Durchgängige Continuous Integration für Embedded Systeme

SAEC Days 2020

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21.07.2020

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Why do we want Continuous Integration?

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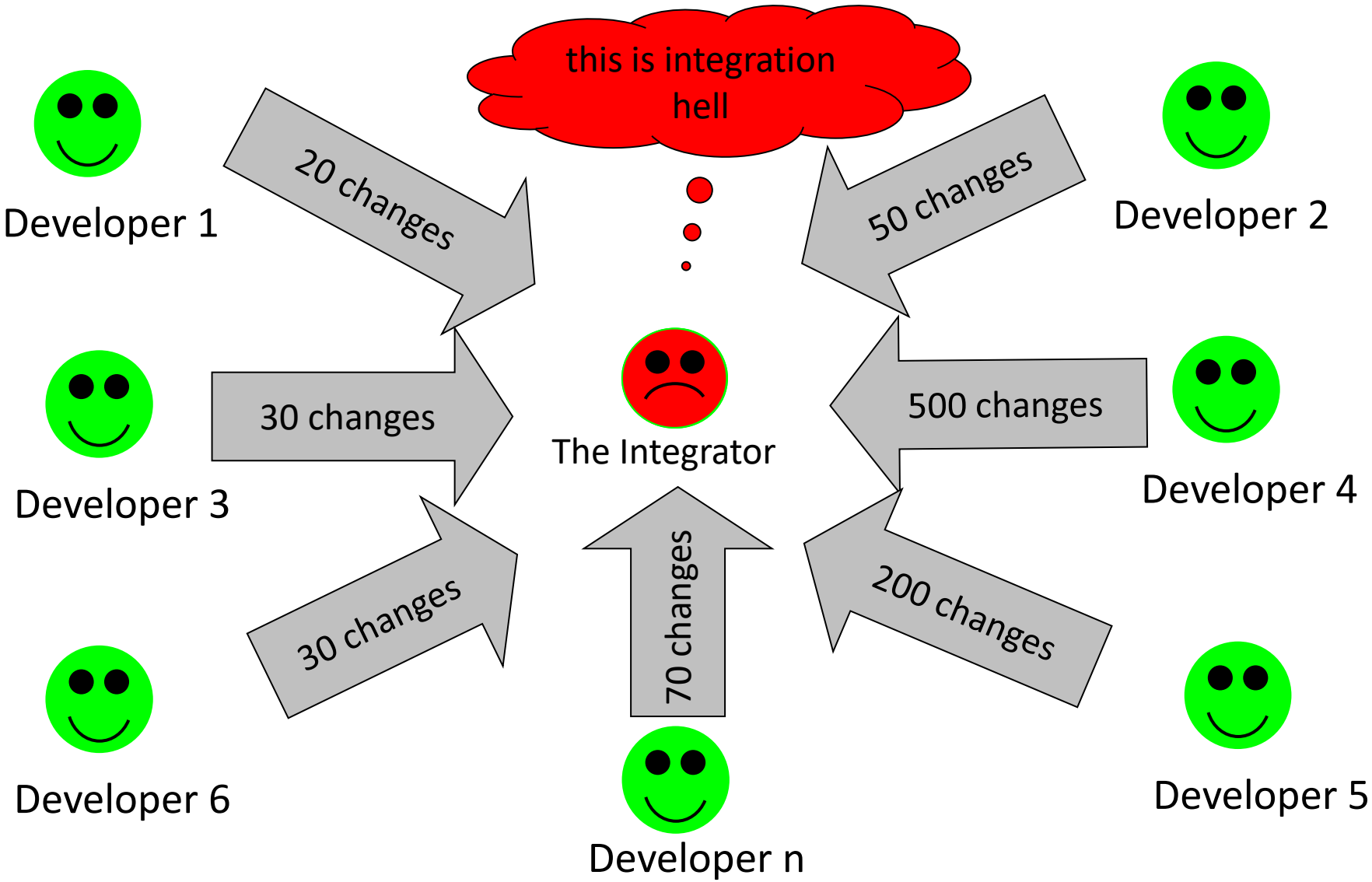
The Integration Problem



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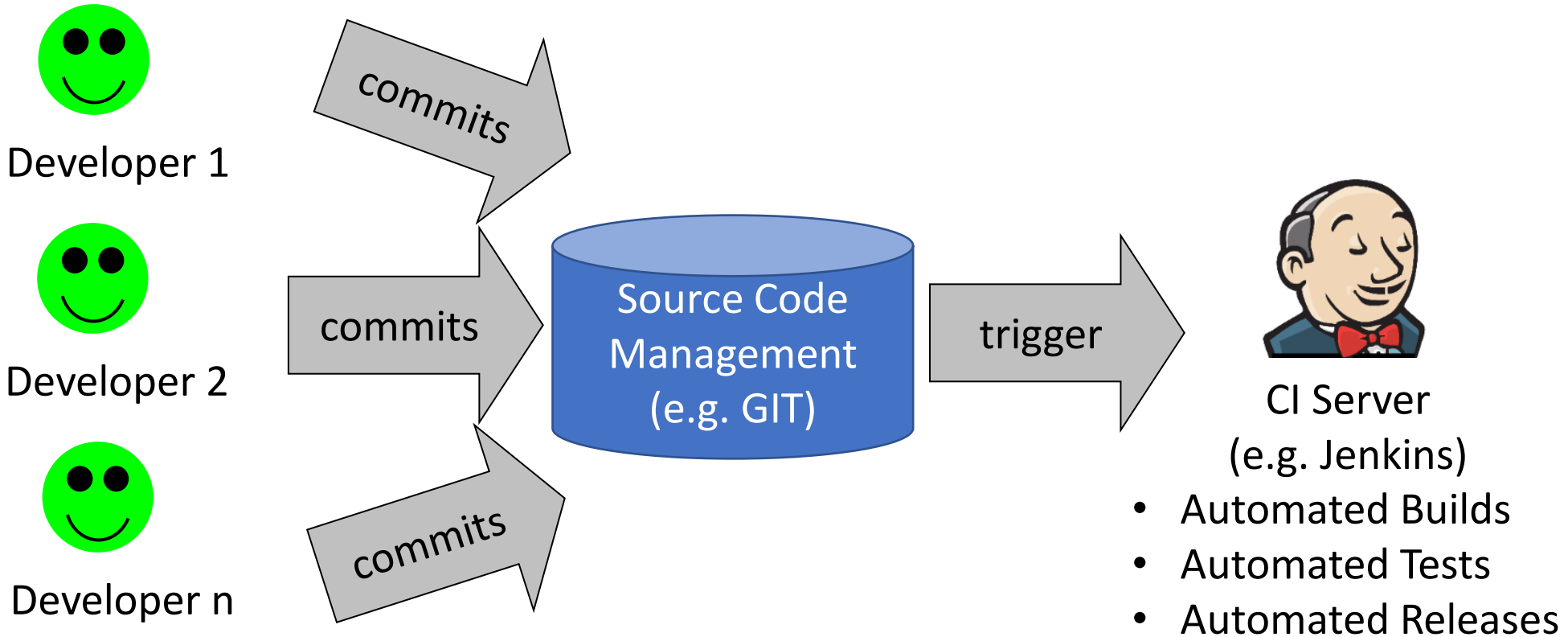
How does Continuous Integration work?



- every change is integrated & tested
- early & often – fail fast
- bugs can be detected and fixed very early (sometimes within in minutes)

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Continuous Integration Rules

- Commit early, commit often
- Never commit broken code
- Fix build problems immediately
- Fail fast (staging) for fast feedback
- Act on metrics
- Build for all targets
- Release and Deliver always

Testautomation is a Precondition for Continuous Integration

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What is the Problem with CI and Embedded?

- Many Tests need Hardware Environment
- Hardware Test Setups hard to automate
- Only „Happy Path“ is tested
- Expensive Test Setup often prohibits Testautomation
- Tests are not directly integrated in Development Process
  - Fail Fast is not possible

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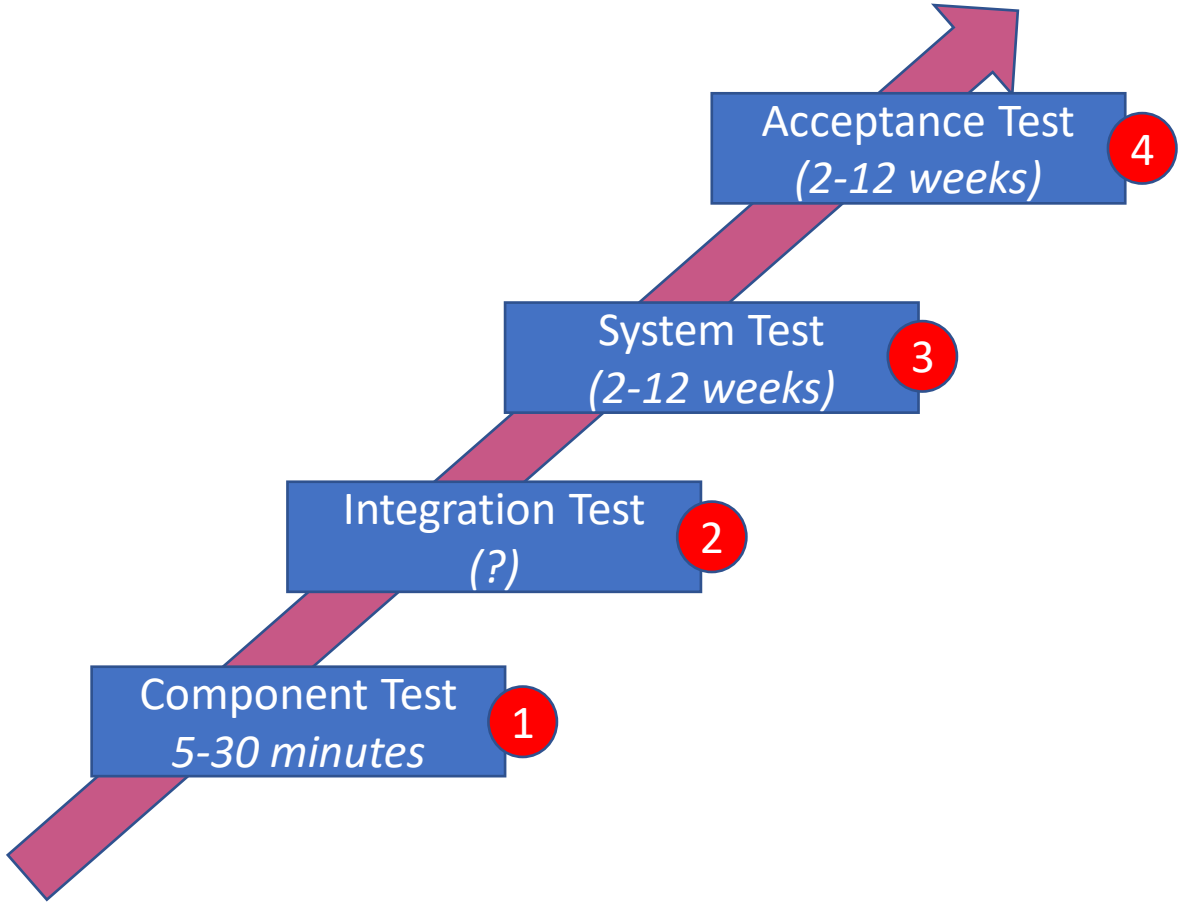
The Response Time for Test Levels



2-12 weeks is not „fail fast !“

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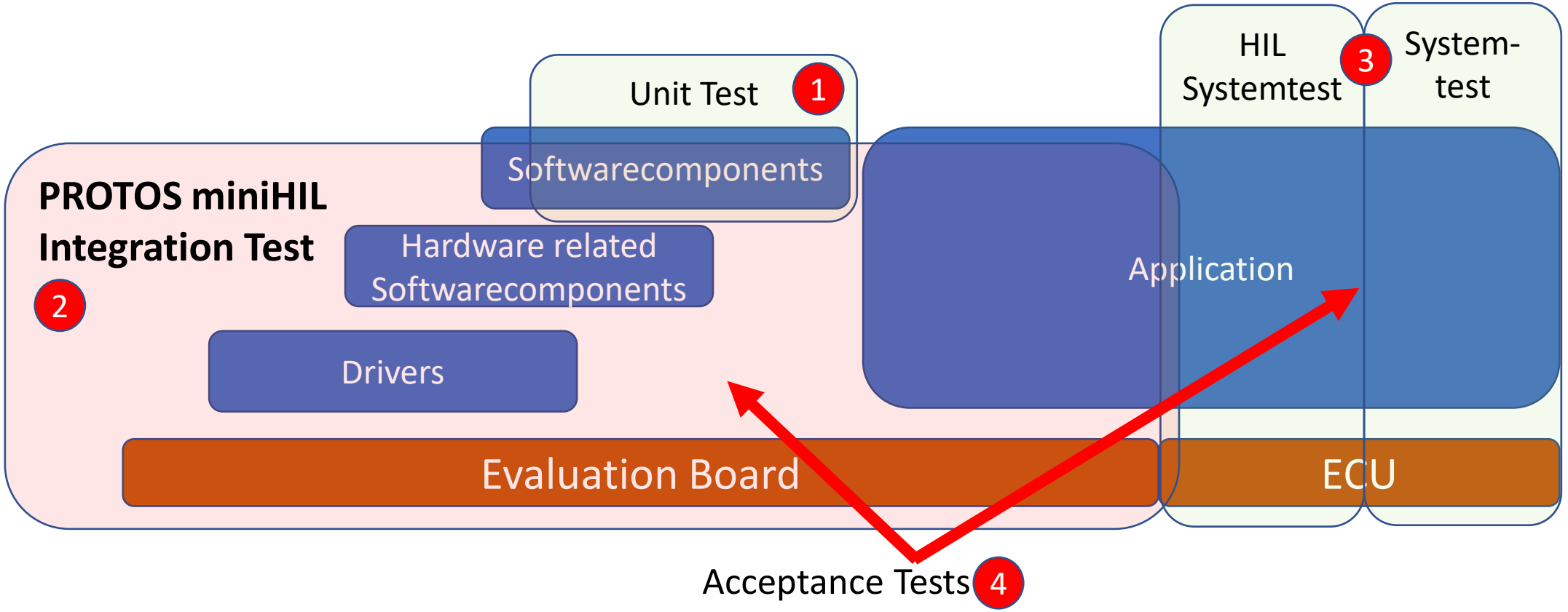
The Testing Gap



Typical Development Process for Embedded Systems

Embedded Projects are often not tested in the early phases

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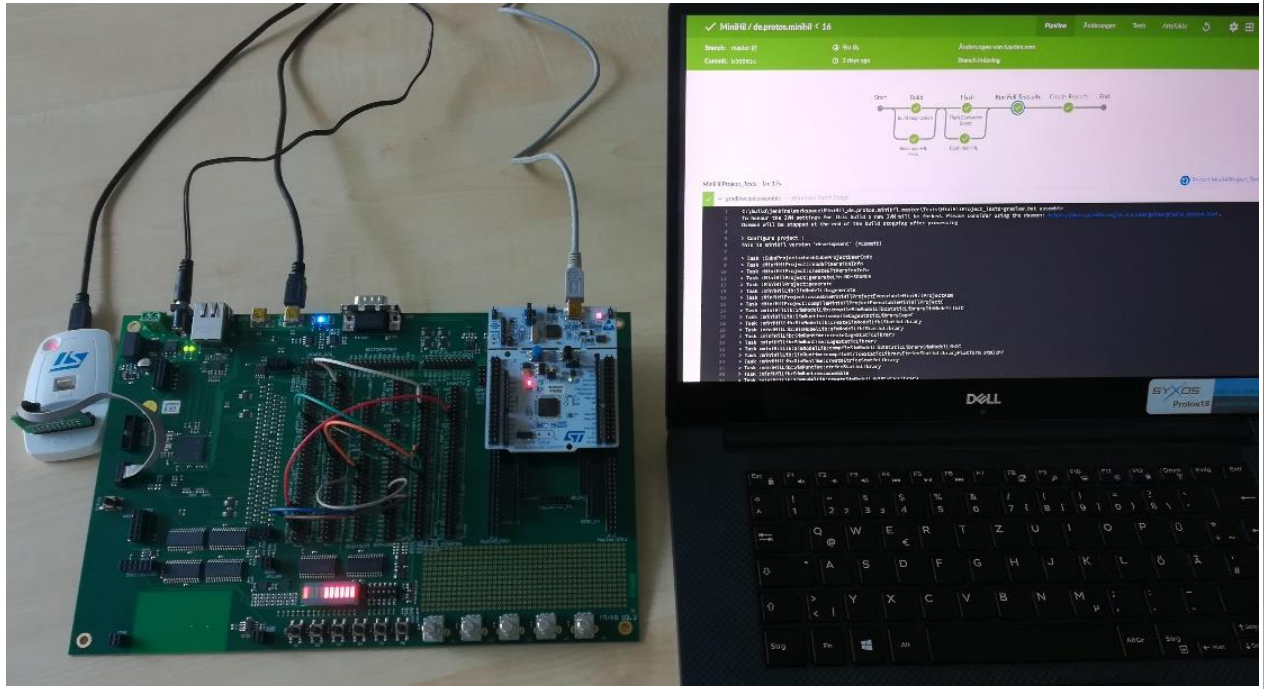
Continuous Integration for HIL Test

- Full Hardware in the Loop test automation with continuous integration (CI)
- Every commit for application or test cases triggers test run
- Fail fast: First test results for commit after 5-15 minutes
- Deeper tests can run automated over night (robustness, performance, …)
- Automated test reporting
- Inexpensive, small hardware enables CI setup for every project
- Every application or test developer can use the test setup on desktop or with Continuous Integration



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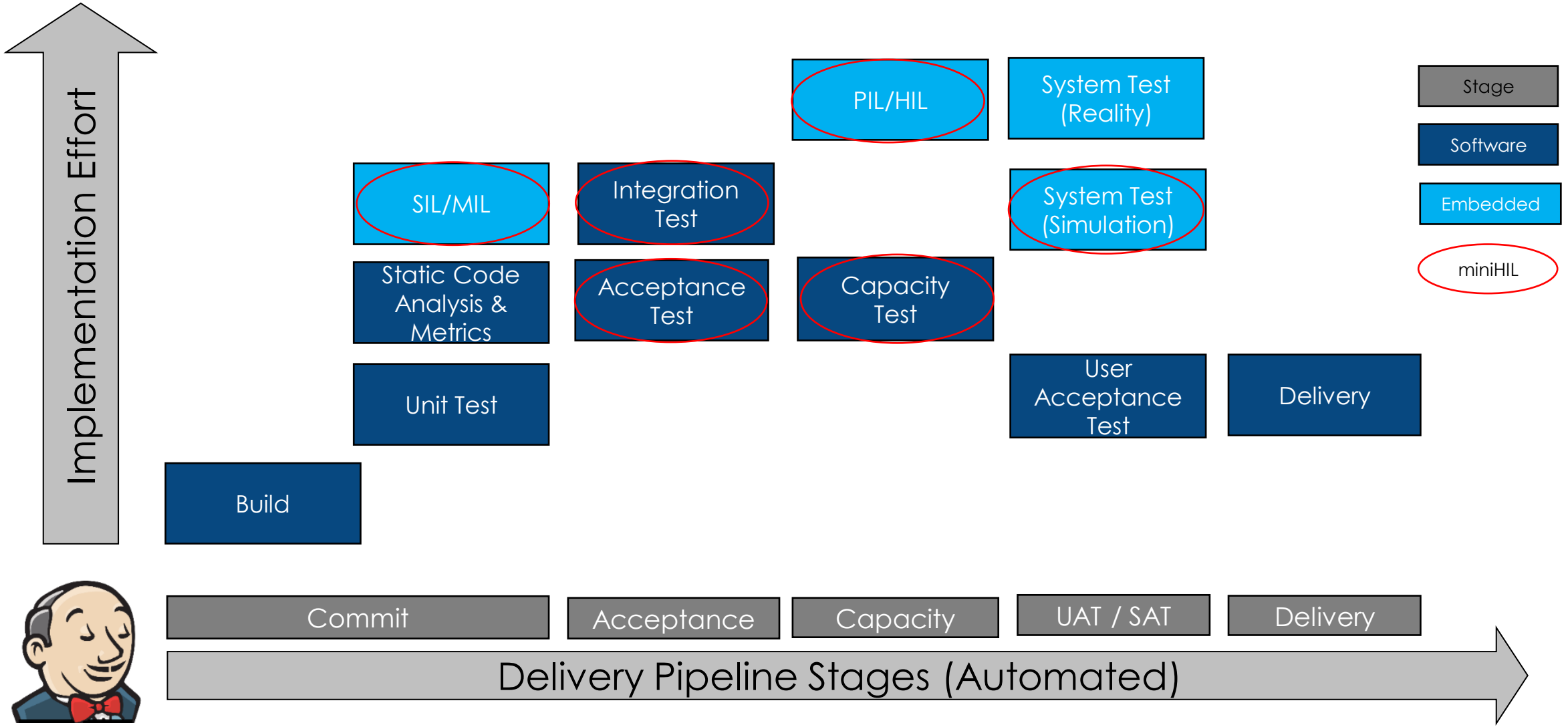
Typical CI Delivery Pipeline



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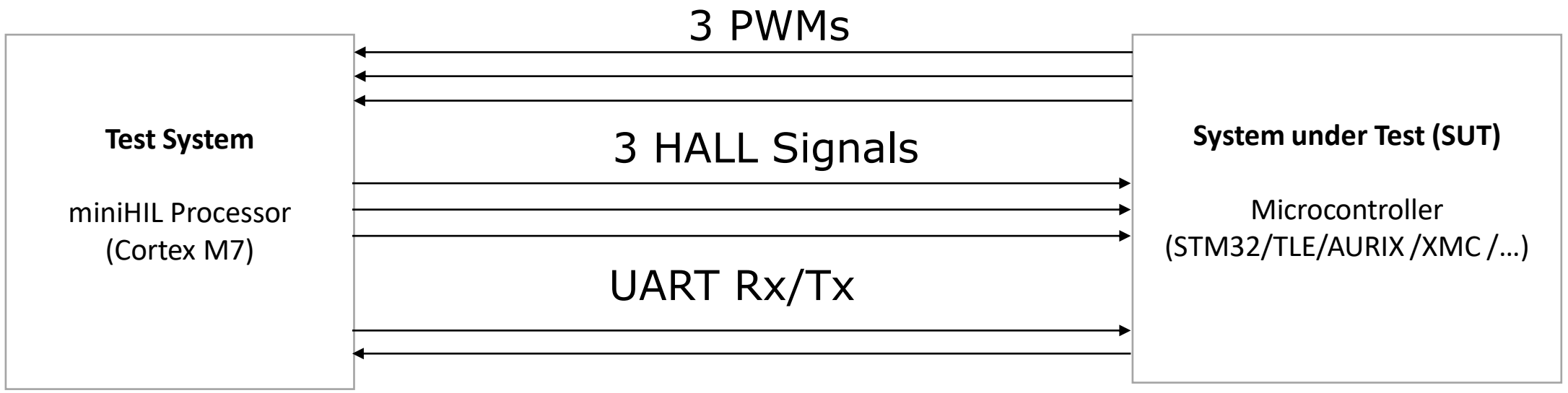
DEMO Testsystem Setup



Simulation and Tests

1. Send/Receive Commands with System under Test via UART
2. Measure PWMs
3. Run Motor Simulation (Closed Loop)
4. Generate HALL Signals
5. Run Test Cases

Motor Control Application

1. Accepts RPM, Direction, Brake commands via UART
2. Run Motor Control for BLDC (PWMs and HALL)

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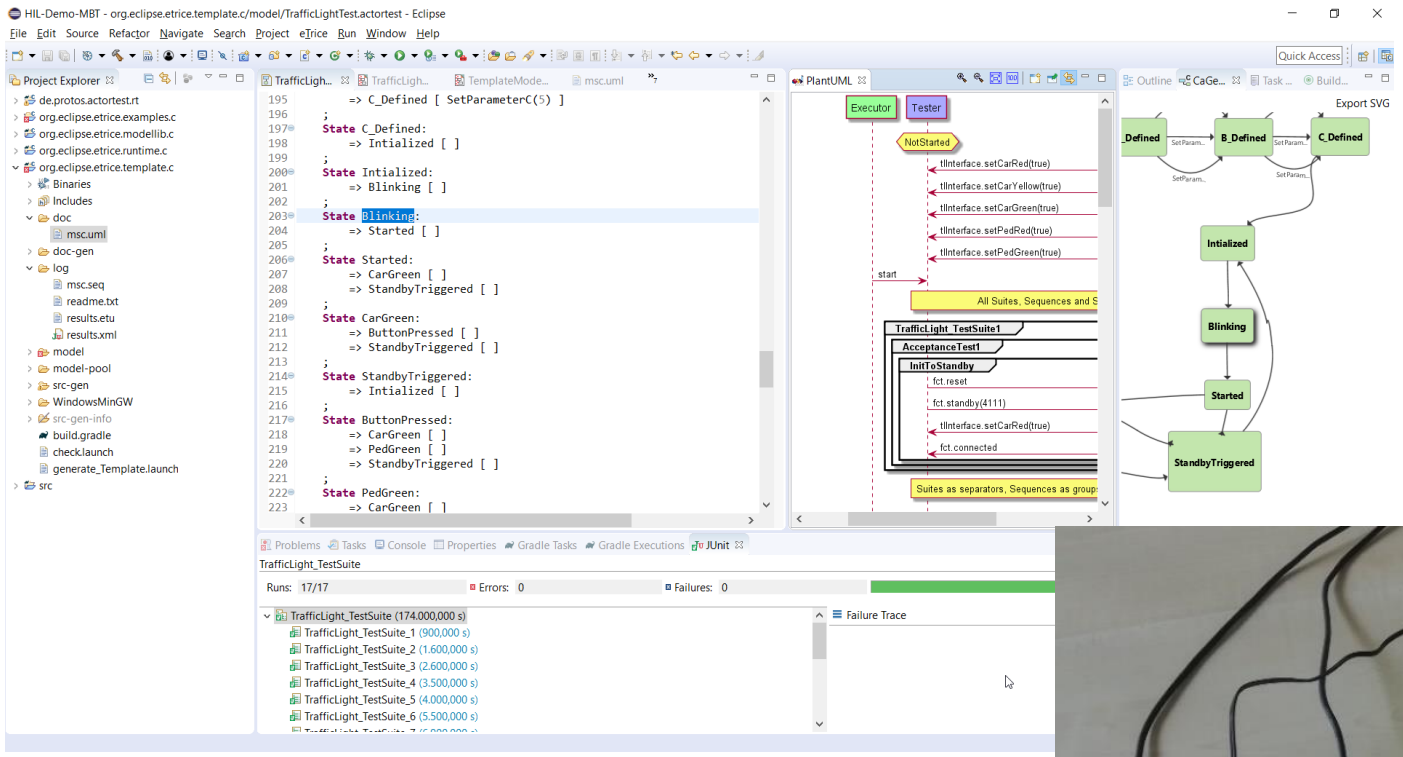
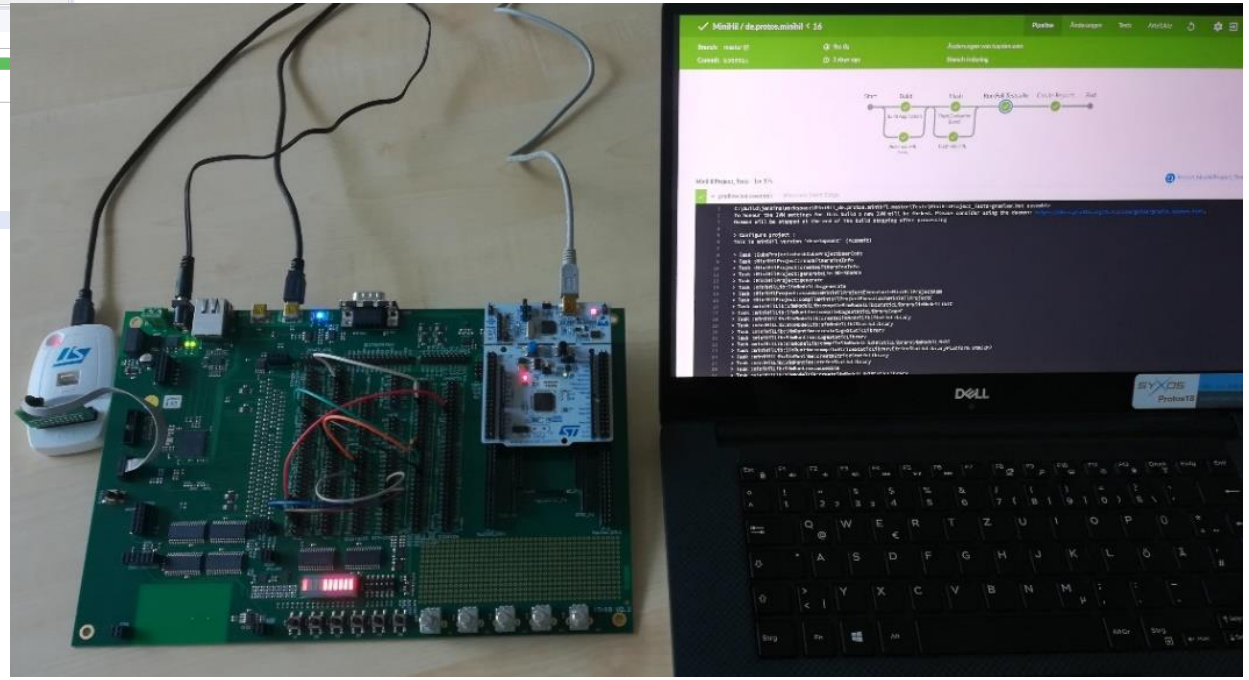
DEMO





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Conclusion

The miniHIL enables Continuous Integration for Embedded Systems:

- **Unit Tests** are simple to automate with Continuous Integration: **Start here!**
- Hardware in the Loop Test for Integration- and System-Tests are hard to automate

  so: **keep it simple**
- Test methods have to **run on command line** to integrate well with Continuous Integration
- Also **automate Metrics and Documentation**
- Aim for "**Fail Fast**" within Minutes instead of Months

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… any Questions?

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https://www.protos.de/hil-test-automatisierung-mit-continuous-integration/

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