



From Digital Twins to Acceptance Tests

Strategies for Efficient Testing

The Challenges Ahead

Time to market

EN 50716

DevOps Integration (CI)

How can we solve this?

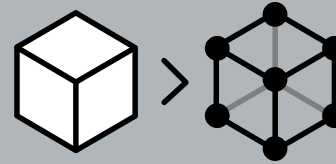
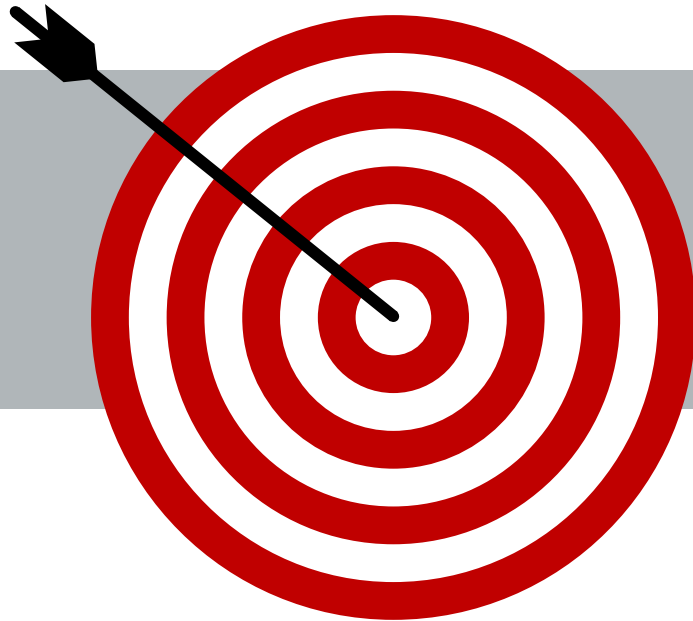
EULYNX

I/O Access

Efficiency

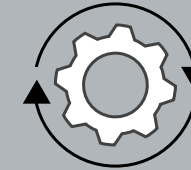
Digital Twins

Agenda



Digital Twins

What are the advantages of digital twins?



Test automation

How can you benefit from test automation and early testing?



Examples

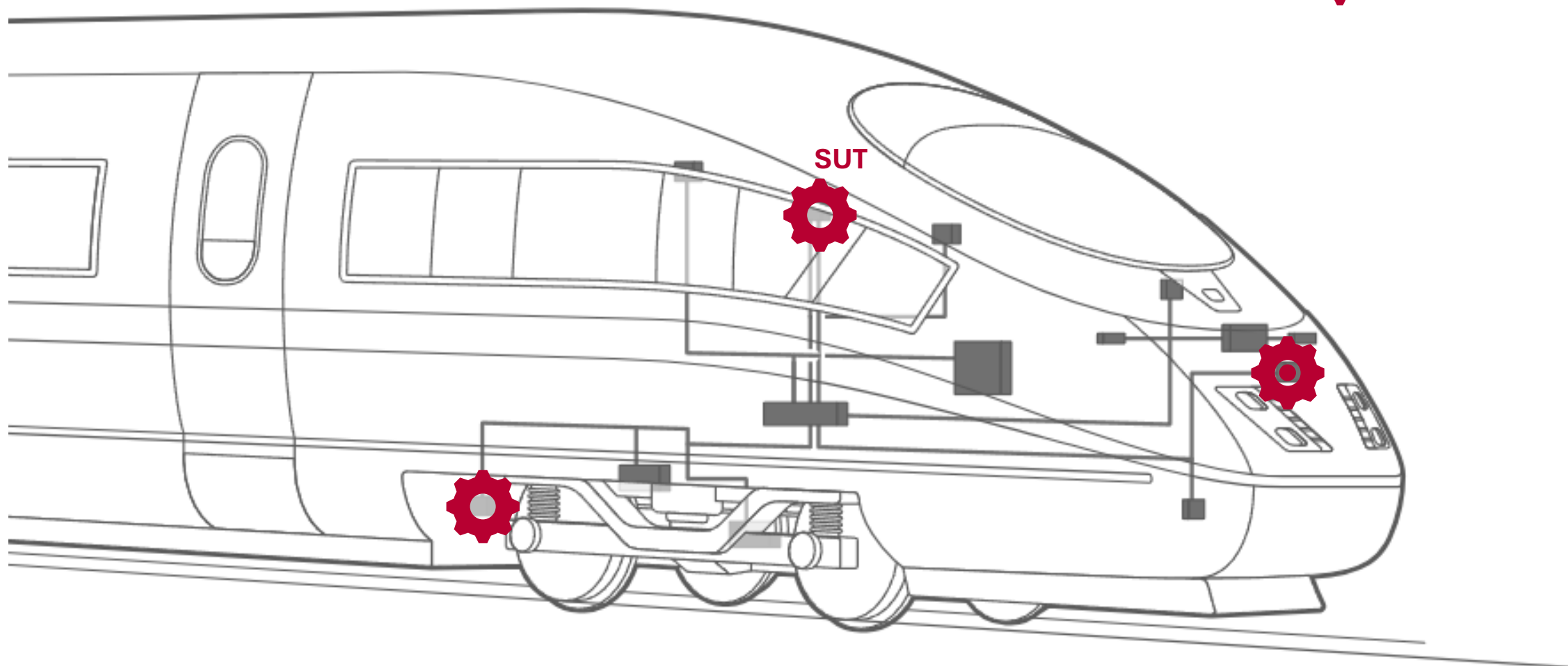
Successful projects with **DB InfraGO** and others



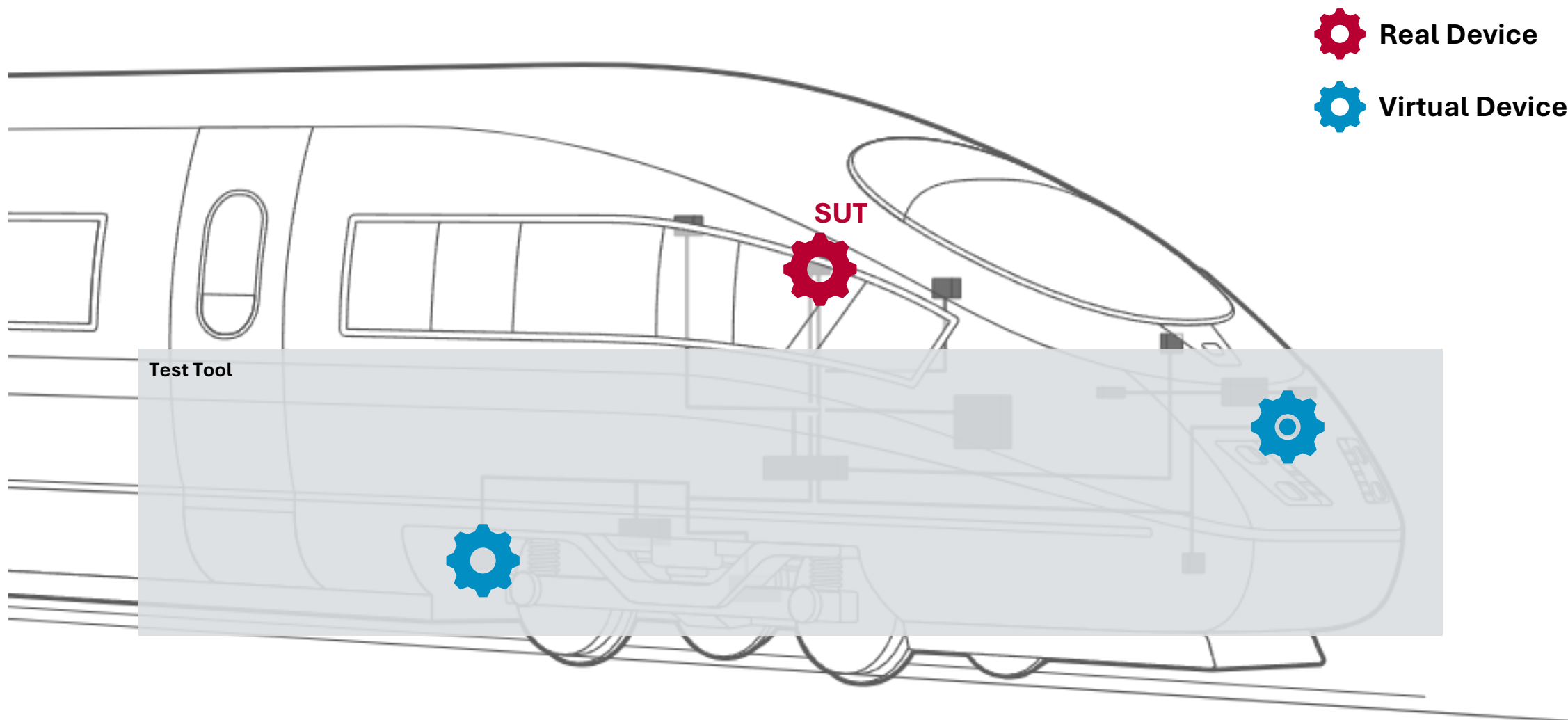
System-Level Testing in Different Environments – From End to Start

System-Level Testing in a Real Environment

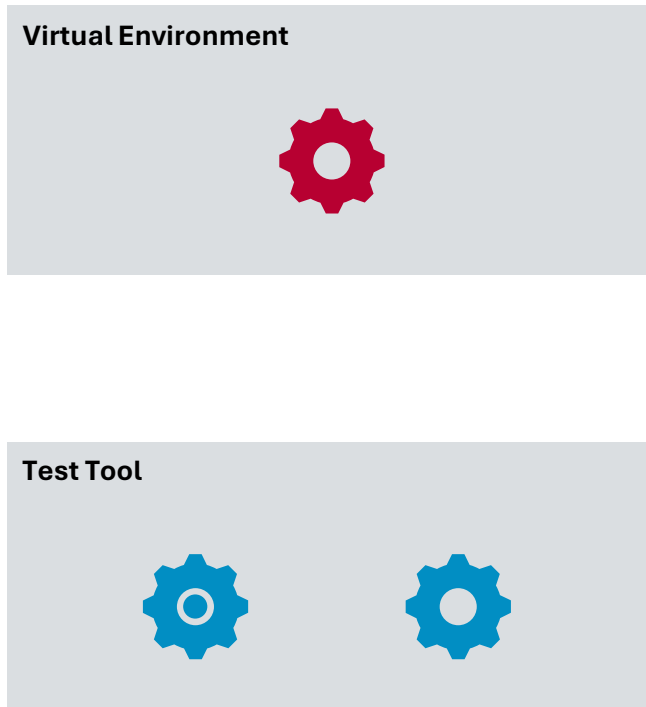
 Real Device



System-Level Testing (HIL) in a Virtual Environment



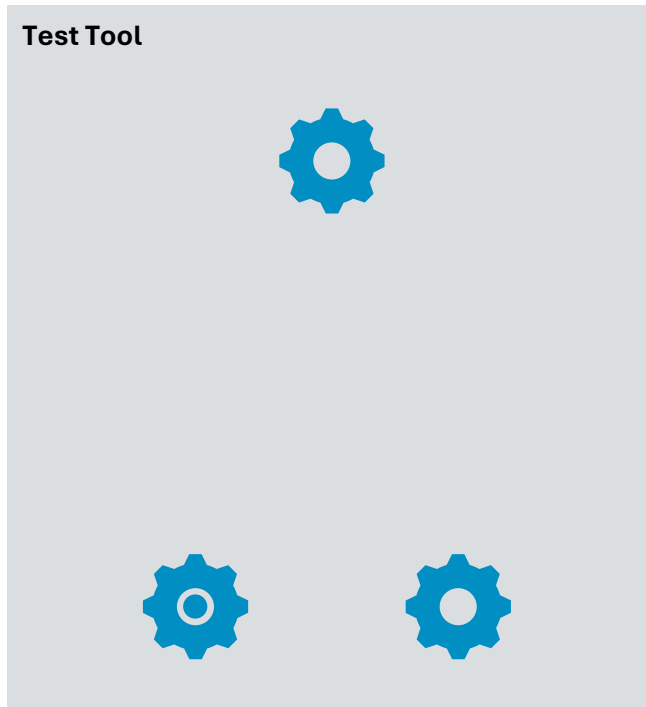
System-Level Testing (SIL) in a Virtual Environment



By running the source code in a virtual environment and simulating the communications partners of the system under test, we

- ▶ save hardware costs
- ▶ are faster with debugging
- ▶ integrate components faster
- ▶ realize CI/CT workflows
- ▶ ...

System-Level Testing (SIL) in a Virtual Environment



By simulating everything as a first step, we

- ▶ save hardware costs for prototypes
- ▶ are faster with debugging
- ▶ integrate components faster
- ▶ ...

All Teams Benefit From Simulations!

Test Engineers



Start with test cases
right away

Software Engineers

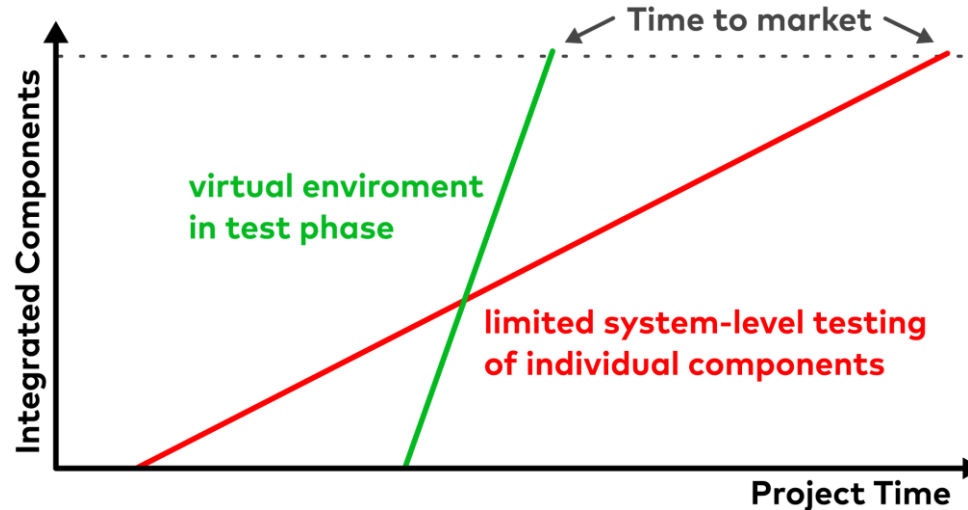


Test-driven development

Requirements Engineers



Early feedback
& adjustments

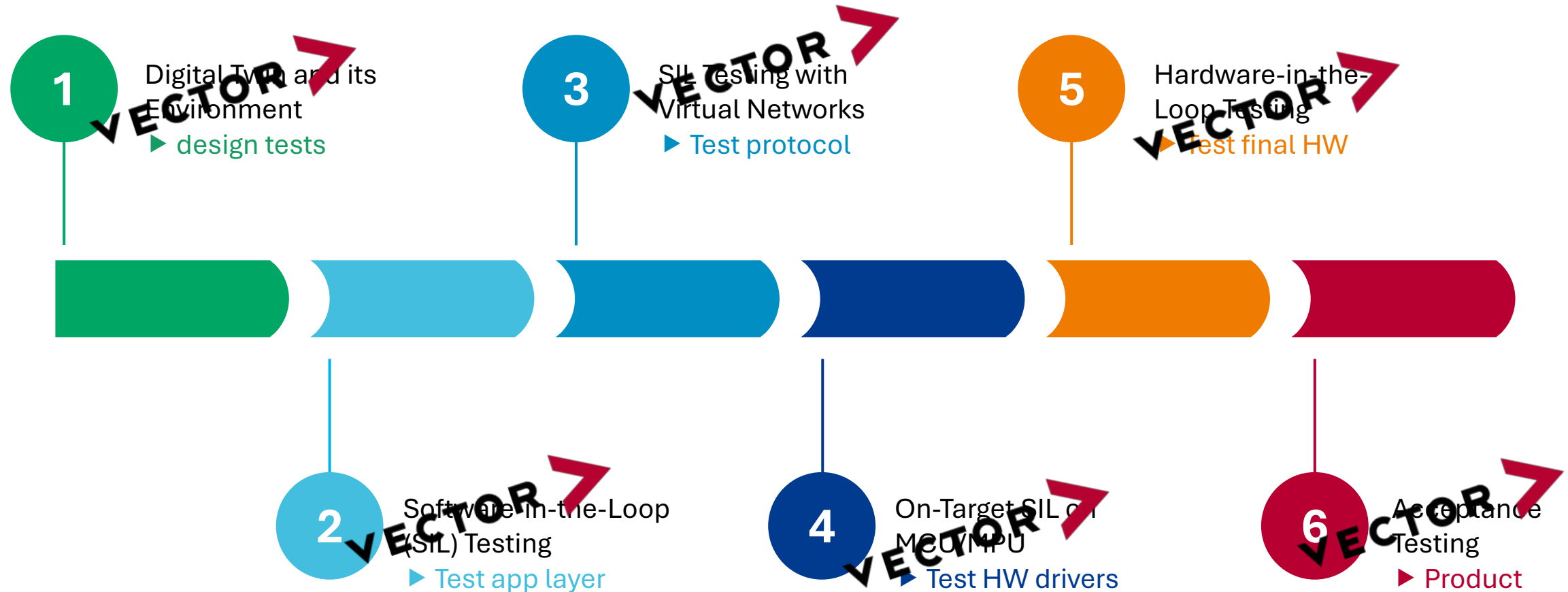


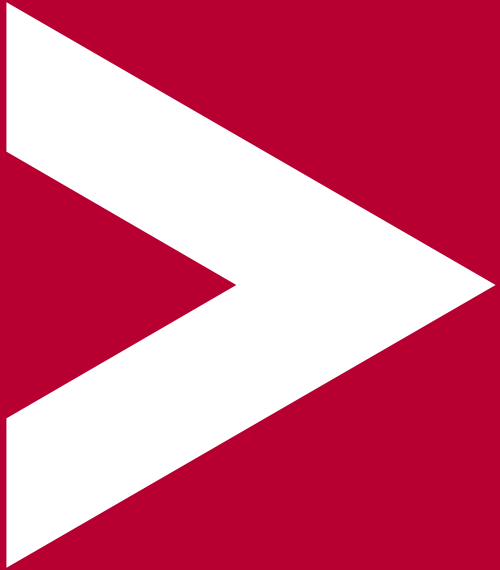
“Give me six hours to chop down
a **tree** and I will spend the first
four **sharpening the axe.**”

- Abraham Lincoln

- Each component tested in a virtual environment reduces the hardware integration time drastically!

Step-by-step: From Digital Twins to Acceptance Tests with Vector Solutions

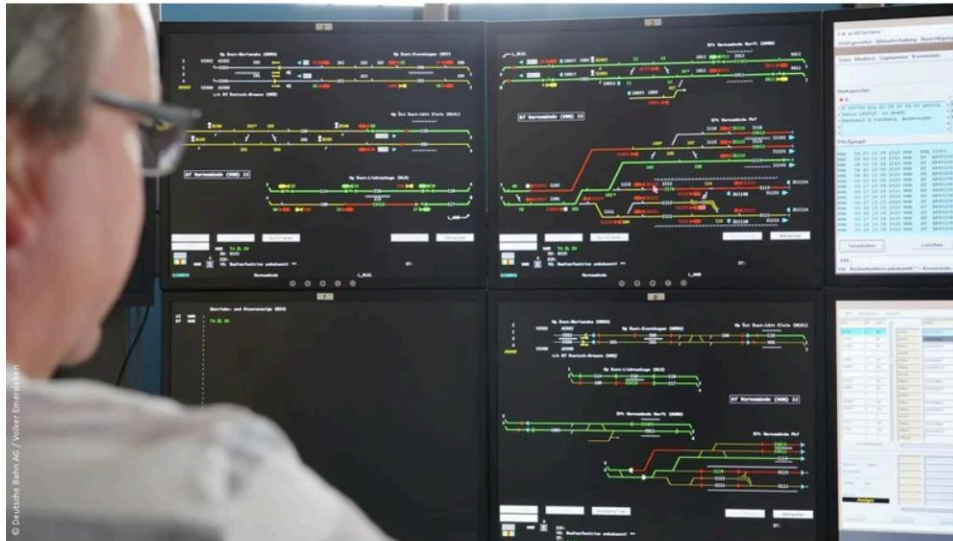




Customer Project Highlights

Some Highlights – DB InfraGO

Digitale Schiene
Deutschland



2025/03/12

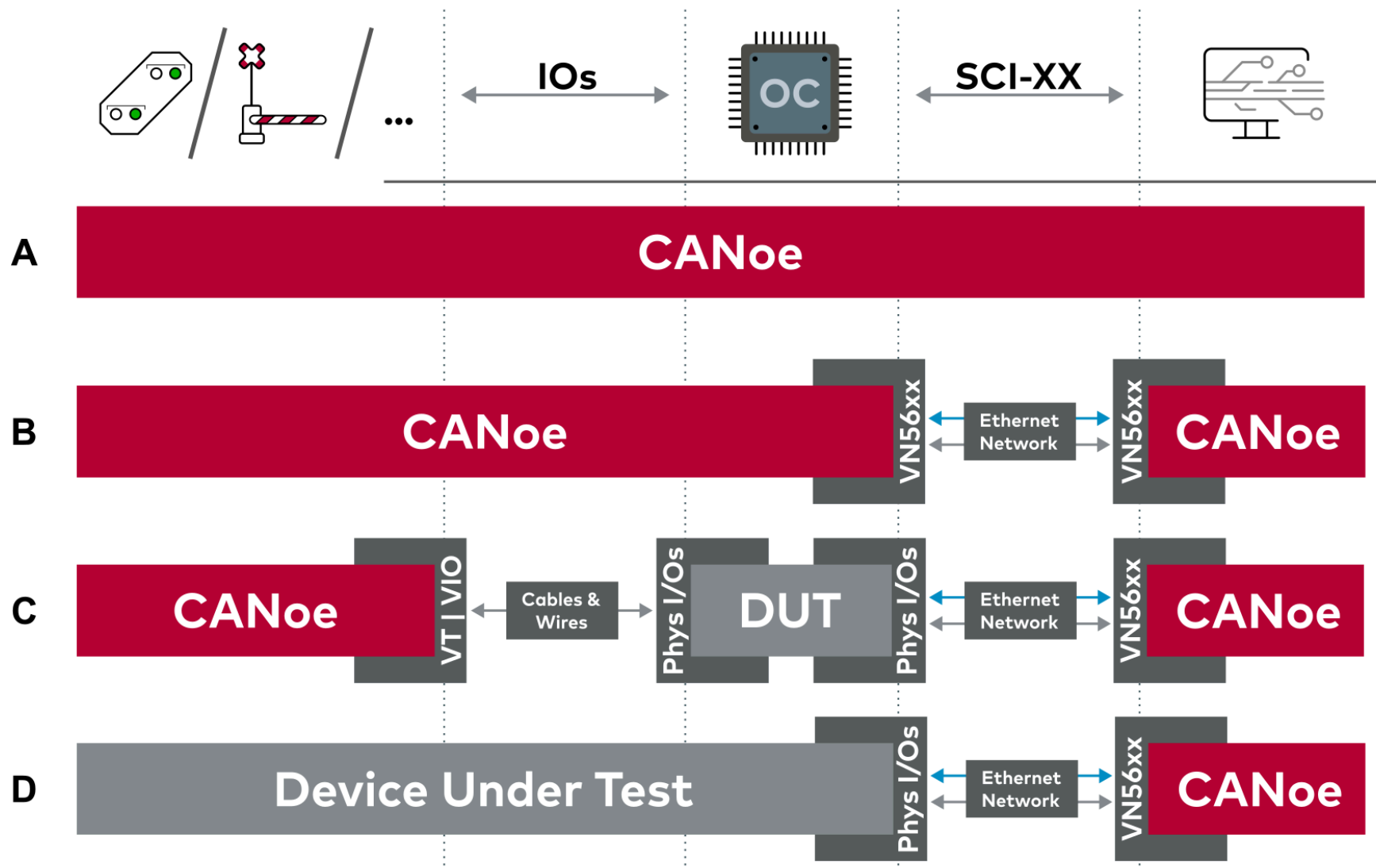
**Volume contract worth EUR 6.3 billion
concluded between DB and the rail industry
– a milestone for faster realisation of digital
control and safety technology**

<https://digitale-schiene-deutschland.de/en/news/2025/volume-contract>



**Who performs the
acceptance tests of
these components?**

Some Highlights – DB InfraGO

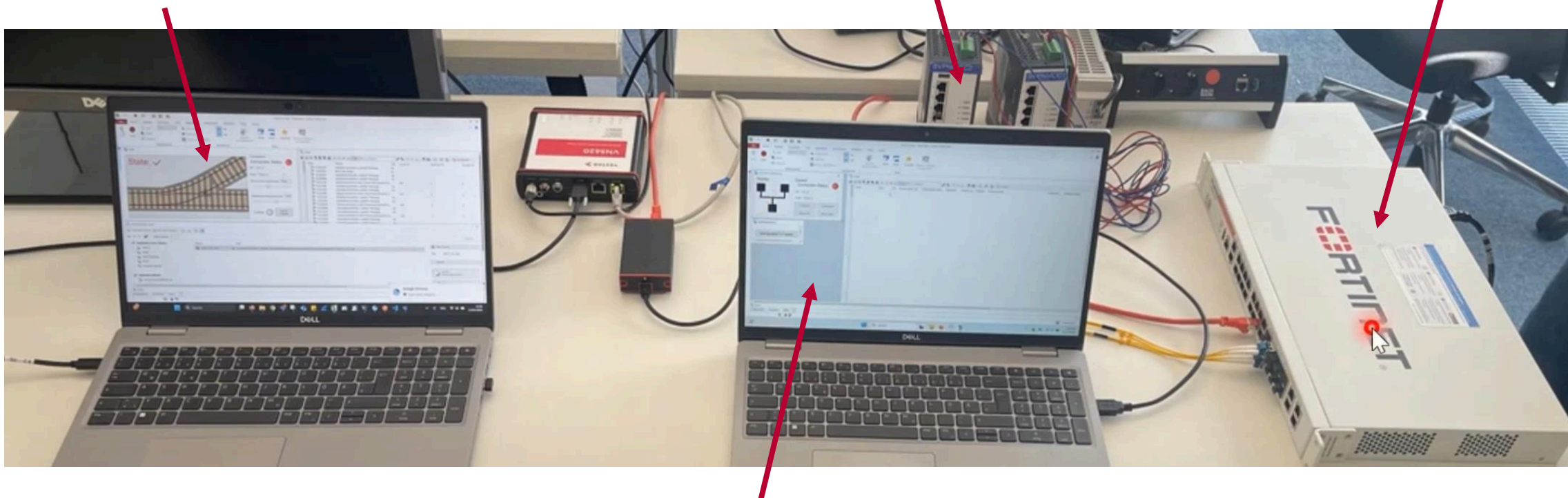


Some Highlights – DB InfraGO

Security Gateways

Real Network

Point



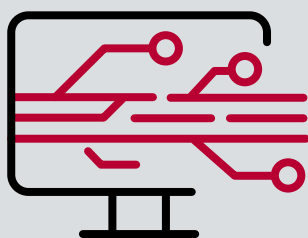
Interlocking

<https://www.vector.com/int/en/products/industries/railway/vector-virtual-railway-engineering-day>

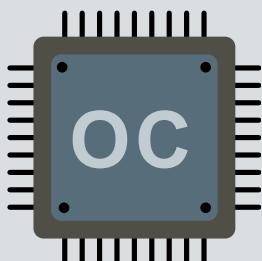
Other Successful Customer Projects



TRDP for on-board communication



Development and **integration** of DSTW



RaSTA conformity tests for
object controllers

ongoing



Vector Tools for Automated Testing

Our Test Tools for ...

validation | verification

static code analysis | unit testing | system-level testing | environment simulation



System-Level Testing | **CANoe & vTESTstudio**

HW/SW Integration Testing | **CANoe & vTESTstudio**

Unit Integration Testing | **VectorCAST/C++ & CANoe**

Unit Testing | **VectorCAST/C++**

Static Code Analysis | **PC-lint Plus**

... and many more

stimulation | measurement

A row of various Vector Instruments modules, including signal conditioners, multi-channel analyzers, and data acquisition cards, displayed against a white background. The modules are shown in a perspective view, highlighting their different functions and interfaces.

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Our HIL Hardware for ...

stimulation | measurement

Ethernet | CAN | logging | real-time

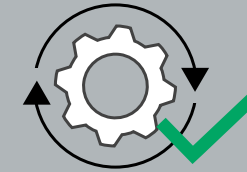
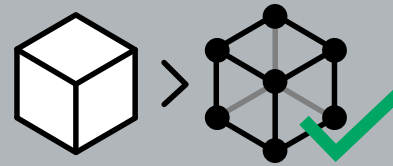
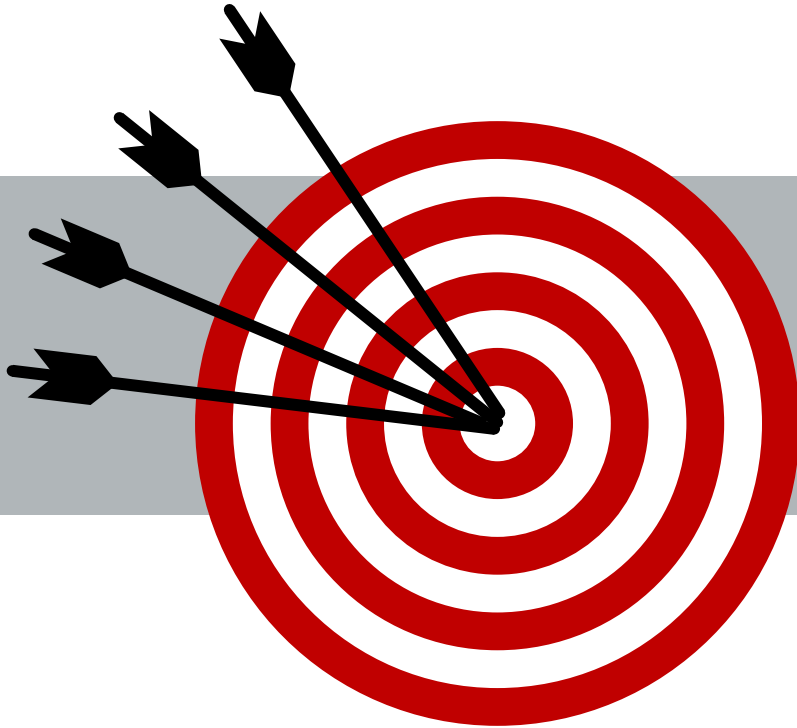


... and many more



Summary

Summary



Digital Twins

- ▶ Abstraction layers in software and test tool lead to reusability of environment simulations and test cases

Test automation

- ▶ Testing in virtual environments can be done early
- ▶ Test automation is crucial for development efficiency

Examples

- ▶ DB InfraGO uses our tools for automation of acceptance tests
- ▶ Other customers use our tools for test automation and thereby higher test efficiency

Talk To Us @ Booth D104



Strategic Customer Consultant

Dr. Mario Winkler



Strategic Customer Consultant

Dr. Manuel Hüpfel

Experts for system-level testing | Supporting customers in pilot projects

For more information about Vector
and our products please visit

www.vector.com/railway

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