Model Based Engineering With Aadl An Introduction To The Sae Architecture Analysis Design Language

This book constitutes the proceedings of the 5th International Symposium on Model-Based Safety and Assessment, IMBSA 2017, held inTrento, Italy, in September 2017. The 17 revised full papers presented were carefully reviewed and selected from 29 initial submissions. The papers are organized in topical sections on safety process; safety models and languages; fault detection and propagation; safety assessment in the automotive domain; and case studies.
The theme of HumanCom and EMC is focused on the various aspects of human-centric computing for advances in computer science and its applications, embedded and multimedia computing and provides an opportunity for academic and industry professionals to discuss the latest issues and progress in the area of embedded and multimedia computing. And the theme of EMC (Advanced in Embedded and Multimedia Computing) is focused on the various aspects of embedded system, smart grid, cloud and multimedia computing, and it provides an opportunity for academic, industry professionals to discuss the latest issues and progress in the area of embedded and multimedia computing. Therefore this book will be include the various theories and practical applications in human-centric computing and embedded and multimedia computing.
Conventional build-then-test practices are making today ' s embedded, software-reliant systems unaffordable to build. In response, more than thirty leading industrial organizations have joined SAE (formerly, the Society of Automotive Engineers) to define the SAE Architecture Analysis & Design Language (AADL) AS-5506 Standard, a rigorous and extensible foundation for model-based engineering analysis practices that encompass software system design, integration, and assurance. Using AADL, you can conduct lightweight and rigorous analyses of critical real-time factors such as performance, dependability, security, and data integrity. You can integrate additional established and custom analysis/specification techniques into your engineering environment, developing a fully unified architecture model that makes it easier to build reliable systems that meet customer expectations. Model-Based Engineering with AADL is the first guide to using this new international standard to optimize your development processes. Coauthored by Peter H. Feiler, the standard ' s author and technical lead, this introductory reference and tutorial is ideal for self-directed learning or classroom instruction, and is an excellent reference for practitioners, including architects, developers, integrators, validators, certifiers, first-level technical leaders, and project managers. Packed with real-world examples, it introduces all aspects of the AADL notation as part of an architecture-centric, model-based engineering approach to discovering embedded software systems problems earlier, when they cost less to solve. Throughout, the authors compare AADL to other modeling notations and approaches, while presenting the language via a complete case study: the development and analysis of a realistic example system through repeated refinement and analysis. Part One introduces both the AADL language and core Model-Based Engineering (MBE) practices, explaining basic software systems modeling and analysis in the context of an example system, and offering practical guidelines for effectively applying AADL. Part Two describes the characteristics of each AADL element, including their representations, applicability, and constraints. The Appendix includes comprehensive listings of AADL language elements, properties incorporated in the AADL standard, and a description of the book ' s example system.
The book is a collection of high-quality peer-reviewed research papers presented in the Second International Conference on Computational Intelligence in Data Mining (ICCIDM 2015) held at Bhubaneswar, Odisha, India during 5 – 6 December 2015. The two-volume Proceedings address the difficulties and challenges for the seamless integration of two core disciplines of computer science, i.e., computational intelligence and data mining. The book addresses different methods and techniques of integration for enhancing the overall goal of data mining. The book helps to disseminate the knowledge about some innovative, active research directions in the field of data mining, machine and computational intelligence, along with some current issues and applications of related topics.
An Introduction to the SAE Architecture Analysis and Design Language (paperback)
Developing AADL Models for Control Systems
19th International Symposium, Singapore, May 12-16, 2014. Proceedings
5th International Symposium, IMBSA 2017, Trento, Italy, September 11–13, 2017, Proceedings
A Practitioner's Guide
An Introduction to the Design & Analysis of Experiments
33rd International Conference, CAV 2021, Virtual Event, July 20–23, 2021, Proceedings, Part I

*UML, the Universal Modeling Language, was the first programming language designed to fulfill the requirement for "universality." However, it is a software-specific language, and does not support the needs of engineers designing from the broader systems-based perspective. Therefore, SysML was created. It has been steadily gaining popularity, and many companies, especially in the heavily-regulated Defense, Automotive, Aerospace, Medical Device and Telecomms industries, are already using SysML, or are plannning to switch over to it in the near future. However, little information is currently available on the market regarding SysML. Its use is just on the crest of becoming a widespread phenomenon, and so thousands of software engineers are now beginning to look for training and resources. This book will serve as the one-stop, definitive guide that provide an introduction to SysML, and instruction on how to implement it, for all these new users. *SysML is the latest emerging programming language–250,000 estimated software systems engineers are using it in the US alone! *The first available book on SysML in English *Insider information! The author is a member of the SysML working group and has written sections of the specification *Special focus comparing SysML and UML, and explaining how both can work together*
This book constitutes the refereed proceedings of the Third International Workshop on Formal Techniques for Safety-Critical Systems, FTSCS 2014, held in Luxembourg, in November 2014. The 14 revised full papers presented together with two invited talks were carefully reviewed and selected from 40 submissions. The papers address various topics related to the application of formal and semi-formal methods to improve the quality of safety-critical computer systems.
A perennial bestseller, the Digital Avionics Handbook offers a comprehensive view of avionics. Complete with case studies of avionics architectures as well as examples of modern systems flying on current military and civil aircraft, this Third Edition includes: Ten brand-new chapters covering new topics and emerging trends Significant restructuring to deliver a more coherent and cohesive story Updates to all existing chapters to reflect the latest software and technologies Featuring discussions of new data bus and display concepts involving retina scanning, speech interaction, and synthetic vision, the Digital Avionics Handbook, Third Edition provides practicing and aspiring electrical, aerospace, avionics, and control systems engineers with a pragmatic look at the present state of the art of avionics.
Software engineering for complex systems requires abstraction, multi-domain expertise, separation of concerns, and reuse. Domain experts rarely are software engineers and should formulate solutions using their domain's vocabulary instead of general purpose programming languages (GPLs). Successful integration of domain-specific languages (DSLs) into a software system requires a separation of concerns between domain issues and integration issues while retaining a loose enough coupling to support DSL reuse in different contexts. Component-based software engineering (CBSE) increases reuse and separation of concerns by encapsulating functionalities in components. Components are GPL artifacts, which raises accidental complexities. Model-driven engineering (MDE) abstracts from GPLs by lifting models to primary development artifacts. Models can be abstract and better comprehensible by using domain vocabulary instead of a GPL. They can be platform-independent and translated into GPLs for different target platforms. Component & connector (C&C) architecture description languages (ADLs) combine CBSE and MDE to compose of architectures from component models. We present concepts for engineering software systems with exchangeable component behavior languages. The concepts are realized in a software architecture modeling infrastructure that comprises modeling languages to develop applications based on C&C software architectures with exchangeable component behavior DSLs. It supports transformations from platform-independent to platform-specific software architectures and compositional code generation. With this, it enables domain experts to (re-)use the most appropriate component behavior DSL and facilitates composition of domain solutions through encapsulation in components.
Technical Debt in Practice
An Extensible Component & Connector Architecture Description Infrastructure for Multi-Platform Modeling
A Practical Guide to SysML
Proceedings of the International Conference on CIDM, 5-6 December 2015
Model-Driven Engineering and Software Development
4th International Symposium, FHIES 2014, and 6th International Workshop, SEHC 2014, Washington, DC, USA, July 17-18, 2014, Revised Selected Papers
The Process of Software Architecting

This book constitutes thoroughly revised and selected papers from the 7th International Conference on Model-Driven Engineering and Software Development, MODELSWARD 2019, held in Prague, Czech Republic, in February 2019. The 16 thoroughly revised and extended papers presented in this volume were carefully reviewed and selected from 76 submissions. They address some of the most relevant challenges being faced by researchers and practitioners in the field of model-driven engineering and software development and cover topics like language design and tooling; programming support tools; code and text generation from models, behavior modeling and analysis; model transformations and multi-view modeling; as well as applications of MDD and its related techniques to cyber-physical systems, cyber security, IoT, autonomous vehicles and healthcare.
This open access book includes contributions by leading researchers and industry thought leaders on various topics related to the essence of software engineering and their application in industrial projects. It offers a broad overview of research findings dealing with current practical software engineering issues and also pointers to potential future developments. Celebrating the 20th anniversary of adesso AG, adesso gathered some of the pioneers of software engineering including Manfred Broy, Ivar Jacobson and Carlo Ghezzi at a special symposium, where they presented their thoughts about latest software engineering research and which are part of this book. This way it offers readers a concise overview of the essence of software engineering, providing valuable insights into the latest methodological research findings and adesso's experience applying these results in real-world projects.
A Practical Guide to SysML: The Systems Modeling Language is a comprehensive guide to SysML for systems and software engineers. It provides an advanced and practical resource for modeling systems with SysML. The source describes the modeling language and offers information about employing SysML in transitioning an organization or project to model-based systems engineering. The book also presents various examples to help readers understand the OMG Systems Modeling Professional (OCSMP) Certification Program. The text is organized into four parts. The first part provides an overview of systems engineering. It explains the model-based approach by comparing it with the document-based approach and providing the modeling principles. The overview of SYsML is also discussed. The second part of the book covers a comprehensive description of the language. It discusses the main concepts of model organization, parametrics, blocks, use cases, interactions, requirements, allocations, and profiles. The third part presents examples that illustrate how SysML supports different model-based procedures. The last part discusses how to transition and deploy SysML into an organization or project. It explains the integration of SysML into a systems development environment. Furthermore, it describes the category of data that are exchanged between a SysML tool and other types of tools, and the types of exchange mechanisms that can be used. It also covers the criteria that must be considered when selecting a SysML. Software and systems engineers, programmers, IT practitioners, experts, and non-experts will find this book useful. *The authoritative guide for understanding and applying SysML *Authored by the foremost experts on the language *Language description, examples, and quick reference guide included
Introduction to the Design & Analysis of Experiments introduces readers to the design and analysis of experiments. It is ideal for a one-semester, upper-level undergraduate course for majors in statistics and other mathematical sciences, natural sciences, and engineering. It may also serve appropriate graduate courses in disciplines such as business, health sciences, and social sciences. This book assumes that the reader has completed a two-semester sequence in the application of probability and statistical inference. KEY TOPICS: An Introduction to the Design of Experiments; Investigating a Single Factor: Completely Randomized Experiments; Investigating a Single Factor: Randomized Complete and Incomplete Block and Latin Square Designs; Factorial Experiments: Completely Randomized Designs; Factorial Experiments: Randomized Block and Latin Square Designs; Nested Factorial Experiments and Repeated Measures Designs; 2f and 3f Factorial Experiments; Confounding in 2f and 3f Factorial Experiments; Fractional Factorial Experiments0; Regression Analysis: The General Linear Model; Response Surface Designs for First and Second-Order Models. MARKET: For all readers interested in experimental design.
4th International Conference, SIMPAR 2014, Bergamo, Italy, October 20-23, 2014. Proceedings
Foundations of Multi-Paradigm Modelling for Cyber-Physical Systems
Cyber-Physical System Design from an Architecture Analysis Viewpoint
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Computational Intelligence in Data Mining—Volume 2

Simulation, Modeling, and Programming for Autonomous Robots

As software systems become ubiquitous, the issues of dependability become more and more crucial. This state-of-the-art survey contains 18 expanded and peer-reviewed papers based on the carefully selected contributions to the Workshop on Architecting Dependable Systems (WADS 2006) organized at the 2006 International Conference on Dependable Systems and Networks (DSN 2006), held in Philadelphia, PA, USA, in June 2006.
Model-based Systems Engineering (MBSE) provides features for behavioral analysis, requirements traceability, system architecture, simulation, testing, and performance analysis that are imperative for the testing of safety-critical systems. In this report, we present a case study of a simple safety-critical system, and model the system using UML (Unified Modeling Language), SysML (Systems Modeling Language), and AADL (Architecture Analysis and Design Language). We then extend the AADL model with user-defined properties an additional analysis and reporting capabilities relevant to safety-critical systems. As safety and security expectations grow in concert with system complexity, MBSE will become increasingly ingrained in the workflow of the systems and software engineering communities
This open access book coherently gathers well-founded information on the fundamentals of and formalisms for modelling cyber-physical systems (CPS). Highlighting the cross-disciplinary nature of CPS modelling, it also serves as a bridge for anyone entering CPS from related areas of computer science or engineering. Truly complex, engineered systems—known as cyber-physical systems—that integrate physical, software, and network aspects are now on the rise. However, there is no unifying theory nor systematic design methods, systems. Individual (mechanical, electrical, network or software) engineering disciplines only offer partial solutions. A technique known as Multi-Paradigm Modelling has recently emerged suggesting to model every part and aspect of a system explicitly, at the most appropriate level(s) of abstraction, using the most appropriate modelling formalism(s), and then weaving the results together to form a representation of the system. If properly applied, it enables, among other global aspects, performance analysis, exhaustive simulation, and v first systematic attempt to bring together these formalisms for anyone starting in the field of CPS who seeks solid modelling foundations and a comprehensive introduction to the distinct existing techniques that are multi-paradigmatic. Though chiefly intended for master and post-graduate level students in computer science and engineering, it can also be used as a reference text for practitioners.
This book constitutes the refereed proceedings of the 19th International Symposium on Formal Methods, FM 2014, held in Singapore, May 2014. The 45 papers presented together with 3 invited talks were carefully reviewed and selected from 150 submissions. The focus of the papers is on the following topics: Interdisciplinary Formal Methods, Practical Applications of Formal Methods in Industrial and Research Settings, Experimental Validation of Tools and Methods as well as Construction and Evolution of Formal Methods Tools.
Digital Avionics Handbook
Third International Workshop, FTSCS 2014, Luxembourg, November 6-7, 2014. Revised Selected Papers
How to Find It and Fix It
A Risk-Driven Approach
SysML Distilled
An Introduction
Embedded Systems
This is a practical guide for software developers, and different than other software architecture books. Here's why: It teaches risk-driven architecting. There is no need for meticulous designs when risks are small, nor any excuse for sloppy designs when risks threaten your success. This book describes a way to do just enough architecture. It avoids the one-size-fits-all process tar pit with advice on how to tune your design effort based on the risks you face. It democratizes architecture. This book seeks to make architecture relevant to all software developers. Developers need to understand how to use constraints as guiderails that ensure desired outcomes, and how seemingly small changes can affect a system's properties. It cultivates declarative knowledge. There is a difference between being able to hit a ball and knowing why you are able to hit it, what psychologists refer to as procedural knowledge versus declarative knowledge. This book will make you more aware of what you have been doing and provide names for the concepts. It emphasizes the engineering. This book focuses on the technical parts of software development and what developers do to ensure the system works not job titles or processes. It shows you how to build models and analyze architectures so that you can make principled design tradeoffs. It describes the techniques software designers use to reason about medium to large sized problems and points out where you can learn specialized techniques in more detail. It provides practical advice. Software design decisions influence the architecture and vice versa. The approach in this book embraces drill-down/pop-up behavior by describing models that have various levels of abstraction, from architecture to data structure design.
The practical implications of technical debt for the entire software lifecycle; with examples and case studies. Technical debt in software is incurred when developers take shortcuts and make ill-advised technical decisions in the initial phases of a project, only to be confronted with the need for costly and labor-intensive workarounds later. This book offers advice on how to avoid technical debt, how to locate its sources, and how to remove it. It focuses on the practical implications of technical debt for the entire software life cycle, with examples and case studies from companies that range from Boeing to Twitter. Technical debt is normal; it is part of most iterative development processes. But if debt is ignored, over time it may become unmanageably complex, requiring developers to spend all of their effort fixing bugs, with no time to add new features--and after all, new features are what customers really value. The authors explain how to monitor technical debt, how to measure it, and how and when to pay it down. Broadening the conventional definition of technical debt, they cover requirements debt, implementation debt, testing debt, architecture debt, documentation debt, deployment debt, and social debt. They intersperse technical discussions with "Voice of the Practitioner" sidebars that detail real-world experiences with a variety of technical debt issues.
This book constitutes revised selected papers from the jointly held conferences FHIES 2014, 4th International Symposium on Foundations of Health Information Engineering and Systems, and SEHC 2014, 6th International Workshop on Software Engineering in Health Care. The meeting took place in Washington, DC, USA, in July 2014. The 16 papers presented in this volume were carefully reviewed and selected from 23 submissions. They deal with security aspects of health information systems; medical devices in cyberphysical systems; the process of providing healthcare and of monitoring patients; and patient safety and the assurance of medical systems.
This open access two-volume set LNCS 12759 and 12760 constitutes the refereed proceedings of the 33rd International Conference on Computer Aided Verification, CAV 2021, held virtually in July 2021. The 63 full papers presented together with 16 tool papers and 5 invited papers were carefully reviewed and selected from 290 submissions. The papers were organized in the following topical sections: Part I: invited papers; AI verification; concurrency and blockchain; hybrid and cyber-physical systems; security; and synthesis. Part II: complexity and termination; decision procedures and solvers; hardware and model checking; logical foundations; and software verification. This is an open access book.
Modeling, Analysis, Design
Model-based System and Architecture Engineering with the Arcadia Method
The Essence of Software Engineering
Threat Modeling
Advanced Technologies, Embedded and Multimedia for Human-centric Computing
Model-Based Engineering with AADL
Computer Aided Verification
Model-Based Engineering with AADLAn Introduction to the SAE Architecture Analysis & Design LanguageAddison-Wesley
Providing a wide variety of technologies for ensuring the safety and dependability of cyber-physical systems (CPS), this book offers a comprehensive introduction to the architecture-centric modeling, analysis, and verification of CPS. In particular, it focuses on model driven engineering methods including architecture description languages, virtual prototyping, and formal analysis methods. CPS are based on a new design paradigm intended to enable emerging software-intensive systems. Embedded computers and networks monitor and control the physical processes, usually with the help of feedback loops where physical processes affect computations and vice versa. The principal challenges in system design lie in this constant interaction of software, hardware and physics. Developing reliable CPS has become a critical issue for the industry and society, because many applications such as transportation, power distribution, medical equipment and tele-medicine are dependent on CPS. Safety and security requirements must be ensured by means of powerful validation tools. Satisfying such requirements, including quality of service, implies having formally proven the required properties of the system before it is deployed. The book is concerned with internationally standardized modeling languages such as AADL, SysML, and MARTE. As the effectiveness of the technologies is demonstrated with industrial sample cases from the automotive and aerospace sectors, links between the methods presented and industrial problems are clearly understandable. Each chapter is self-contained, addressing specific scientific or engineering problems, and identifying further issues. In closing, it includes perspectives on future directions in CPS design from an architecture analysis viewpoint.
Architecture Description Languages is an essential reference for both academic and professional researchers in the field of system engineering and design. The papers presented in this volume were selected from the workshop of the same name that was held as part of the World Computer Congress 2004 Conference, held in Toulouse, France in August 2004. This collection presents significant research and innovative developments and applications from both academic researchers and industry practitioners on topics ranging from Semantics to Tool and Development Environments. The aim of an ADL is to formally describe software and hardware architectures. Usually, an ADL describes components, their interfaces, their structures, their interactions (structure of data flow and control flow) and the mappings to hardware systems. A major goal of such description is to allow analysis with respect to several aspects like timing, safety, reliability. The papers in this state-of-the-art volume cover such topics of interest as components, connectors, composition; semantics and formalization; verification, simulation and test; tools and development environments; standardization; industrial projects. To encourage closer interaction between academic and industrial networking research communities, the workshop welcomed academic research papers as well as industrial contributions, and both are included here. Which makes this collection important not only for ADL experts and researchers, but also for all teachers and administrators interested in ADL.
This book constitutes the refereed proceedings of the 4th International Conference on Simulation, Modeling, and Programming for Autonomous Robots, SIMPAR 2014, held in Bergamo, Italy, in October 2014. The 49 revised full papers presented were carefully reviewed and selected from 62 submissions. The papers are organized in topical sections on simulation, modeling, programming, architectures, methods and tools, and systems and applications.
The Architecture Analysis & Design Language (AADL)
Communications of NII Shonan Meetings
Analysis and Modeling with SysML, UML and AADL
Documenting Software Architectures
Languages, Design Methods, and Tools for Electronic System Design
FM 2014: Formal Methods
Selected Contributions from FDL 2014

Abstract: "In November 2004, the Society of Automotive Engineers (SAE) released the aerospace standard AS5506, named the Architecture Analysis & Design Language (AADL). The AADL is a modeling language that supports early and repeated analyses of a system's architecture with respect to performance-critical properties through an extendable notation, a tool framework, and precisely defined semantics. The language employs formal modeling concepts for the description and analysis of application system architectures in terms of distinct components and their interactions. It includes abstractions of software, computational hardware, and system components for (a) specifying and analyzing real-time embedded and high dependability systems, complex systems of systems, and specialized performance capability systems and (b) mapping of software onto computational hardware elements. The AADL is especially effective for model-based analysis and specification of complex real-time embedded systems. This techinical note is an introduction to the concepts, language structure, and application of the AADL."
Since the construction of the first embedded system in the 1960s, embedded systems have continued to spread. They provide a continually increasing number of services and are part of our daily life. The development of these systems is a difficult problem which does not yet have a global solution. Another difficulty is that systems are plunged into the real world, which is not discrete (as is generally understood in computing), but has a richness of behaviors which sometimes hinders the formulation of simplifying assumptions due to their generally autonomous nature and they must face possibly unforeseen situations (incidents, for example), or even situations that lie outside the initial design assumptions. Embedded Systems presents the state of the art of the development of embedded systems and, in particular, concentrates on the modeling and analysis of these systems by looking at "model-driven engineering", (MDE2): SysML, UML/MARTE and AADL. A case study (based on a pacemaker) is presented which enables the reader to observe how the different aspects of a system are addressed using the different approaches. All three systems are important in that they provide the reader with a global view of their possibilities and demonstrate the contributions of each approach in the different stages of the software lifecycle. Chapters dedicated to analyzing the specification and code generation are also presented. Contents Foreword, Brian R. Larson. Foreword, Dominique Potier. Introduction, Fabrice Kordon, Jérôme Hugues, Agusti Canals and Alain Dohet. Part 1. General Concepts 1. Elements for the Design of Embedded Computer Systems, Fabrice Kordon, Jérôme Hugues, Agusti Canals and Alain Dohet. 2. Case Study: Pacemaker, Fabrice Kordon, Jérôme Hugues, Agusti Canals and Alain Dohet. Part 2. SysML 3. Presentation of SysML Concepts, Jean-Michel Bruel and Pascal Roques. 4. Modeling of the Case Study Using SysML, Loïc Fejoz, Philippe Leblanc and Agusti Canals. 5. Requirements Analysis, Ludovic Apvrille and Pierre De Saqui-Sannes. Part 3. MARTE 6. An Introduction to MARTE Concepts, Sébastien Gérard and François Terrier. 7. Case Study Modeling Using MARTE, Jérôme Delatour and Joël Champeau. 8. Model-Based Analysis, Frederic Boniol, Philippe Dhaussy, Luka Le Roux and Jean-Charles Roger. 9. Model-Based Deployment and Code Generation, Chokri Mraidha, Ansgar Radermacher and Sébastien Gérard. Part 4. AADL 10. Presentation of the AADL Concepts, Jérôme Hugues and Xavier Renault. 11. Case Study Modeling Using AADL, Etienne Borde. 12. Model-Based Analysis, Thomas Robert and Jérôme Hugues. 13. Model-Based Code Generation, Laurent Pautet and Béchir Zalila. About the Authors Fabrice Kordon is Professor at University Pierre and Marie Curie in Paris, France, where he is in charge of the team "Modélisation et vérification" of the LIP6. His research field is at the crossroads of distributed systems, software engineering and formal methods. Jérôme Hugues is lecturer-researcher at the Institut Supérieur de l'Aéronautique et de l'Espace (ISAE) in Toulouse, France and has been a member of the language standardization committee (AADL) since 2006. His research fields cover the engineering of embedded systems and the generation of automatic code of these systems from modeling languages, integrating verification and analysis tools on the model and code level. Agusti Canals is a software engineer and has worked at CS "Communication et Systèmes" in Paris, France since 1981. He is deputy director of the "Direction de la Qualité et des Audits Techniques" (DQAT) of CS and an expert in software engineering (certified "UML Professional" and "SysML Builder" by OMG). Alain Dohet is a general armament engineer at the "Direction Générale pour l'Armement" (organization of the French Defense Minister ensuring the conduct of system programs), where he is in charge of guiding activities, skills, methods and tools in the fields of systems of systems (SoS), systems engineering, analysis for certification purposes, operational safety of embedded computing systems and critical software.
The capability modeling and simulation (M&S) supplies for managing systems complexity and investigating systems behaviors has made it a central activity in the development of new and existing systems. However, a handbook that provides established M&S practices has not been available. Until now. Modeling and Simulation-Based Systems Engineering Handbook details the M&S practices for supporting systems engineering in diverse domains. It discusses how you can identify systems engineering needs and adapt these practices to suit specific application domains, thus avoiding redefining practices from scratch. Although M&S practices are used and embedded within individual disciplines, they are often developed in isolation. However, they address recurring problems common to all disciplines. The editors of this book tackled the challenge by recruiting key representatives from several communities, harmonizing the different perspectives derived from individual backgrounds, and lining them up with the book's vision. The result is a collection of M&S systems engineering examples that offer an initial means for cross-domain capitalization of the knowledge, methodologies, and technologies developed in several communities. These examples provide the pros and cons of the methods and techniques available, lessons learned, and pitfalls to avoid. As our society moves further in the information era, knowledge and M&S capabilities become key enablers for the engineering of complex systems and systems of systems. Therefore, knowledge and M&S methodologies and technologies become valuable output in an engineering activity, and their cross-domain capitalization is key to further advance the future practices in systems engineering. This book collates information across disciplines to provide you with the tools to more efficiently design and manage complex systems that achieve their goals.
This book constitutes the refereed proceedings of the 7th International Conference on Rigorous State-Based Methods, ABZ 2020, which was due to be held in Ulm, Germany, in May 2020. The conference was cancelled due to the COVID-19 pandemic. The 12 full papers and 9 short papers were carefully reviewed and selected from 61 submissions. They are presented in this volume together with 2 invited papers, 6 PhD-Symposium-contributions, as well as the case study and 6 accepted papers outlining solutions to it. The papers are organized in the following sections: keynotes and invited papers; regular research articles; short articles; articles contributing to the case study; short articles of the PhD-symposium (work in progress).
An Introduction to the SAE Architecture Analysis & Design Language
4th International Symposium, NFM 2012, Norfolk, VA, USA, April 3-5, 2012, Proceedings
Modeling and Simulation-Based Systems Engineering Handbook
Rigorous State-Based Methods
Testing Safety-critical Systems Using Model-based Systems Engineering (MBSE)
7th International Conference, ABZ 2020, Ulm, Germany, May 27–29, 2020, Proceedings
7th International Conference, MODELSWARD 2019, Prague, Czech Republic, February 20–22, 2019, Revised Selected Papers

The Systems Modeling Language (SysML) extends UML with powerful systems engineering capabilities for modeling a wider spectrum of systems and capturing all aspects of a system's design. SysML Distilled is the first clear, concise guide for everyone who wants to start creating effective SysML models. (Drawing on his pioneering experience at Lockheed Martin and NASA, Lenny Delligatti illuminates SysML's core components and provides practical advice to help you create good models and good designs. Delligatti begins with an easy-to-understand overview of Model-Based Systems Engineering (MBSE) and an explanation of how SysML enables effective system specification, analysis, design, optimization, verification, and validation. Next, he shows how to use all nine types of SysML diagrams, even if you have no previous experience with modeling languages. A case study running through the text demonstrates the use of SysML in modeling a complex, real-world sociotechnical system. Modeled after Martin Fowler's classic UML Distilled, Delligatti's indispensable guide quickly teaches you what you need to know to get started and helps you deepen your knowledge incrementally as the need arises. Like SysML itself, the book is method independent and is designed to support whatever processes, procedures, and tools you already use. Coverage Includes Why SysML was created and the business case for using it Quickly putting SysML to practical use What to know before you start a SysML modeling project Essential concepts that apply to all SysML diagrams SysML diagram elements and relationships Diagramming block definitions, internal structures, use cases, activities, interactions, state machines, constraints, requirements, and packages Using allocations to define mappings among elements across a model SysML notation tables, version changes, and sources for more information
A Comprehensive Process for Defining Software Architectures That Work A good software architecture is the foundation of any successful software system. Effective architecting requires a clear understanding of organizational roles, artifacts, activities performed, and the optimal sequence for performing those activities. With The Process of Software Architecting , Peter Eeles and Peter Cripps provide guidance on these challenges by covering all aspects of architecting a software system, introducing best-practice techniques that apply in every environment, whether based on Java EE, Microsoft .NET, or other technologies. Eeles and Cripps first illuminate concepts related to software architecture, including architecture documentation and reusable assets. Next, they present an accessible, task-focused guided tour through a typical project, focusing on the architect's role, with common issues illuminated and addressed throughout. Finally, they conclude with a set of best practices that can be applied to today's most complex systems. You will come away from this book understanding The role of the architect in a typical software development project How to document a software architecture to satisfy the needs of different stakeholders The applicability of reusable assets in the process of architecting The role of the architect with respect to requirements definition The derivation of an architecture based on a set of requirements The relevance of architecting in creating complex systems The Process of Software Architecting will be an indispensable resource for every working and aspiring software architect—and for every project manager and other software professional who needs to understand how architecture influences their work.
Conventional build-then-test practices are making today's embedded, software-reliant systems unaffordable to build. In response, more than thirty leading industrial organizations have joined SAE (formerly, the Society of Automotive Engineers) to define the SAE Architecture Analysis & Design Language (AADL) AS-5506 Standard, a rigorous and extensible foundation for model-based engineering analysis practices that encompass software system design, integration, and assurance. Using AADL, you can conduct lightweight and rigorous analyses of critical real-time factors such as performance, dependability, security, and data integrity. You can integrate additional established and custom analysis/specification techniques into your engineering environment, developing a fully unified architecture model that makes it easier to build reliable systems that meet customer expectations. Model-Based Engineering with AADL is the first guide to using this new international standard to optimize your development processes. Coauthored by Peter H. Feiler, the standard's author and technical lead, this introductory reference and tutorial is ideal for self-directed learning or classroom instruction, and is an excellent reference for practitioners, including architects, developers, integrators, validators, certifiers, first-level technical leaders, and project managers. Packed with real-world examples, it introduces all aspects of the AADL notation as part of an architecture-centric, model-based engineering approach to discovering embedded software systems problems earlier, when they cost less to solve. Throughout, the authors compare AADL to other modeling notations and approaches, while presenting the language via a complete case study: the development and analysis of a realistic example system through repeated refinement and analysis. Part One introduces both the AADL language and core Model-Based Engineering (MBE) practices, explaining basic software systems modeling and analysis in the context of an example system, and offering practical guidelines for effectively applying AADL. Part Two describes the characteristics of each AADL element, including their representations, applicability, and constraints. The Appendix includes comprehensive listings of AADL language elements, properties incorporated in the AADL standard, and a description of the book's example system.
This book constitutes the proceedings of the 7th International Symposium on Model-Based Safety and Assessment, IMBSA 2020, held in Lisbon, Portugal, in September 2020. The conference was held virtually due to the COVID-19 pandemic. The 15 revised full papers and 4 short papers presented were carefully reviewed and selected from 30 initial submissions. The papers are organized in topical sections on safety models and languages; state-space modeling; dependability analysis process; safety assessment in automotive domain; AI and safety assurance.
The Systems Modeling Language
Architecture Description Languages
Model-Based Safety and Assessment

Views and Beyond
7th International Symposium, IMBSA 2020, Lisbon, Portugal, September 14–16, 2020, Proceedings
Systems Engineering with SysML/UML
Software Engineering in Health Care
This book brings together a selection of the best papers from the seventeenth edition of the Forum on specification and Design Languages Conference (FDL), which took place on October 14-16, 2014, in Munich, Germany. FDL is a well-established international forum devoted to dissemination of research results, practical experiences and new ideas in the application of specification, design and verification languages to the design, modeling and verification of integrated circuits, complex hardware/software embedded systems, and mixed-technology systems.
This book presents ARCADIA—a tooled method devoted to systems and architecture engineering, especially for those dealing with strong constraints to be reconciled (cost, performance, safety, security, reuse, consumption, weight). The book describes the detailed reasoning necessary to: understand the real customer need; define and share the product architecture among all engineering stakeholders; early validate its design and justify it; and ease and master integration, validation, verification and qualification (IVVQ). Offers a comprehensive examination of systems engineering, including the use of models to support it Not only yet another book on modeling, but rather a journey in systems engineering, enlightening the use of models to support it. Focuses on solitary modeling tasks while also covering prime collaborations between engineering stakeholders Examines modeling techniques to capture and share architecture and to early verify it against need and non-functional constraints Addresses subjects not usually covered by model-based system engineering (MBSE) methods, such as co-engineering with specialties, system/sub-system co-engineering, integration verification and validation Features a powerful, dedicated tool (Capella) Covers a range of topics, including an introduction to system engineering issues, an introduction to MBSE, a presentation of the method for beginners and a handy reference manual for advanced users
Abstract: "This document is a guide to help practitioners using the Architecture Analysis and Design Language (AADL), an international industry standard for the model-based engineering of real-time and embedded systems. The primary goal of this document is to describe an approach for and the mechanics of constructing an architectural model that can be analyzed based on the AADL. The first section of this document presents an overview of AADL concepts and many of the keywords of the language. The second part of the document illustrates a model-building approach using the AADL. It takes the perspective of an engineer who is developing a model for the first time using the AADL. This guide leads the reader through complete AADL model development based on automotive embedded control systems (cruise control, traction control, etc.) by describing the use and syntax of the AADL and interleaving modeling abstraction tradeoffs to achieve models that are abstract but precise. Models are constructed with different analysis perspectives in mind to illustrate the semantics as well as the richness of the AADL.
Since the construction of the first embedded system in the 1960s, embedded systems have continued to spread. They provide a continually increasing number of services and are part of our daily life. The development of these systems is a difficult problem which does not yet have a global solution. Another difficulty is that systems are plunged into the real world, which is not discrete (as is generally understood in computing), but has a richness of behaviors which sometimes hinders the formulation of simplifying assumptions due to their generally autonomous nature and they must face possibly unforeseen situations (incidents, for example), or even situations that lie outside the initial design assumptions. Embedded Systems presents the state of the art of the development of embedded systems and, in particular, concentrates on the modeling and analysis of these systems by looking at "model-driven engineering", (MDE2): SysML, UML/MARTE and AADL. A case study (based on a pacemaker) is presented which enables the reader to observe how the different aspects of a system are addressed using the different approaches. All three systems are important in that they provide the reader with a global view of their possibilities and demonstrate the contributions of each approach in the different stages of the software lifecycle. Chapters dedicated to analyzing the specification and code generation are also presented. Contents Foreword, Brian R. Larson. Foreword, Dominique Potier. Introduction, Fabrice Kordon, Jérôme Hugues, Agusti Canals and Alain Dohet. Part 1. General Concepts 1. Elements for the Design of Embedded Computer Systems, Fabrice Kordon, Jérôme Hugues, Agusti Canals and Alain Dohet. 2. Case Study: Pacemaker, Fabrice Kordon, Jérôme Hugues, Agusti Canals and Alain Dohet. Part 2. SysML 3. Presentation of SysML Concepts, Jean-Michel Bruel and Pascal Roques. 4. Modeling of the Case Study Using SysML, Loic Fejoz, Philippe Leblanc and Agusti Canals. 5. Requirements Analysis, Ludovic Apvrille and Pierre De Saqui-Sannes. Part 3. MARTE 6. An Introduction to MARTE Concepts, Sébastien Gérard and François Terrier. 7. Case Study Modeling Using MARTE, Jérôme Delatour and Joël Champeau. 8. Model-Based Analysis, Frederic Boniol, Philippe Dhaussy, Luka Le Roux and Jean-Charles Roger. 9. Model-Based Deployment and Code Generation, Chokri Mraidha, Ansgar Radermacher and Sébastien Gérard. Part 4. AADL 10. Presentation of the AADL Concepts, Jérôme Hugues and Xavier Renault. 11. Case Study Modeling Using AADL, Etienne Borde. 12. Model-Based Analysis, Thomas Robert and Jérôme Hugues. 13. Model-Based Code Generation, Laurent Pautet and Béchir Zalila.
Architecting Dependable Systems IV
NASA Formal Methods
Formal Techniques for Safety-Critical Systems
Just Enough Software Architecture
A Brief Guide to the Systems Modeling Language
IFIP TC-2 Workshop on Architecture Description Languages (WADL), World Computer Congress, Aug. 22-27, 2004, Toulouse, France
HumanCom and EMC 2013
Threat modeling is one of the most essential--and most misunderstood--parts of the development lifecycle. Whether you're a security practitioner or a member of a development team, this book will help you gain a better understanding of how you can apply core threat modeling concepts to your practice to protect your systems against threats. Contrary to popular belief, threat modeling doesn't require advanced security knowledge to initiate or a Herculean effort to sustain. But it is critical for spotting and addressing potential concerns in a cost-effective way before the code's written--and before it's too late to find a solution. Authors Izar Tarandach and Matthew Coles walk you through various ways to approach and execute threat modeling in your organization. Explore fundamental properties and mechanisms for securing data and system functionality Understand the relationship between security, privacy, and safety Identify key characteristics for assessing system security Get an in-depth review of popular and specialized techniques for modeling and analyzing your systems View the future of threat modeling and Agile development methodologies, including DevOps automation Find answers to frequently asked questions, including how to avoid common threat modeling pitfalls
This book constitutes the refereed proceedings of the Fourth International Symposium on NASA Formal Methods, NFM 2012, held in Norfolk, VA, USA, in April 2012. The 36 revised regular papers presented together with 10 short papers, 3 invited talks were carefully reviewed and selected from 93 submissions. The topics are organized in topical sections on theorem proving, symbolic execution, model-based engineering, real-time and stochastic systems, model checking, abstraction and abstraction refinement, compositional verification techniques, static and dynamic analysis techniques, fault protection, cyber security, specification formalisms, requirements analysis and applications of formal techniques.
Software architecture—the conceptual glue that holds every phase of a project together for its many stakeholders—is widely recognized as a critical element in modern software development. Practitioners have increasingly discovered that close attention to a software system's architecture pays valuable dividends. Without an architecture that is appropriate for the problem being solved, a project will stumble along or, most likely, fail. Even with a superb architecture, if that architecture is not well understood or well communicated the project is unlikely to succeed. Documenting Software Architectures, Second Edition, provides the most complete and current guidance, independent of language or notation, on how to capture an architecture in a commonly understandable form. Drawing on their extensive experience, the authors first help you decide what information to document, and then, with guidelines and examples (in various notations, including UML), show you how to express an architecture so that others can successfully build, use, and maintain a system from it. The book features rules for sound documentation, the goals and strategies of documentation, architectural views and styles, documentation for software interfaces and software behavior, and templates for capturing and organizing information to generate a coherent package. New and improved in this second edition: Coverage of architectural styles such as service-oriented architectures, multi-tier architectures, and data models Guidance for documentation in an Agile development environment Deeper treatment of documentation of rationale, reflecting best industrial practices Improved templates, reflecting years of use and feedback, and more documentation layout options A new, comprehensive example (available online), featuring documentation of a Web-based service-oriented system Reference guides for three important architecture documentation languages: UML, AADL, and SysML