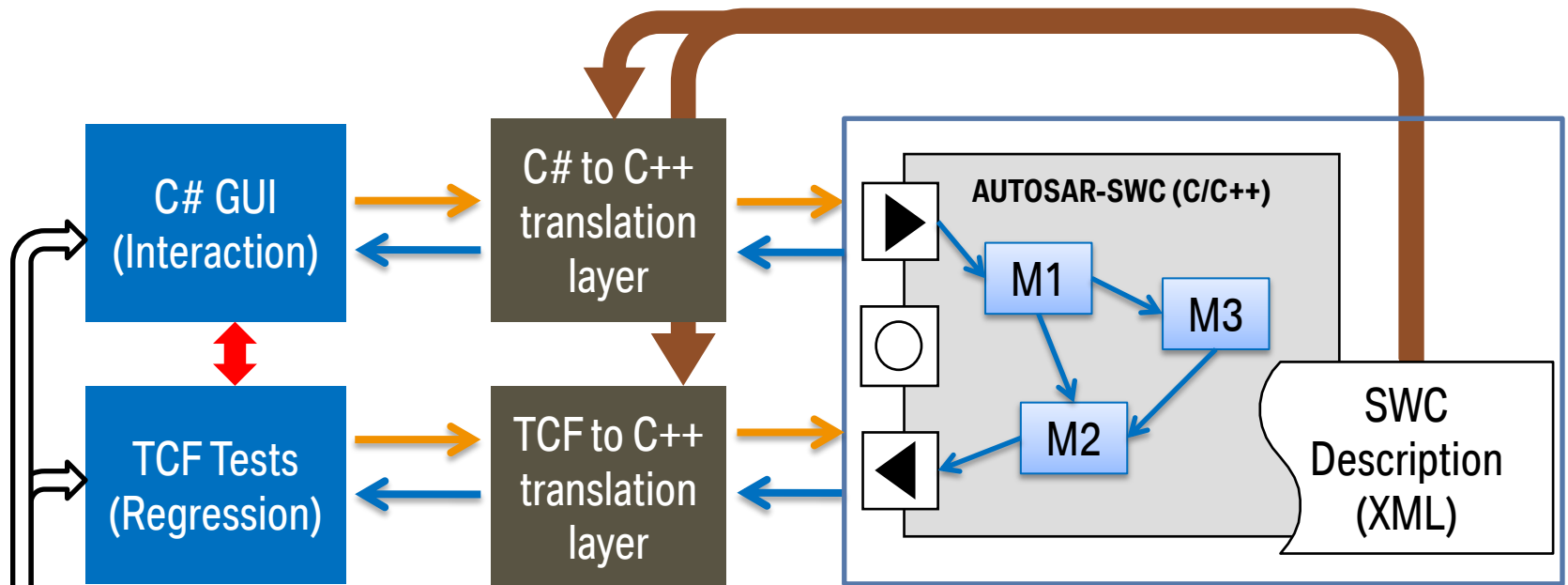
Requirements System level: „button", „display", „actor".

Requirements SWC level: „I/O signal", „timing", „bits".

THE GUI.
YOU GET THE IDEA.

– Provides user controls and in-car displays.

– Simulates missing partners: other SWCs and required Basic SW.

– Provides fine-grain lifecycle control, error injection.

– Early demonstration/validation.

– Experience functions before in-car tests are possible.

– Execute high-level test scenarios.

– No hardware required.

THANK YOU.
QUESTIONS…