Publications

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Smart Software, Smart Trucks

Author: Holger Jakobs (WABCO GmbH)
Published: dSPACE Magazine 1/2019, February 2019,
pp. 34-37

The technology supplier WABCO utilizes the MES Model Examiner® (MXAM). Discover how to optimize the development of safety-critical and reliability-orientated systems in the latest dSPACE Magazine 1/2019.

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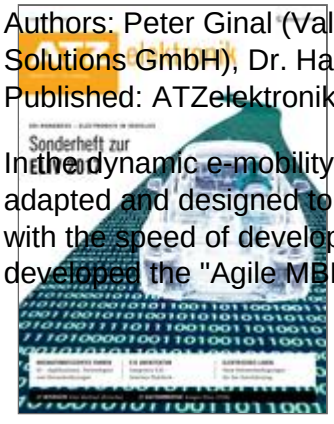
Analysis and Improvement of Model Architectures for Safety Related Systems

Author: Dr. Heiko Dörr (Model Engineering Solutions GmbH), Ferry Bachmann (Model Engineering Solutions GmbH)
Published: WCX World Congress Experience (online April 3, 2018)

This work presents current methods to analyze and improve the architecture of Simulink models. The methods follow the “principles for architectural design” of part 6 on software development of the ISO 26262 functional safety standard for road vehicles, the dominating standard in the automotive industry. The methods presented describe how the abstract architectural principles of the ISO 26262 can be implemented in the context of model-based development using Simulink. Therefore we demonstrate how different metrics can be used to improve or enforce the compliance with the principles. In contrast to previous publications we will not primarily focus on the metrics itself, but emphasize the architectural principles themselves and expose the architectural implications of applying the metrics. As the architectural principles of the ISO 26262 are targeted at reducing the overall complexity, we will also focus on metrics and methods that help to reduce the models complexity.

Test Automation at Valeo Siemens eAutomotive

Authors: Peter Ginal (Valeo Siemens eAutomotive Germany GmbH), Dr. Heiko Dörr (Model Engineering Solutions GmbH), Dr. Hartmut Lackner (Model Engineering Solutions GmbH)
Published: ATZelektronik (online and print special edition 1/2017, pp. 42-47)



In the dynamic e-mobility field, agile software development is required. This is due to products being adapted and designed to individual customer needs. Parallel to this, quality assurance must keep pace with the speed of development. In order to achieve this, Valeo Siemens Automotive (VSeA) has developed the "Agile MBD Suite". This allows for prototypes in the field of e-drives to be developed

quickly. In collaboration with Model Engineering Solutions (MES), VSeA combines agile development activities and automated quality assurance.

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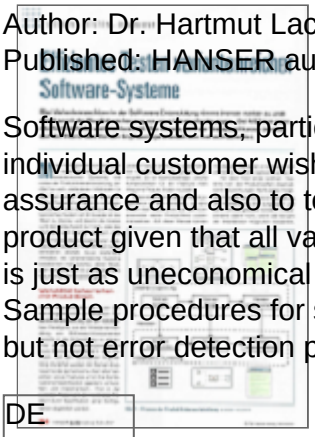
Testing Software Systems with Multiple Test Variants Efficiently



Author: Dr. Hartmut Lackner (Model Engineering Solutions GmbH)
Published: HANSER automotive (online and print edition 5-6/2017, pp. 24-25)

Software systems, particularly in automotive engineering, are becoming more and more adaptable to individual customer wishes. This wide range of variants presents two new challenges to quality assurance and also to testing. Firstly, it is uneconomical to test every possible variant as a separate product given that all variants have functional similarities, which are thus repeatedly tested. Secondly, it is just as uneconomical to build all variants unless a large portion of them are also going to be sold. Sample procedures for selecting relevant variants are helpful here, which significantly reduce test effort but not error detection potential.

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On the Impact of the Second Edition of the ISO 26262 on Model-Based Development of Safety-Related Systems

Author: Dr. Heiko Dörr (Model Engineering Solutions GmbH), Dr. Lena Kaland (Model Engineering Solutions GmbH), Dr. Thomas End (Model Engineering Solutions GmbH)
Published: WCX™ 17: SAE World Congress Experience (online March 28, 2017)

The release of the ISO 26262 in November 2011 was a major milestone for the safeguarding of safety-related systems that include one or more electrical and / or electronic (E/E) systems and that are installed in series production passenger cars. Although no specific requirements exist for a model-based software development process, ISO 26262 compiles general requirements and recommendations that need to be applied to model-based development. The second edition of the ISO 26262 has been distributed for review with a final publication scheduled for 2018. This revised edition not only integrates the experiences of the last few years but also extends the overall scope of safety-related systems. In order to determine the necessary adaptions for already existing software development processes, a detailed analysis of this revision is necessary. In this work, we focus on an analysis and the impact on model-based software development of safety-related systems. First, it is important to point out the main questions that need to be considered for this kind of gap analysis. Based on this gap analysis the main differences on requirements and in particular, methods for model-based development will be elaborated.

Efficient Testing of Multivariable Systems

Author: Dr. Hartmut Lackner (Model Engineering Solutions GmbH)
Published: WCX™ 17: SAE World Congress Experience (online March 28, 2017)

Software systems, and automotive software in particular, are becoming increasingly configurable to fulfill

customer needs. New methods such as product line engineering facilitate the development and enhance the efficiency of such systems. In modern, versatile systems, the number of theoretically possible variants easily exceeds the number of actually built products. This produces two challenges for quality assurance and especially testing. First, the costs of conventional test methods increase substantially with every tested variant. And secondly, it is no longer feasible to build every possible variant for the purpose of testing. Hence, efficient criteria for selecting variants for testing are necessary. In this contribution, we propose a new test design method that enables systematic sampling of variants from test cases. We present six optimization criteria to enable control of test effort and test quality by sampling variants with different characteristics. This approach is inherently different to conventional design methods, where firstly variants are selected for testing and then test cases are designed for each variant. Finally, we demonstrate and discuss the feasibility of our approach and compare the results to established test methods for multivariable systems.

Electric and Safe

Author: Alexander Dolpp (Mercedes-Benz RDNA, Inc.) / Dr. Ingo Stürmer (Model Engineering Solutions GmbH)
Published: dSPACE Magazine 2016/01, May 2016,
pp. 19-21

Together with the TargetLink Strategic Partner Model Engineering Solutions, Mercedes-Benz Research & Development North America developed automatically testable conformity rules for modeling with dSPACE TargetLink, which comply with important requirements of the ISO 26262 standard.

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ISO 26262-compliant Software Development

Published: hanser automotive (print, edition 09/2016, pp. 39-42)

With ever more extensive functions, creating a safety case is not only complex from a conceptual point of view. The immense practical challenge actually lies in handling the sheer mass of individual verifications to be collected during product development. A new tool now enables monitoring and progress control of quality assurance measures in development projects.

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JUST SIMPLIFY: Clone Detection for Simulink Controller Models

Author: Dr. Elke Salecker (Model Engineering Solutions GmbH), Dr. Ingo Stürmer (Model Engineering Solutions GmbH)
Published: SAE 2016 World Congress and Exhibition (online April 5, 2016)

Huge Simulink controller models often consists of (almost) identical subsystems, very often resulting from

copy-and-paste operations and only slight adaptation of the subsystems by the model engineer. Although this “copy-and-paste” approach might help to achieve initial results very fast, in the long-run such subsystem clones can create considerable problems. Like code clones, model clones increase the effort for testing and maintenance. Model clones also tend to influence the code efficiency and code quality in a negative way in case the Simulink model is used as a basis for code generation. JUST SIMPLIFY is an approach for detecting model clones in a Simulink model automatically based on model metrics calculations. This approach has been implemented in our model metrics and complexity measurement tool MXRAY. JUST SIMPLIFY allows reducing the effort for model refactoring by avoiding time consuming manual search for model clones. As a result, the effort for testing and for maintaining models can be reduced and the code quality can be improved significantly.

Managing an ISO 26262 Safety Case: A Software System Perspective

Author: Dr. Heiko Dörr (Model Engineering Solutions GmbH), Dr. Ingo Stürmer (Model Engineering Solutions GmbH)
Published: SAE 2016 World Congress and Exhibition (online April 5, 2016)

A key component of developing a safety-critical automotive system in compliance with ISO 26262 is developing what is known as the safety case. This delivery justifies that the system is free from unreasonable risk and that the safety requirements are complete and satisfied according to evidence from ISO 26262 work products. However, the standard provides neither practical guidance on how the safety case should be developed, nor how the safety argument should be evaluated in the functional safety assessment process.

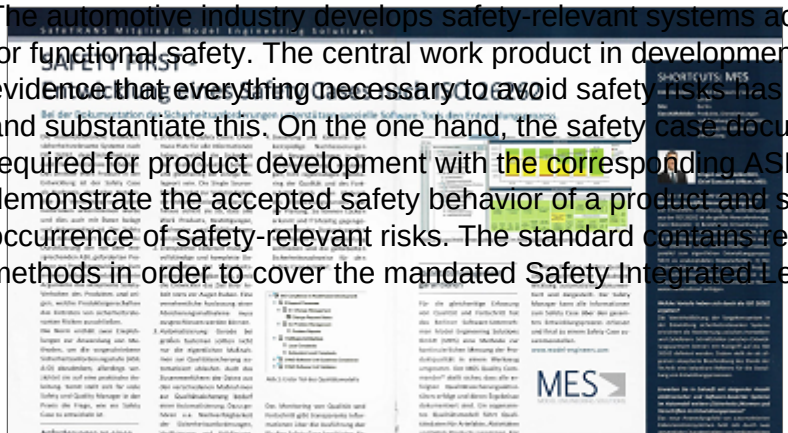
Safe Model - Safe Software

Author: Inga Töller (Model Engineering Solutions GmbH)
Published: embedded design (print, edition No. 3, April 2016, p. 49)

In the automotive and aviation industry, software errors can represent a big safety risk to people. For manufacturers, product recalls come with high costs and cause enormous damage to a brand's image. Implementing model-based development is the first step towards safe software. It is also important for manufacturers to safeguard software models from the very beginning and thus considerably improve the quality of the code. Standards like ISO 26262 (automotive) or DO 178C (aviation) call for the use of modeling rules for developing safety-relevant software.

SAFETY FIRST - Developing a Safety Case According to ISO 26262

Author: Dr. Heiko Dörr (Model Engineering Solutions GmbH)
Published: SafeTRANS (online and print, edition 01/2016, pp. 14-15)



The automotive industry develops safety-relevant systems according to ISO 26262, the safety standard for functional safety. The central work product in development is the safety case, which is used as evidence that everything necessary to avoid safety risks has been done and there is data to document and substantiate this. On the one hand, the safety case documents the execution of the processes required for product development with the corresponding ASIL. On the other, product-based arguments demonstrate the accepted safety behavior of a product and show which product properties eliminate the occurrence of safety-relevant risks. The standard contains recommendations on how to apply the methods in order to cover the mandated Safety Integrated Level (ASIL A-D), however it foregoes any

practical instruction. For many safety and quality managers, the question is how to develop a safety case in practice.

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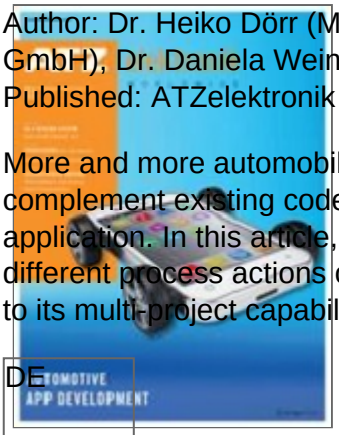
Distributed Development of Large-Scale Model-Based Designs in Compliance with ISO 26262

Author: Dr. Ulrich Eisemann (dSPACE GmbH), Dr. Elke Salecker (Model Engineering Solutions GmbH), Dr. Ingo Stürmer (Model Engineering Solutions GmbH)
Published: SAE 2014 World Congress and Exhibition (online April 1, 2014)

The intent of this paper is threefold. Firstly, we summarize those requirements of ISO 26262 that are relevant for developing complex software in a distributed environment. Secondly, we provide best practices for distributed development of large-scale controllers with MATLAB, Simulink, and TargetLink in compliance with ISO 26262. We address topics such as functional partitioning of complex units, defining and using interfaces consistently, avoiding long processing times during code generation, as well as aspects of testing and software integration. Finally, we demonstrate how to apply model metrics to deal with Simulink model complexity and show how complexity can be improved.

Multi-Project Capability in Checking Software Models



Author: Dr. Heiko Dörr (Model Engineering Solutions GmbH), Anna Trögel (Model Engineering Solutions GmbH), Dr. Daniela Weinberg (Model Engineering Solutions GmbH)
Published: ATZelektronik (online and print, edition 01/2014, pp. 34-37)

More and more automobile manufacturers and suppliers choose model-based development to complement existing code-based development. Today, the required tools are apt for safety-critical application. In this article, Model Engineering Solutions, a company offering appropriate tools, introduces different process actions of applying its 'Model Examiner'. Among other features, the tool stands out due to its multi-project capability, a key to applicability in increasingly complex interconnected systems.

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Process for Functional Safety

Author: David Brothanek (Headframe IT GmbH), Dr. Martin Jung (FAU Erlangen), Verena Jung (Siemens), Michael Krell (Siemens), Reinhard Pfundt (Siemens), Dr. Elke Salecker (Model Engineering Solutions GmbH), Dr. Ingo Stürmer (Model Engineering Solutions GmbH), Dr. Heiko Zatocil (Siemens)
Published: dSPACE Magazine 2013/01, July 2013, pp. 12-19

The Siemens Drive Technologies Division has added modelbased development to their classic software development process for implementing safety-critical vehicle functions. With the support of dSPACE TargetLink Strategic Partner, Model Engineering Solutions GmbH, Siemens Drive Technologies defined a process on the basis of dSPACE TargetLink that satisfies the requirements of ISO 26262 (Road Vehicles – Functional Safety).

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