Modeling And Verification Using Uml Statecharts A Working Guide To Reactive System Design Runtime Monitoring And Execution Based Model Checking Author Doron Drusinsky May 2006

At the dawn of the 21st century and the information age, communication and c- puting power are becoming ever increasingly available, virtually pervading almost every aspect of modern socio-economical interactions. Consequently, the potential for realizing a signi?cantly greater number of technology-mediated activities has emerged. Indeed, many of our modern activity ?elds are heavily dependant upon various underlying systems and software-intensive platforms. Such technologies are commonly used in everyday activities such as commuting, traf?c control and m- agement, mobile computing, navigation, mobile communication. Thus, the correct function of the forenamed computing systems becomes a major concern. This is all the more important since, in spite of the numerous updates, patches and ?rmware revisions being constantly issued, newly discovered logical bugs in a wide range of modern software platforms (e. g. , operating systems) and software-intensive systems (e. g. , embedded systems) are just as frequently being reported. In addition, many of today's products and services are presently being deployed in a highly competitive environment wherein a product or service is succeeding in most of the cases thanks to its quality to price ratio for a given set of features. Accordingly, a number of critical aspects have to be considered, such as the ab- ity to pack as many features as needed in a given product or service while c- currently maintaining high quality, reasonable price, and short time -to- market. DepCoS – RELCOMEX is an annual series of conferences organized by Wroc?aw University of Technology to promote a comprehensive approach to evaluation of system performability which is now commonly called dependability. In contrast to classic analyses which were concentrated on reliability of technical resources and structures built from them, dependability is based on multi-disciplinary approach to theory, technology and maintenance of a system considered to be a multifaceted amalgamation of technical, information, organization, software and human (users, administrators, supervisors, etc.) resources. Diversity of processes being realized (data processing, system management, system monitoring, etc.), their concurrency and their reliance on in-system intelligence often severely impedes construction of strict mathematical models and calls for application of intelligent and soft computing methods. This book presents the proceedings of the Ninth International Conference on Dependability and Complex Systems DepCoS-RELCOMEX, which took place in Brunów Palace, Poland, from 30th June to 4th July, 2014. The articles selected for this volume illustrate the variety of topics that must be included in system dependability analysis: tools, methodologies and standards for

modelling, design and simulation of the systems, security and confidentiality in information processing, specific issues of heterogeneous, today often wireless, computer networks or management of transportation networks.

Annotation As systems being developed by industry and government grow larger and more complex, the need for superior specification and verification approaches and tools becomes increasingly vital. The developer and customer must have complete confidence that the design produced is correct, and that it meets forma development and verification standards. In this text, UML expert author Dr. Doron Drusinsky compiles all the latest information on the application of UML (Universal Modeling Language) statecharts, temporal logic, automata, and other advanced tools for run-time monitoring and verification. This is the first book that deals specifically with UML verification techniques. This important information is introduced within the context of real-life examples and solutions, particularly focusing on national defense applications. A practical text, as opposed to a high-level theoretical one, it emphasizes getting the system developer up-to-speed on using the tools necessary for daily practice.

This book provides basics and selected advanced insights on how to generate reliability, safety and resilience within (socio) technical system developments. The focus is on working definitions, fundamental development processes, safety development processes and analytical methods on how to support such schemes. The method families of Hazard Analyses, Failure Modes and Effects Analysis and Fault Tree Analysis are explained in detail. Further main topics include semiformal graphical system modelling, requirements types, hazard log, reliability prediction standards, techniques and measures for reliable hardware and software with respect to systematic and statistical errors, and combination options of methods. The book is based on methods as applied during numerous applied research and development projects and the support and auditing of such projects, including highly safety-critical automated and autonomous systems. Numerous questions and answers challenge students and practitioners.

This volume contains the ?nal proceedings of the 7th International Andrei Ershov Memorial Conference on Perspectives of System Informatics Akad- gorodok (Novosibirsk, Russia), June 15–19, 2009. PSI is a forum for academic and industrial researchers, developers and users working on topics relating to computer, software and information sciences. The conference serves to bridge the gaps between di?erent communities whose - searchareasarecoveredbybutnotlimitedtofoundationsofpro gramandsystem development and analysis, programming methodology and softwareengineering, and information technologies. PSI 2009 was dedicated to the memory of a prominent scientist, academician Andrei Ershov (1931–1988),and to a signi?cant date in the history of computer science in the country, namely, the 50th anniversary of the Programming - partment founded by Andrei Ershov. Initially, the department was a part of the Institute of Mathematics and later, in 1964, it joined the newly established Computing

Center of the Siberian Branch of the USSR Academy of Sciences. Andrei Ershov, who was responsible for forming the department, gathered a team of young graduates from leading Soviet universities. The ?rst signi?cant project of the department was aimed at the development of ALPHA system, an optimizing compiler for an extension of Algol 60 implemented on a Soviet c- puterM-20. Later,theresearchersofthedepartmentcreatedtheAlgibr,Epsilon, Sigma, and Alpha-6 programming systems for the BESM-6 computers. The list of their achievements also includes the ?rst Soviet time-sharing system AIST-0, the multi-language system BETA, research projects in arti?cial intelligence and parallel programming, integrated tools for text processing and publishing, and many others.

This book constitutes the thoroughly refereed post-proceedings of the First Combined International Workshops on Formal Approaches to Software Testing, FATES 2006, and on Runtime Verification, RV 2006, held within the scope of FLoC 2006, the Federated Logic Conference in Seattle, WA, USA in August 2006. Coverage discusses formal approaches to test and analyze programs and monitor and guide their executions by using various techniques.

This book focuses on web service specification, search, composition, validation, resiliency, security and engineering, and discusses various service specification standards like WSDL, SAWSDL, WSMO and OWLS. The theory and associated algorithms for service specification verification are detailed using formal models like Petrinet, FSM and UML. The book also explores various approaches proposed for web service search and composition, highlighting input/output, parameter-based search, and selection of services based on both functional and non-functional parameters. In turn, it examines various types of composite web services and presents an overview of popular fault handling strategies for each of these types. Lastly, it discusses the standards used for implementing web service security on the basis of a case study, and introduces the Web Service Development Life Cycle (WSDLC), which defines co-operation between several industry partners to develop web services in a more structured way.

This book constitutes the refereed proceedings of the 25th IFIP WG 6.1 International Conference on Formal Techniques for Networked and Distributed Systems, FORTE 2005, held in Taipei, Taiwan, in October 2005. The 33 revised full papers and 6 short papers presented together with 3 keynote speeches were carefully reviewed and selected from 88 submissions. The papers cover all current aspects of formal methods for distributed systems and communication protocols such as formal description techniques (MSC, UML, Use cases, . . .), semantic foundations, model-checking, SAT-based techniques, process algebrae, abstractions, protocol testing, protocol verification, network synthesis, security system analysis, network robustness, embedded systems, communication protocols, and several promising new techniques.

gramatKoreaUniversityandtheDepartmentofComputerScienceatKAISTfor ?nancialsupport. We sincerely hope that the readers ?nd the

proceedings of ATVA 2008 informative and rewarding.

The pioneering organizers of the ?rst UML workshop in Mulhouse, France inthe summerof1998couldhardlyhaveanticipatedthat,in littleoveradecade, theirinitiativewouldblossomintotoday'shighlysuccessfulMODELSconference series, the premier annual gathering of researchersand practitioners focusing on a very important new technical discipline: model-based software and system engineering. This expansion is, of course, a direct consequence of the growing signi?cance and success of model-based methods in practice. The conferences have contributed greatly to the heightened interest in the ?eld, attracting much young talent and leading to the gradualemergence of its correspondingscienti?c and engineering foundations. The proceedings from the MODELS conferences are one of the primary references for anyone interested in a more substantive study of the domain. The 12th conference took place in Denver in the USA, October 4–9, 2009 along with numerous satellite workshops and tutorials, as well as several other related scienti?c gatherings. The conference was exceptionally fortunate to have three eminent, invited keynote speakers from industry: Stephen Mellor, Larry Constantine, and Grady Booch.

This volume pays tribute to the scientific achievements of Hartmut Ehrig, who passed away in March 2016. The contributions represent a selection from a symposium, held in October 2016 at TU Berlin, commemorating Hartmut' s life and work as well as other invited papers in the areas he was active in. These areas include Graph Transformation, Model Transformation, Concurrency Theory, in particular Petri Nets, Algebraic Specification, and Category Theory in Computer Science.

This book constitutes the thoroughly refereed joint postproceedings of the satellite activities held at the 7th International Conference on the Unified Modeling Language, UML 2004, in Lisbon, Portugal in October 2004 complementing the main conference track. The book presents reports on the 10 workshops held at UML and covers a broad range of topics around systems modelling; these reports are compiled by the respective workshop organizers. Furthermore 12 revised reviewed papers from the industry track are included as well as 11 short papers corresponding to selected poster/demo presentations and a summary on the UML tools exhibition.

This book constitutes the refereed proceedings of the 9th International Conference on Software Engineering and Formal Methods, SEFM 2011, held in Montevideo, Uruguay, in November 2011. The 22 revised regular papers presented together with 1 short paper, 2 tool papers, and 4 keynote talks were carefully reviewed and selected from 105 initial abstracts and 85 full submissions. Besides the regular session the conference held a special track devoted to "Modeling for Sustainable Development" with 5 accepted papers - selected from 7 submissions - that are also part of this volume. The aim of SEFM is to advance the state of the art in formal methods, to scale up their application in software industry and to encourage their integration with practical engineering methods.

This book constitutes the refereed papers of the proceedings of the 8th International Conference on System Analysis and Modeling, SAM 2014, held in Valencia, Spain, in September 2014. The 18 full papers and the 3 short papers presented together with 2 keynotes were carefully reviewed and selected from 71 submissions. The contributions are organized in topical sections named: reuse; availability, safety and optimization; sequences and interactions; testing; metrics, constraints and repositories; and SDL and V&V.

Modeling and Verification Using UML StatechartsA Working Guide to Reactive System Design, Runtime Monitoring and Execution-based Model CheckingElsevier

Applicable to any problem that requires a finite number of solutions, finite state-based models (also called finite state machines or finite state automata) have found wide use in various areas of computer science and engineering. Handbook of Finite State Based Models and Applications provides a complete collection of introductory materials on finite state theories, algorithms, and the latest domain applications.

For beginners, the book is a handy reference for quickly looking up model details. For more experienced researchers, it is suitable as a source of in-depth study in this area. The book first introduces the fundamentals of automata theory, including regular expressions, as well as widely used automata, such as transducers, tree automata, quantum automata, and timed automata. It then presents algorithms for the minimization and incremental construction of finite automata and describes Esterel, an automata-based synchronous programming language for embedded system software development. Moving on to applications, the book explores regular path queries on graph-structured data, timed automata in model checking security protocols, pattern matching, compiler design, and XML processing. It also covers other finite state-based modeling approaches and applications, including Petri nets, statecharts, temporal logic, and UML state machine diagrams.

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A practical approach to enhancing quality in software models usingUML Version 2.0 "Despite its increasing usage, many companies are not taking thebest advantage of UML and, occasionally, individuals haveexperienced frustration in applying its standards. Perhaps this isbecause they have not yet read this book!" -From the Foreword by Prof. Brian Henderson-Sellers This book presents a practical checklist approach to enhancing thequality of software models created with the Unified ModelingLanguage (UML) Version 2.0. The foundation for quality is set bythe discussion on the nature and creation of UML models. This isfollowed by a demonstration of how to apply verification andvalidation checks to these models with three foci: syntacticalcorrectness, semantic meaningfulness, and aesthetic symmetry. Thequality work is carried out within three distinct yet relatedmodeling spaces: * Model of problem space (MOPS) * Model of solution space (MOSS) * Model of background space (MOBS) Readers can then choose a specific quality approach according totheir roles in their projects. Verification and validation checks are also organized according tothese three modeling spaces, making it easier for the reader tofocus on the appropriate diagrams and quality checks correspondingto their modeling space. In addition, a major element of thispublication is the Strengths, Weaknesses, Objectives, and Traps(SWOT) analysis. This analysis is performed on each UML diagram,enabling readers to fully comprehend these diagrams, theiradvantages and limitations, and the way in which they can be usedin practical projects for modeling. A consistent case study of the Lucky Insurance System is providedthroughout the chapters to illustrate the creation of good qualityUML diagrams, followed by application of quality checks to them.With its emphasis on quality in UML-based projects, this book is anessential resource for all quality professionals, including qualityanalysts, process consultants, quality managers, test designers,and testers.

This book constitutes the refereed joint proceedings of five international workshops held in conjunction with the 24th International Conference on Conceptual Modeling, ER 2005, in Klagenfurt, Austria, in October 2005. The 40 revised full papers presented together with the abstracts of seven tutorials were carefully reviewed and selected from 102 submissions. The papers are organized in topical sections on best practices of UML, experience reports and new applications, model evaluation and requirements modeling, metamodeling and model driven development, positions in engineering agent oriented systems, agent oriented methodologies and conceptual modeling, agent communication and coordination, geographic information systems, spatial and spatio-temporal data representation, spatial relations, spatial queries, analysis and data mining, data modeling and visualisation, conceptual modeling approaches for e-business, information system models quality, and quality driven processes.

This title is devoted to presenting some of the most importantconcepts and techniques for describing real-time systems andanalyzing their behavior in order to enable the designer to achieveguarantees of temporal correctness. Topics addressed include mathematical models of real-timesystems and associated formal verification techniques such as modelchecking, probabilistic modeling and verification, programming

anddescription languages, and validation approaches based on testing.With contributions from authors who are experts in their respectivefields, this will provide the reader with the state of the art informal verification of real-time systems and an overview ofavailable software tools.

This book gives a practical approach to modeling and analyzingcommunication protocols using UML 2. Network protocols are alwayspresented with a point of view focusing on partial mechanisms andstarting models. This book aims at giving the basis needed foranybody to model and validate their own protocols. It follows apractical approach and gives many examples for the description andanalysis of well known basic network mechanisms forprotocols. The book firstly shows how to describe and validate the mainprotocol issues (such as synchronization problems, client-serverinteractions, layer organization and behavior, etc.) in an easy andunderstandable way. To do so, the book considers and presents themain traditional network examples (e.g. unidirectional flows,full-duplex com-munication, error recovering, alternating bit).Finally, it presents the outputs resulting from a few simulationsof these UML models. Other books usually only focus either on teaching UML or onanalyzing network protocols, however this book will allow readersto model network protocols using a new perspective and integratingthese two views, so facilitating their comprehension anddevelopment. Any university student studying in the field of computing science,or those working in telecommunications, embedded systems ornetworking will find this book a very useful addition.

This book presents 12 revised lectures given by top-researchers at the 5th International Symposium on Formal Methods for Components and Objects, FMCO 2006, held in Amsterdam, Netherlands in November 2006. It provides a unique combination of ideas on software engineering and formal methods that reflect the current interest in the application or development of formal methods for large scale software systems such as component-based systems and object systems.

This book constitutes the thoroughly revised selected papers from the 17th International Symposium, FACS 2021, which was hel virtually in October 2021. The 7 full papers and 1 short contribution were carefully reviewed and selected from 16 submissions and are presented in the volume together with 1 invited paper. FACS 2021 is concerned with how formal methods can be applied to component-based software and system development. The book is subdivided into two blocks: Modelling & Composition and Verification. Chapter "A Linear Parallel Algorithm to Compute Bisimulation and Relational Coarsest Partitions" is available open access under a Creative Commons Attribution 4.0 International License via link.springer.com.

Formal methods are a robust approach for problem solving. It is based on logic and algebraic methods where problems can be formulated in a way that can help to find an appropriate solution. This book shows the basic concepts of formal methods and highlights modern modifications and enhancements to provide a more robust and efficient problem solving tool. Applications are presented from different disciplines such as engineering where the operation of chemical plants is synthesized using formal methods. Computational biology becomes easier and systematic using formal methods. Also, hardware compilation and systems can be managed using formal methods. This book will be helpful for both beginners and experts to get insights and experience on modern formal methods by viewing real applications from different domains.

This book constitutes the refereed proceedings of the 10th International Workshop on Abstract State Machines, ASM 2003, held in Taormina, Italy in March 2003. The 16 revised full papers presented together with 8 invited papers and 12 abstracts were carefully reviewed and selected for inclusion in the book. The papers reflect the state of the art of the abstract state machine method for the design and analysis of complex software/hardware systems. Besides theoretical results and methodological progress, application in various fields are studied as

well.

The four-volume set LNCS 12476 - 12479 constitutes the refereed proceedings of the 9th International Symposium on Leveraging Applications of Formal Methods, ISoLA 2020, which was planned to take place during October 20–30, 2020, on Rhodes, Greece. The event itself was postponed to 2021 due to the COVID-19 pandemic. The papers presented were carefully reviewed and selected for inclusion in the proceedings. Each volume focusses on an individual topic with topical section headings within the volume: Part I, Verification Principles: Modularity and (De-)Composition in Verification; X-by-Construction: Correctness meets Probability; 30 Years of Statistical Model Checking; Verification and Validation of Concurrent and Distributed Systems. Part II, Engineering Principles: Automating Software Re-Engineering; Rigorous Engineering of Collective Adaptive Systems. Part III, Applications: Reliable Smart Contracts: State-of-the-art, Applications, Challenges and Future Directions; Automated Verification of Embedded Control Software; Formal methods for DIStributed COmputing in future RAILway systems. Part IV, Tools and Trends: From Verification to Explanation; Engineering of Digital Twins for Cyber-Physical Systems; Software Verification Tools.

This book constitutes the refereed proceedings of the 7th European Conference on Modelling Foundations and Applications, held in Birmingham, UK, in June 2011. The 19 revised full foundations track papers and 5 revised full applications track papers presented were carefully reviewed and selected from 61 submissions; also included are 5 workshop summaries and abstracts of 4 tutorials. The papers are organized in topical sections on model execution, model analysis, methodology, model management, model transformation, variability analysis and ADLs, and domain-specific modeling.

This book constitutes the refereed proceedings of the 7th International Conference on the Unified Modeling Language, UML 2004, held in Lisbon, Portugal, in October 2004. The 30 revised full papers presented together with summaries on the workshops and tutorials were carefully reviewed and selected from 135 technical paper submissions. The papers are organized in topical sections on metamodeling, aspects, profiles and extensions, OCL, model transformation, verification and model consistency, security, and methodology.

This book describes the concepts and application of model-based development (MBD), model transformations, and Agile MBD to a wide range of software systems. It covers systems requirements engineering, system specification and design, verification, reuse, and system composition in the context of Agile MBD. Examples of applications in finance, system migration, internet systems and software refactoring are given. An established open-source MBD technology, UML-RSDS, is used throughout to illustrate the concepts. The book is suitable for industrial practitioners who need training in Agile MBD, and those who need to understand the issues to be considered when introducing MBD in an industrial context. It is also suitable for academic researchers, and for use as text for undergraduate or postgraduate courses in MBD. Examples for educational use of UML-RSDS are included in the book.

As systems being developed by industry and government grow larger and more complex, the need for superior specification and verification approaches and tools becomes increasingly vital. The developer and customer must have complete confidence that the design produced is correct, and that it meets forma development and verification standards. In this text, UML expert author Dr. Doron Drusinsky compiles all the latest information on the application of UML (Universal Modeling Language) statecharts, temporal logic, automata, and other advanced tools for run-time monitoring and verification. This is the first book that deals specifically with UML verification techniques. This important information is introduced within the context of real-life examples and solutions, particularly focusing on national defense applications. A practical text, as opposed to a high-level theoretical one, it emphasizes getting the system developer up-to-speed on using the tools

necessary for daily practice. A practical, tutorial-style text (other books on this topic discuss the tools and formalisms only theoretically) Includes an unclassified case study example from the U.S. Missile Defense project

A tutorial approach to using the UML modeling language in system-on-chip design Based on the DAC 2004 tutorial, applicable for students and professionals Contributions by top-level international researchers The best work at the first UML for SoC workshop Unique combination of both UML capabilities and SoC design issues Condenses research and development ideas that are only found in multiple conference proceedings and many other books into one place Will be the seminal reference work for this area for years to come

This book constitutes the refereed proceedings of the 9th International Conference on Formal Engineering Methods, ICFEM 2007, held in Boca Raton, Florida, USA, November 14-15, 2007. The 19 revised full papers together with two invited talks presented were carefully reviewed and selected from 38 submissions. The papers address all current issues in formal methods and their applications in software engineering. The papers are organized in topical sections.

Innovations in Computing Sciences and Software Engineering includes a set of rigorously reviewed world-class manuscripts addressing and detailing state-of-the-art research projects in the areas of Computer Science, Software Engineering, Computer Engineering, and Systems Engineering and Sciences. Topics Covered: •Image and Pattern Recognition: Compression, Image processing, Signal Processing Architectures, Signal Processing for Communication, Signal Processing Implementation, Speech Compression, and Video Coding Architectures. •Languages and Systems: Algorithms, Databases, Embedded Systems and Applications, File Systems and I/O, Geographical Information Systems, Kernel and OS Structures, Knowledge Based Systems, Modeling and Simulation, Object Based Software Engineering, Programming Languages, and Programming Models and tools. •Parallel Processing: Distributed Scheduling, Multiprocessing, Real-time Systems, Simulation Modeling and Development, and Web Applications. •Signal and Image Processing: Content Based Video Retrieval, Character Recognition, Incremental Learning for Speech Recognition, Signal Processing Theory and Methods, and Vision-based Monitoring Systems. •Software and Systems: Activity-Based Software Estimation, Algorithms, Genetic Algorithms, Information Systems Security, Programming Languages, Software Protection Techniques, Software Protection Techniques, and User Interfaces. •Distributed Processing: Asynchronous Message Passing System, Heterogeneous Software Environments, Mobile Ad Hoc Networks, Resource Allocation, and Sensor Networks. •New trends in computing: Computers for People of Special Needs, Fuzzy Inference, Human Computer Interaction, Incremental Learning, Internet-based Computing Models, Machine Intelligence, Natural Language.

Advances in Computers, Volume 112, the latest volume in a series published since 1960, presents detailed coverage of innovations in computer hardware, software, theory, design and applications. Chapters in this updated volume include Mobile Application Quality Assurance, Advances in Combinatorial Testing, Advances in Applications of Object Constraint Language for Software Engineering, Advances in Techniques for Test Prioritization, Data Warehouse Testing, Mutation Testing Advances: An Analysis and Survey, Event-Based Concurrency: Applications, Abstractions, and Analyses, and A Taxonomy of Software Integrity Protection Techniques. Provides in-depth surveys and tutorials on new computer technology Covers well-known authors and researchers in the field Presents extensive bibliographies with most chapters Includes volumes that are devoted to single themes

or subfields of computer science

This book presents a comprehensive documentation of the scientific outcome of 14 satellite events held at the 13th International Conference on Model-Driven Engineering, Languages and Systems, MODELS 2010, held in Oslo, Norway, in October 2010. Besides the 21 revised best papers selected from 12 topically focused workshops, the post-proceedings also covers the doctoral symposium and the educators symposium; each of the 14 satellite events covered is introduced by a summary of the respective organizers. All relevant current aspects in model-based systems design and analysis are addressed. This book is the companion of the MODELS 2010 main conference proceedings LNCS 6394/6395.

This book constitutes the revised selected papers of the 7th International Conference on Networked Systems, NETYS 2019, held in Marrakech, Morocco, in June 2019. The 23 revised full papers and 3 short papers presented were carefully reviewed and selected from 60 submissions. The papers are organized in the following topics: formal verification, distributed systems, security, concurrency, and networks.

This book constitutes the proceedings of the International Conference on E-business and Strategy, iCETS 2012, held in Tianjin, China, in August 2012. The 65 revised full papers presented were carefully reviewed and selected from 231 submissions. The papers feature contemporary research on developments in the fields of e-business technology, information management systems, and business strategy. Topics addressed are latest development on e-business technology, computer science and software engineering for e-business, e-business and e-commerce applications, social networking and social engineering for e-business, e-business strategic management and economics development, e-business education, entrepreneurship and e-learning, digital economy strategy, as well as internet and e-commerce policy.

This book provides a comprehensive discussion of UML/OCL methods and design flow, for automatic validation and verification of hardware and software systems. While the presented flow focuses on using satisfiability solvers, the authors also describe how these methods can be used for any other automatic reasoning engine. Additionally, the design flow described is applied to a broad variety of validation and verification tasks. The authors also cover briefly how non-functional properties such as timing constraints can be handled with the described flow.

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