Diagnostic Simulation

Opportunity and Challenge

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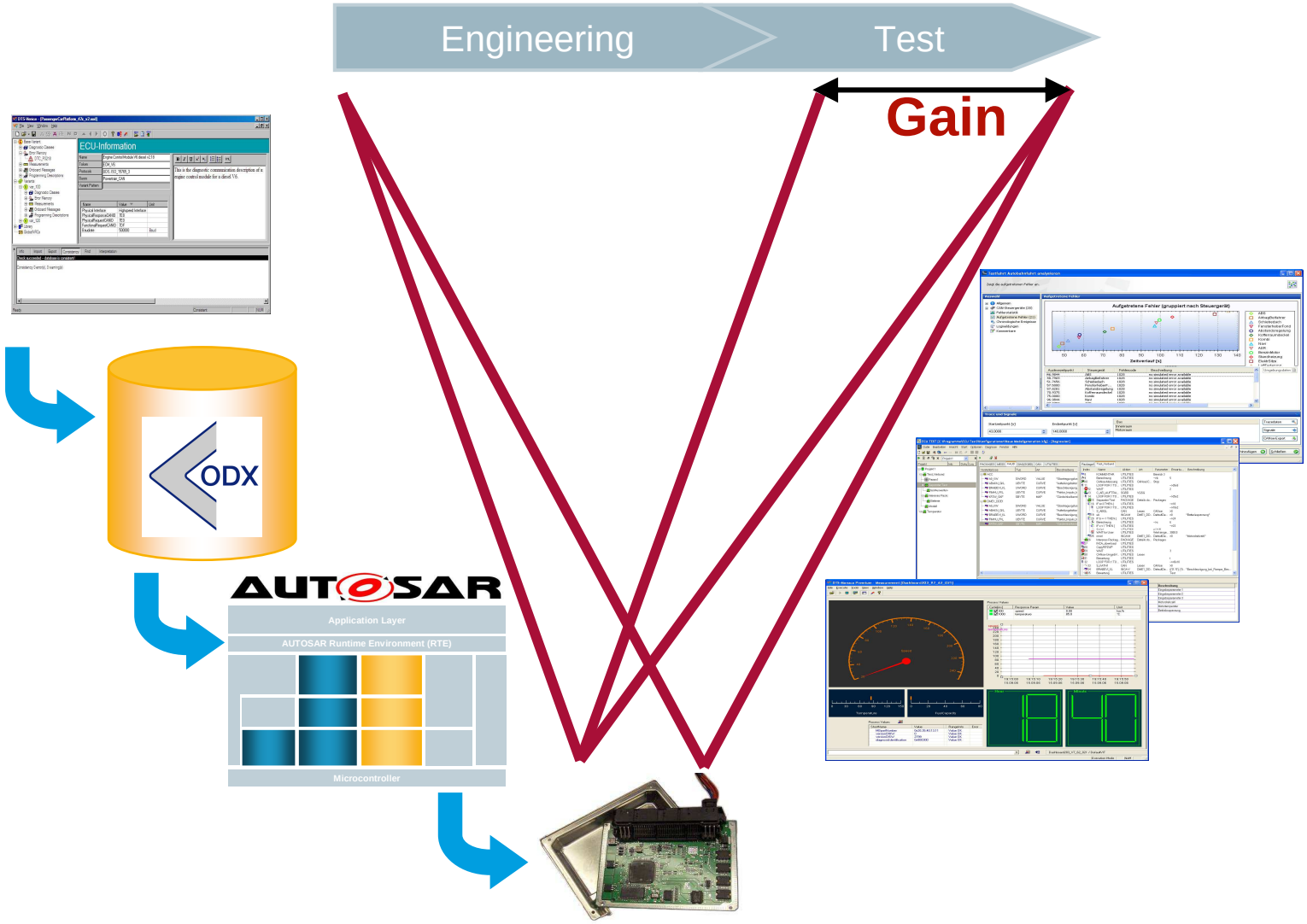
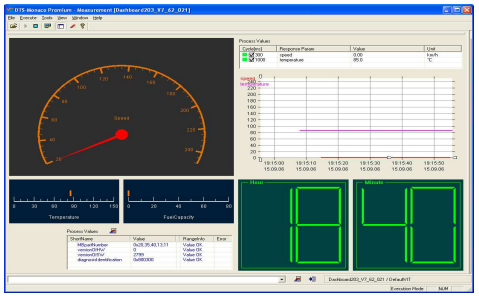
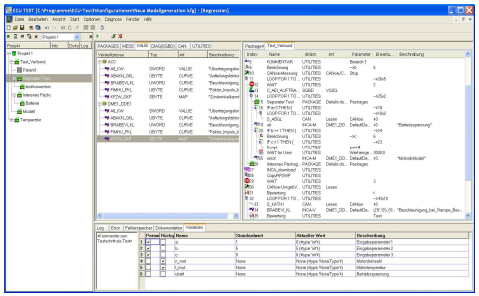
The Challenge

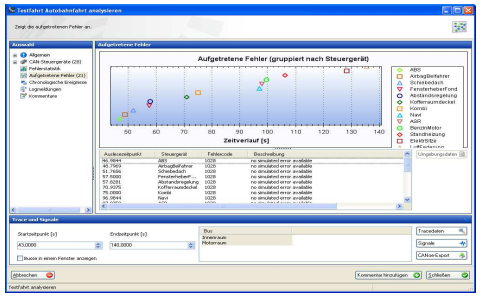


Use Case

ECU test, HiL, Mechatronic system test, Integration test, Road test, …







ParamSet1
ParamSet2
ParamSet3
ParamSet4
ParamSet5

Simulation

Step 1

CAN

Step 2

A sample
B sample
C sample
Variant 1
Variant 2

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Process Requirements

The goal is to have a unique link between the simulation and

→ each ECU

→ each ECU variant

→ each release of the ECU software

Therefore a simulation (device) is claimed that

- is easy to enhance
- supports version management
- allows a quick adaptation to changing parameterization

Requirements for Diagnostic Simulation

Hardware

- Ruggedized housing for rough test fields
- Easy connecting in laboratory, save connecting in test field
- Auto power-up for stand alone usage
- USB/Ethernet connectors for fast and easy configuration

Communication

- Simulation of one or more ECUs
- CAN bus with customer diagnostic protocols
- Good case and bad case testing
- Simple responses on requests and sequences
- Positive responses and (different) negative responses
- Realistic real time behavior

Additional Usage Scenario – Manufacturing

Goal:

Test sequence preparation while ECU is under way

- Additional requirements
  - Long term stability
  - Simulation of many ECUs at once
  - Rest bus simulation
- Advantages
  - Higher quality through early testing
  - Low set-up time – even if the real ECU is rather late!

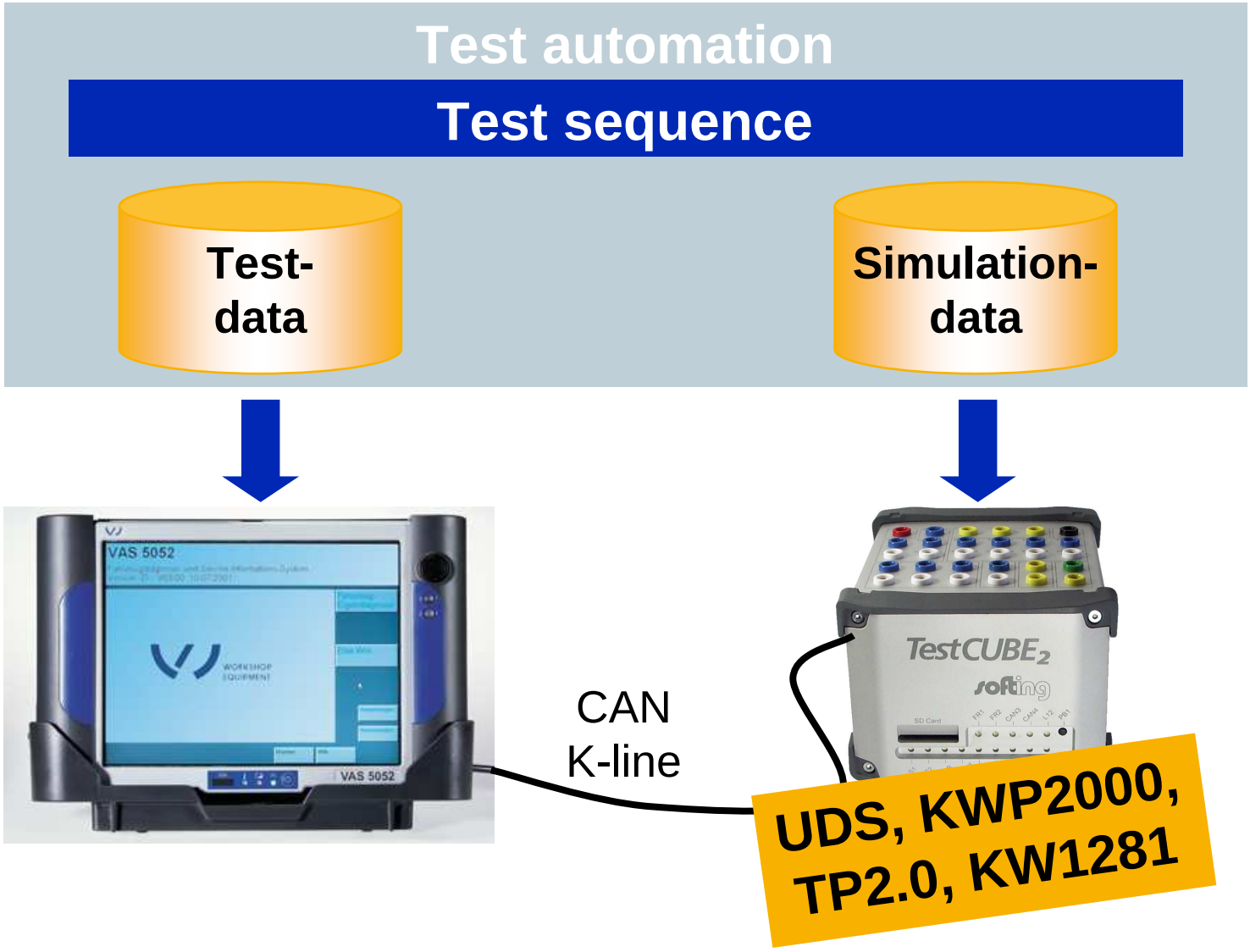
Additional Usage Scenario – Service area

Goal:

Regression test of service tester with all ECUs and variants

- Additional requirements
  - Automatic testing (interface to test automation tool/process)
  - Version management
  - Easy integration of cars already on the road
  - Legacy protocols and K-line support
- Advantages
  - Higher quality through brilliant test depth
  - Excellent support of migration scenarios

Additional Usage Scenario – Service area



Application example: TestCUBE$_2$

Ruggedized housing
Banana plug connection
Additional 26-PIN connector

Request/Response simulation
Diagnostic sequences
Communication Parameters

Configurable
Unit for
Bus Communication
and
ECU-Test

CAN and K-line
UDS and KWP2000
(TP1.6/2.0, KW1281)

Stand alone usage
API for remote configuration
Configuration application

TestCUBE$_2$ – Special Features today

Rest Bus Simulation

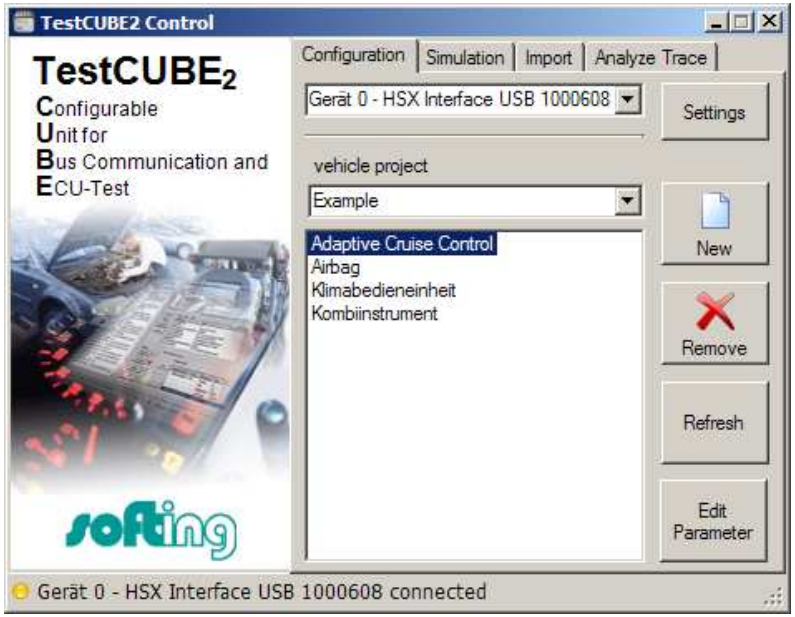
- e.g. ignition signal
- e.g. network management

⇒ all-in-one simulation

Good/bad case testing

- Positive/negative responses
- No response

⇒ Numerous use cases covered



Simulation file generation

- Automatic or manual generation – both by using configuration tool
- Automatic for example from previously recorded trace file (manual adaption possible)

⇒ quick off the mark by using existing vehicles

Future Prospects

Additional Bus Systems

- LIN
- FlexRay

⇒ Vehicle simulation without gateway

ODX generator

- Automatic generation from ODX data
- Minimal manual supplements necessary

⇒ fast, easy, process-proof

Summary

Diagnostic simulation

- is a great opportunity for improvement in the test process
- allows to start the development of test procedures much earlier
- significantly helps to gain quality and reduce costs

Simulated ECU configuration provides excellent support

- whenever real ECUs are not available yet
- whenever real ECUs are not available anymore

Generation for simulation configuration

- Automation reduces time and costs and increases the quality
- one step more in realization of end-to-end process

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