



## From Digital Twins to Acceptance Tests

Strategies for Efficient Testing

## The Challenges Ahead

Time to market

EN 50716

DevOps Integration (CI)

EULYNX

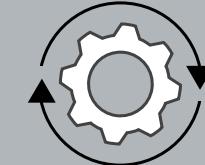
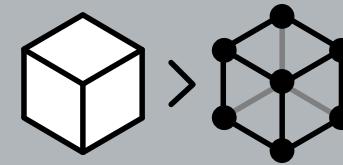
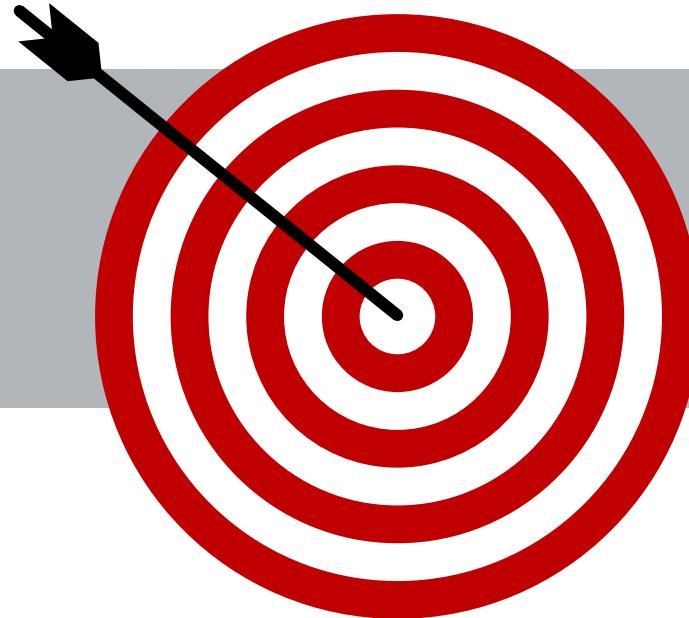
How can we solve this?

I/O Access

Efficiency

Digital Twins

## Agenda



### Digital Twins

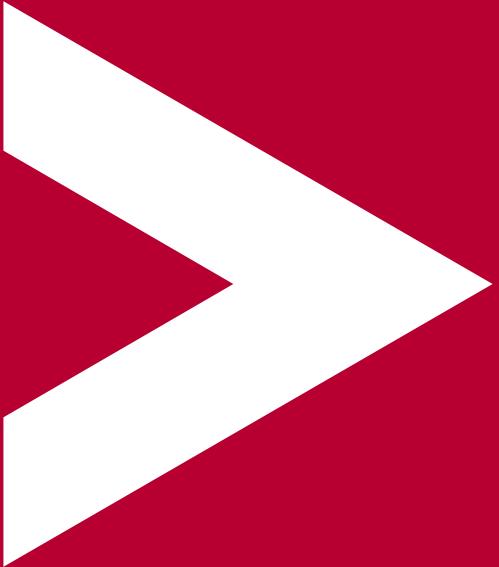
What are the advantages of digital twins?

### Test automation

How can you benefit from test automation and early testing?

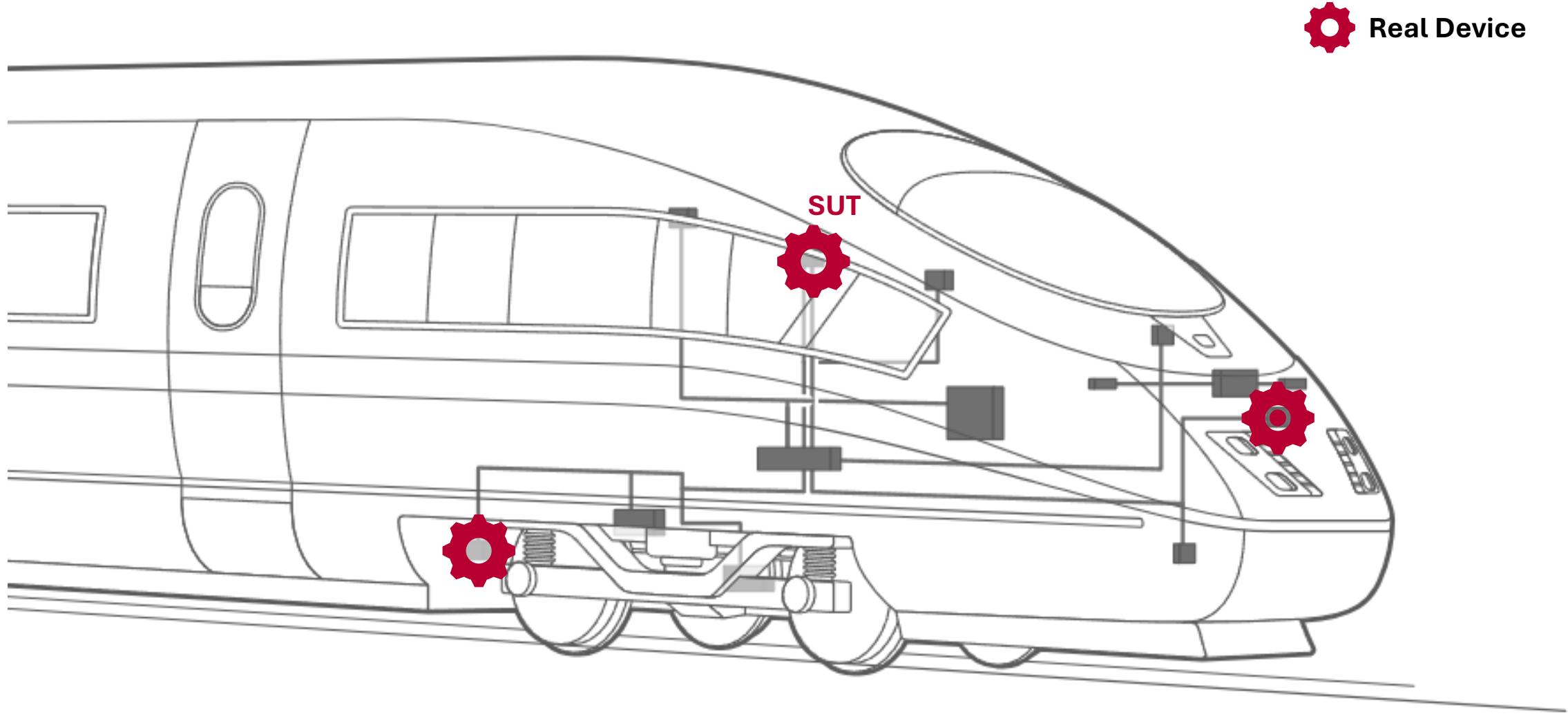
### Examples

Successful projects with **DB InfraGO** and others

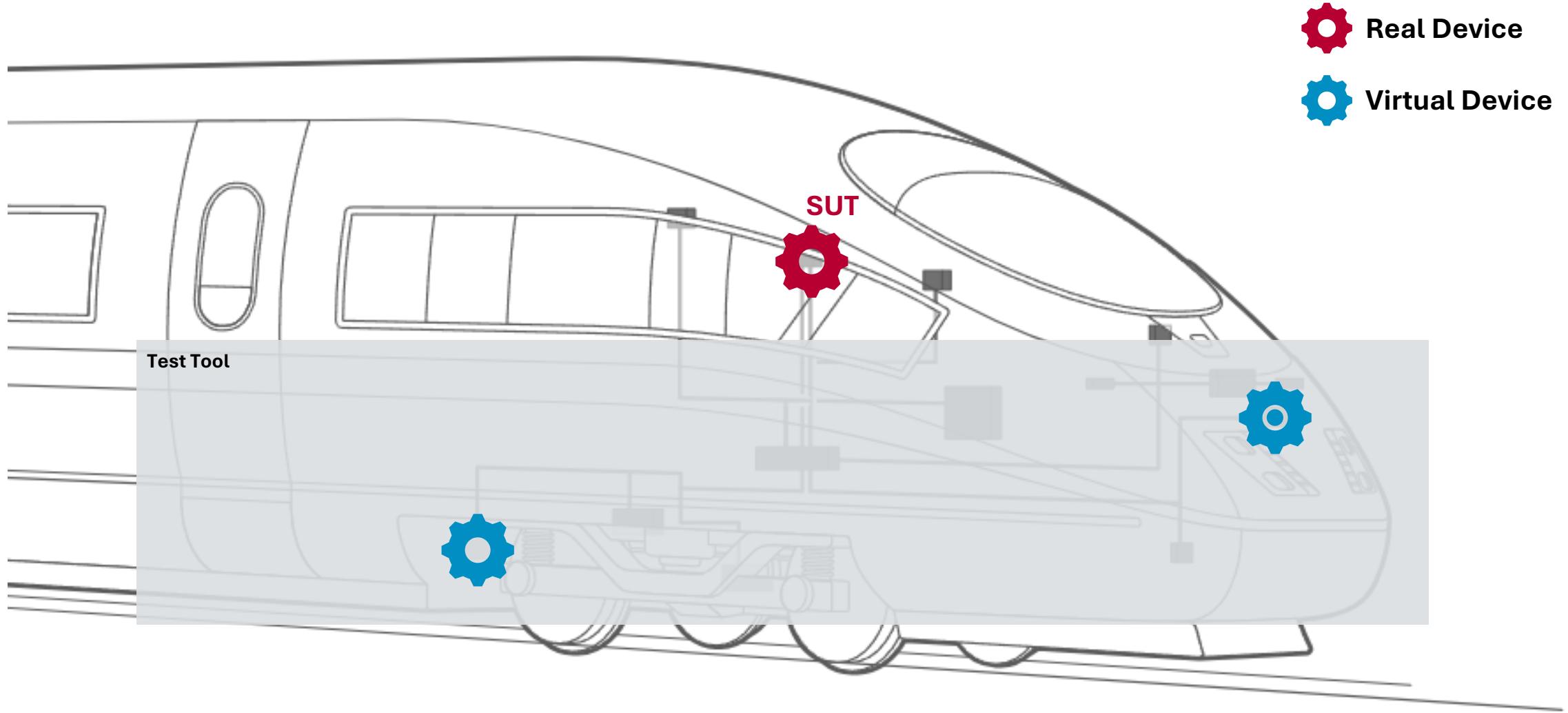


# System-Level Testing in Different Environments – From End to Start

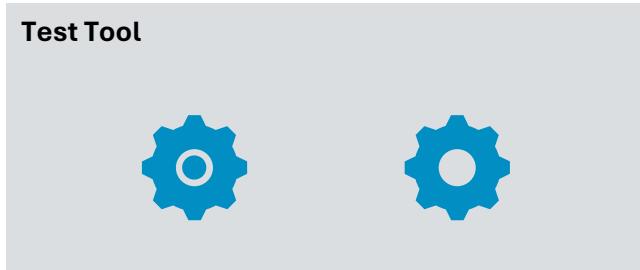
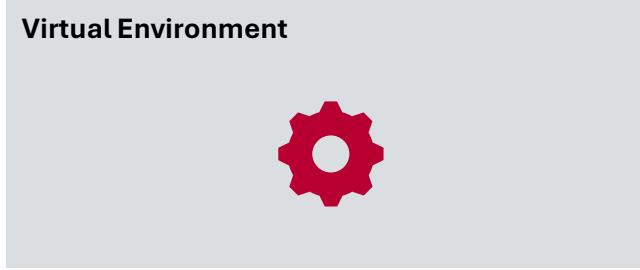
## System-Level Testing in a Real Environment



## System-Level Testing (HIL) in a Virtual Environment



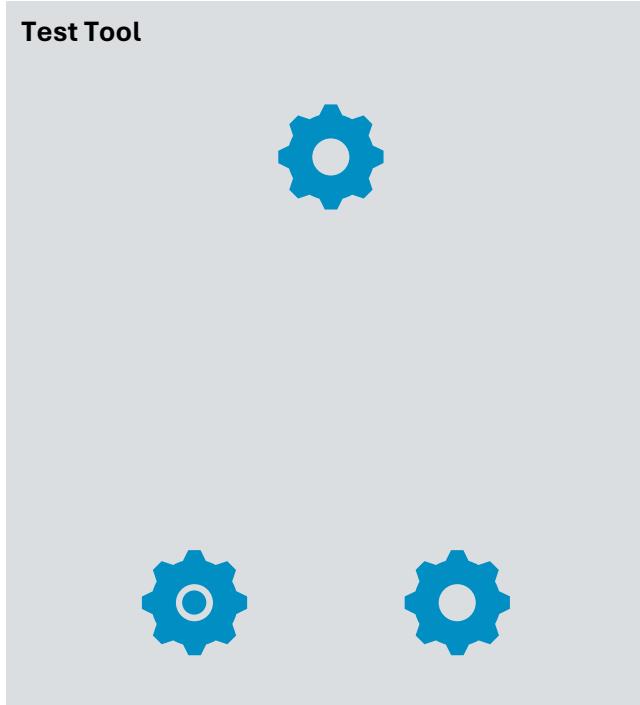
## System-Level Testing (SIL) in a Virtual Environment



**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



Test Tool

**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

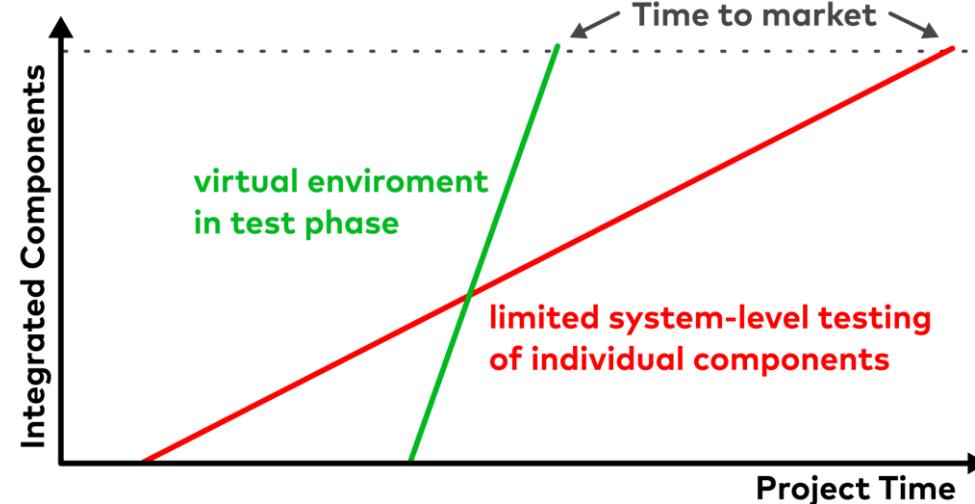


Test-driven development

### Requirements Engineers



Early feedback & adjustments

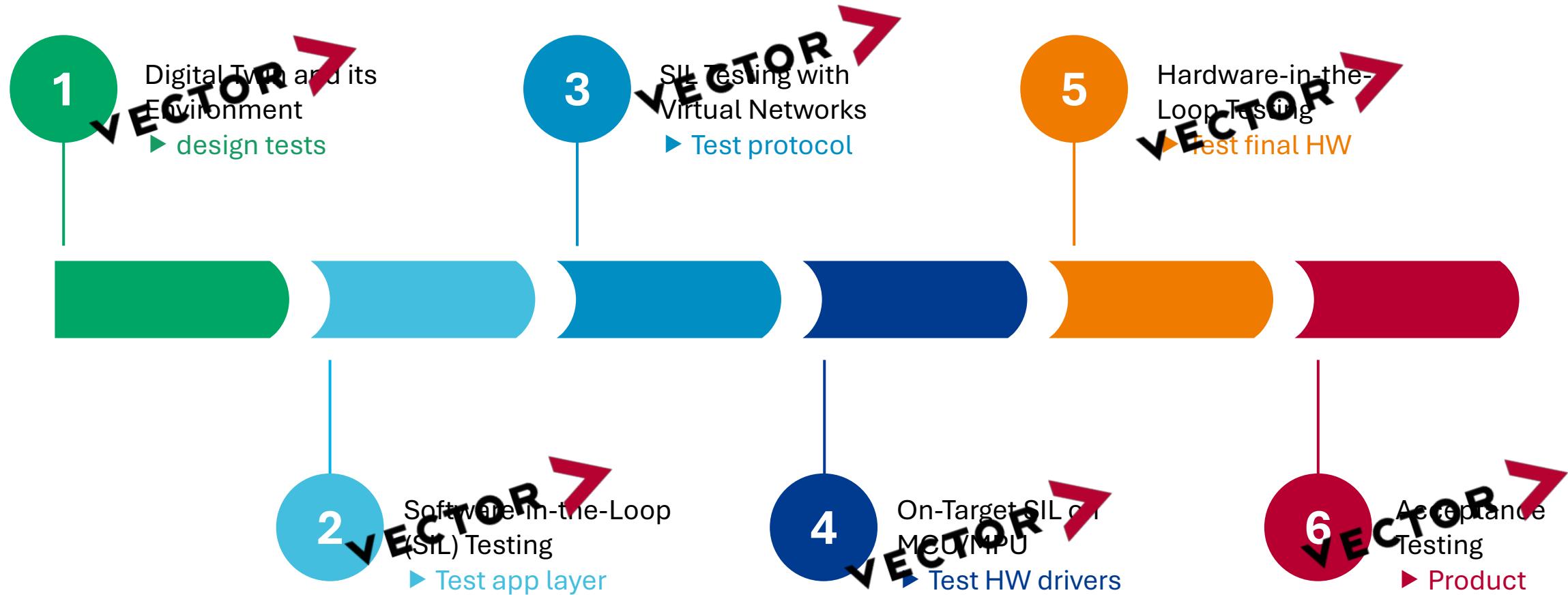


“Give me six hours to chop down a **tree** and I will spend the first four **sharpening the axe**.”

- 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

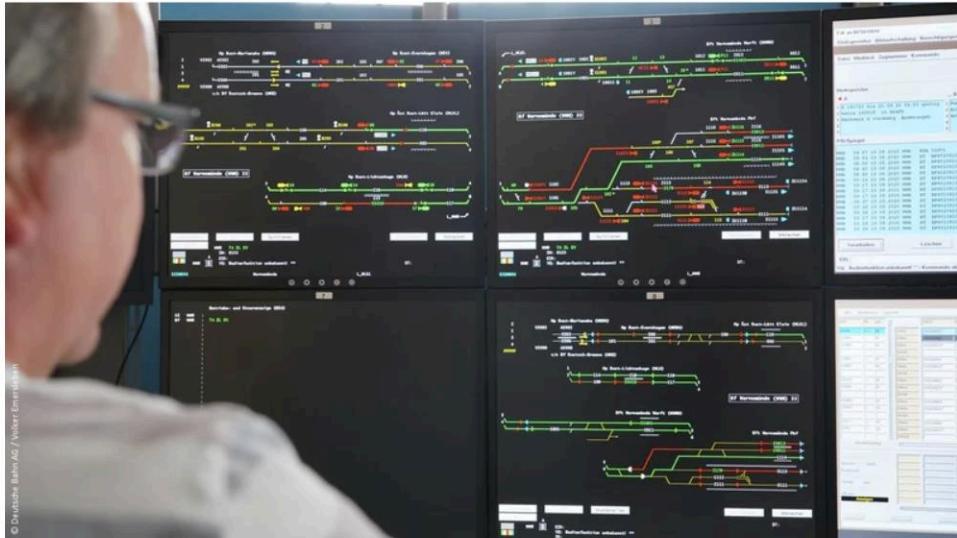




# Customer Project Highlights

## Some Highlights – DB InfraGO

**Digitale Schiene**  
#### Deutschland



2025/03/12

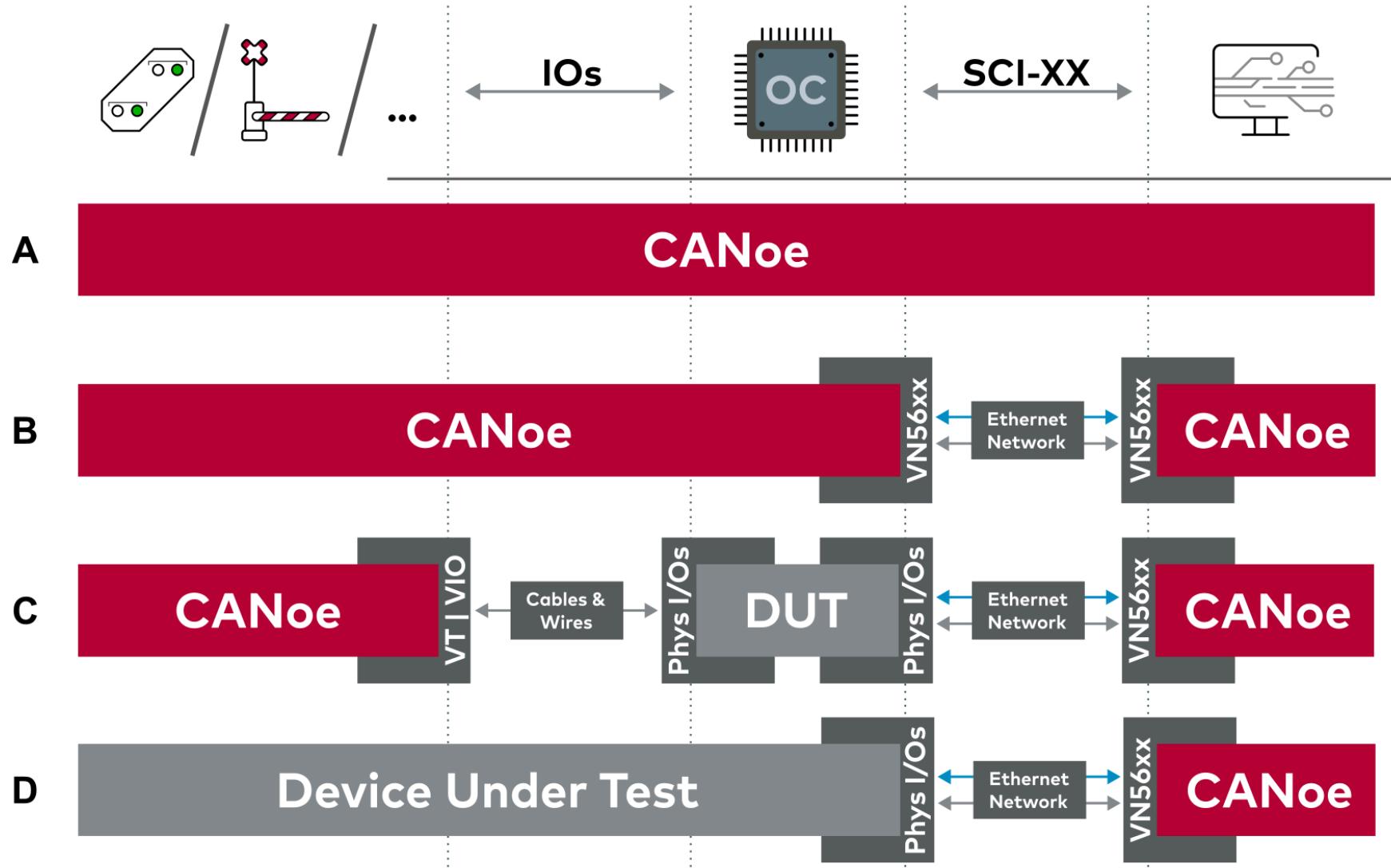
**Volume contract worth EUR 6.3 billion concluded between DB and the rail industry – a milestone for faster realisation of digital control and safety technology**

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

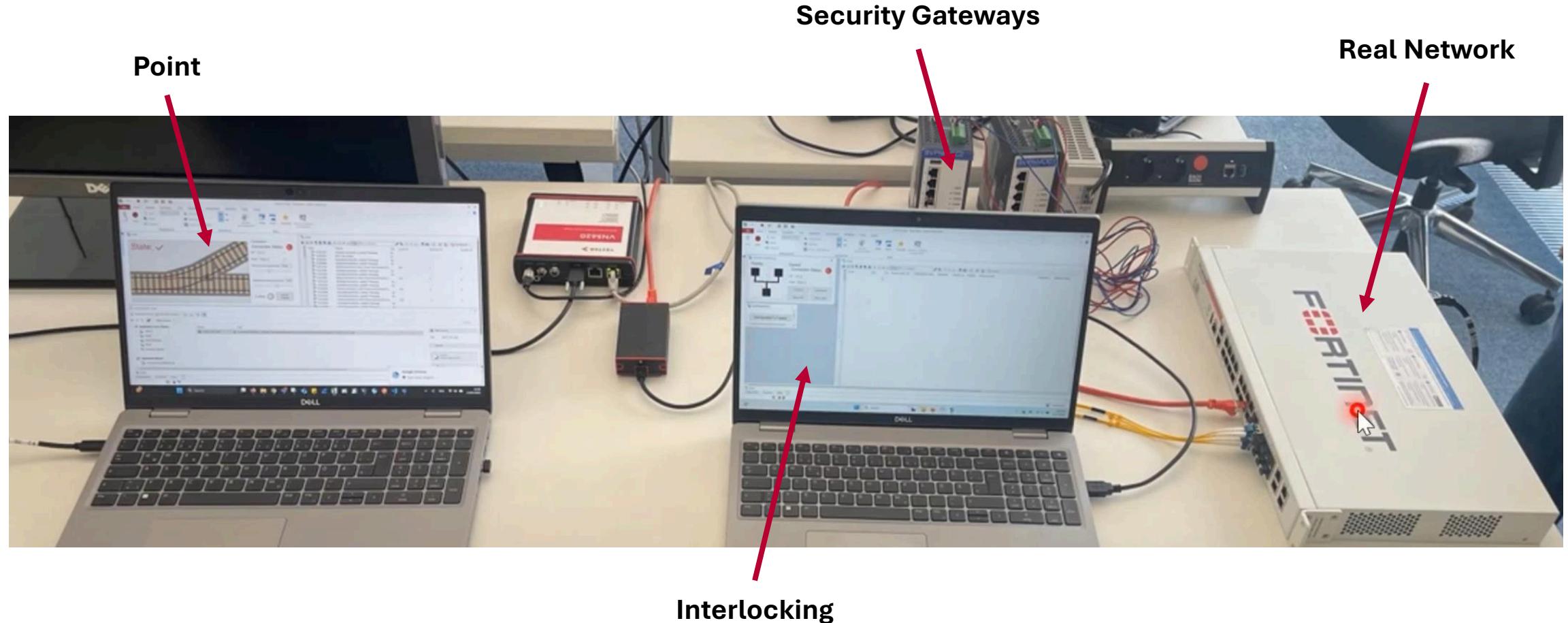


**Who performs the acceptance tests of these components?**

## Some Highlights – DB InfraGO



## Some Highlights – DB InfraGO

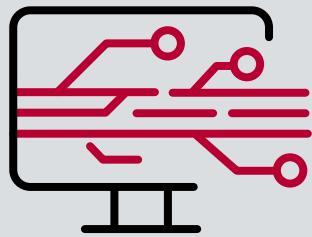


<https://www.vector.com/int/en/products/industries/railway/vector-virtual-railway-engineering-day>

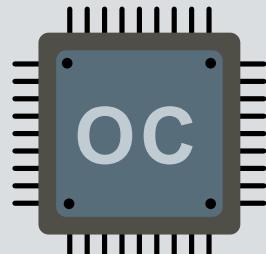
## Other Successful Customer Projects



**TRDP** for on-board communication

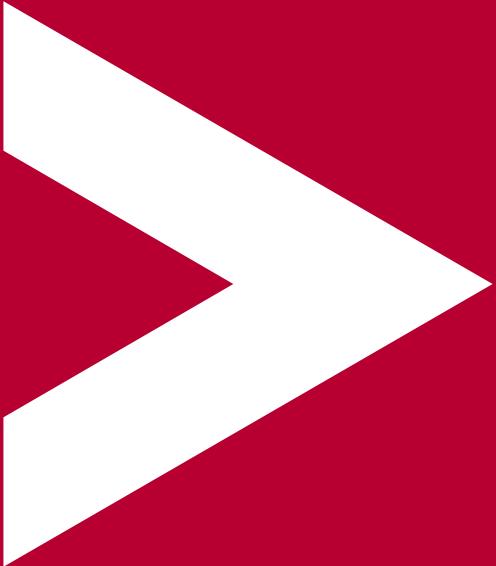


Development and **integration** of DSTW



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

Our HIL Hardware for ...

# stimulation | measurement

analog | digital | serial | network interface | power supply | real-time



... and many more

Our HIL Hardware for ...

# stimulation | measurement

Ethernet | CAN | logging | real-time

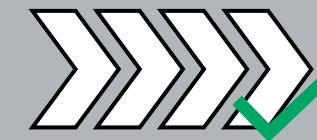
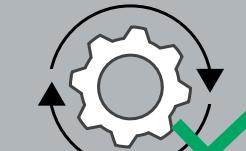
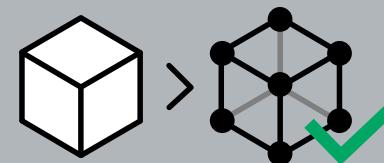
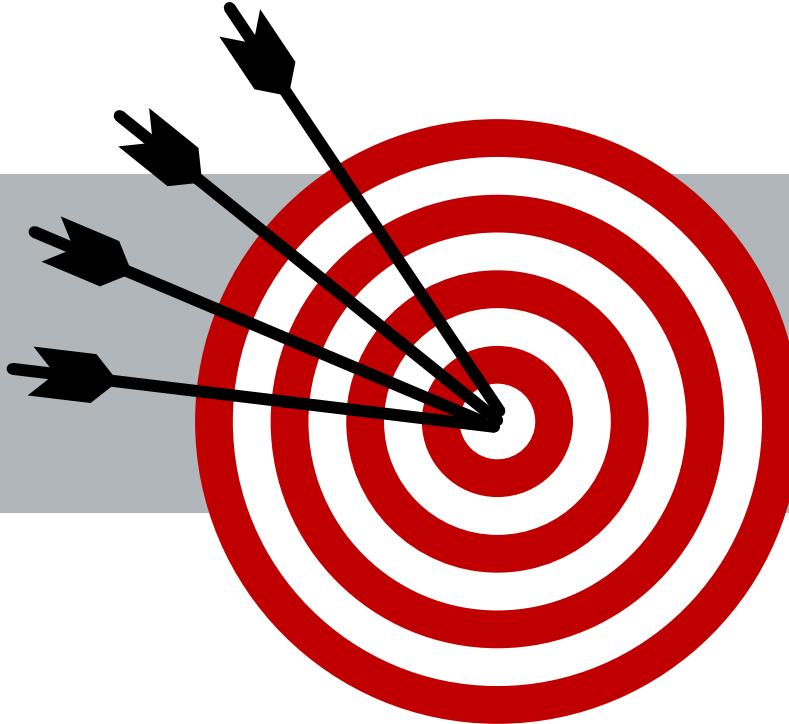


... and many more



# 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  
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[www.vector.com/railway](http://www.vector.com/railway)

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