Introduction to Model-based Development and Quality Assurance of Embedded Software

3 days

Date/Time	Location	Language
Upon request		English/German

This training class provides a practical overview of developing and safeguarding embedded software on the basis of Simulink and code generators like Embedded Coder and TargetLink within the framework of serial projects. The training class takes participants through all process steps from designing and creating the simulation model in Simulink and Stateflow to generating production code.

Model quality assurance consists of verifying the model and software architecture, safeguarding the modeling guidelines, as well as checking for functional compliance with requirements in the model test. The efficient requirements based test specification is implemented for the created models and applied in MiL and SiL tests. Functional accuracy is verified by the evaluation of regression and back-to-back tests. You will learn how to follow all the steps in practical exercises using the MES Test Manager (MTest), the MES Model Examiner (MXAM), and the MES Quality Commander (MQC).

Target Audience

This training class is for novices to model-based development of embedded software based on Simulink and Embedded Coder or TargetLink, including developers, testers, quality managers, project managers, and team leaders. Only basic modeling knowledge of Simulink and Stateflow is required.

Highlights

- Model-based development with Simulink and Stateflow
- Developing safety-critical software in compliance with ISO 26262
- Code generation from Simulink models
- Model quality analysis and evaluation
- Modeling guidelines
- Model testing and test implementation techniques
- A comprehensive example covering all development stages

????? Participant from Continental Automotive

"A resounding thumbs up for this workshop! The speakers displayed a high level of specialist knowledge and presented the subject in a clearly comprehensible and methodical way."

Languages

Available in English and German

Formats

Icon On-Site Training

Open-enrollment Trainings
at one of our locations

Icon Online Training

Virtual Classroom Trainings
wherever you are

Icon Inhouse Training
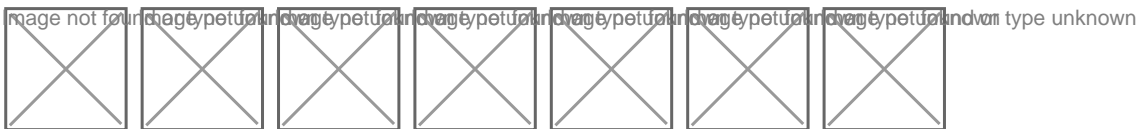
In-house Trainings
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More Details on Formats and Locations

Cost, Terms & Conditions

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Our Trainers

Agenda

Day 1

Overview: Model-based software development with Simulink

- Foundations of model-based development
- Overview of development and quality assurance activities
- Characteristics of ISO 26262-compliant development

Introduction to sample application

- Set up modeling environment
- Introduction to sample models

Modeling embedded software in Simulink

- Simulink modeling environment
- Composition and structure of environment and controller models
- Parametrization of Simulink models
- Continuous and discrete modeling

Hands-on: Simulink

Modeling embedded software with Stateflow

- Introduction to the concept of finite-state machines
- Stateflow modeling environment
- Stateflow design pattern
- Recommended best practices

Hands-on: Stateflow

Analysis and evaluation of model architecture

- Model structure analysis
- Introduction to complexity metrics
- Calculating model complexity
- Measures to reduce model complexity
- Identification of ineffective interfaces and model clones

Hands-on: Analysis, evaluation and refactoring of model architecture

Day 2

Code generation via TargetLink/Embedded Coder development environment

- Principles of code generation
- Data dictionary
- Data types, classes, scaling, and fixed-point arithmetic
- Interfaces (signals and buses)

Integrating models and distributed modeling

- Advantages of model referencing and libraries
- Definition of distributed parameter files

Ensuring model quality with modeling guidelines

- Overview of modeling guidelines
- General modeling guidelines for MISRA- and ISO 26262-compliant modeling
- Specific guidelines on improving code generator application
- Automatic checking of modeling guidelines

Hands-on: Ensuring model quality with modeling guidelines

Ensuring model quality with model testing

- ISO 26262 requirements in the testing process
- Test goals on different testing levels
- Regression testing and back-to-back testing, MiL – SiL – PiL

- Model and code coverage
- Automatic test evaluation with test assessments

Hands-on: Model testing project

Systematic requirements-based test case creation

- Test cases: What are the typical basic elements?
- Definition of test groups and test sequences
- Specification functions and parameter handling
- Best practices for test specifications

Hands-on: Test specification with MTest

Day 3

Automated test evaluation with test assessments

- Principles and objectives of test assessments
- Assessment generation from requirements (MARS)
- Benefits of formal requirements syntax

Hands-on: Formal requirements with MTest

Regression and back-to-back signal comparison

- Scope (MiL – SiL – PiL)
- Combination of back-to-back and regression testing

Hands-on: Signal comparison with MTest

Model and code coverage in the model test

- Model coverage for all MiL test platforms
- Code coverage for SiL/PiL test platforms

Hands-on: Increasing model/code coverage with MTest

Overview and priorities for process adaptation in compliance with ISO 26262

- Quality monitoring of development projects, software verification report
- Prioritizing ISO 26262 requirements for MBD
- Assessing effort and benefits of ISO 26262 requirements
- Available methods and tools for process tailoring

Hands-on: Quality monitoring project