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Resilient Computing: when Dependability meets Cybersecurity

Paulo Esteves-Veríssimo, Professor,
Computer Science and Engineering,
University of Luxembourg
Wednesday, October 16, 12:00 - 13:00
Building 9, Level 2, Hall 2, Room 2325

Resilient Computing Systems

JE Gale

Resilient Computing Systems:

Resilient Computing Systems Tom Anderson,1985   *Resilient Computing Systems* T. Anderson,1985-01   *Resilient Computing Systems* T. Anderson,1997-05   **Architecting Resilient Computing Systems** Miruna Stoicescu,2013 Evolution during service life is mandatory particularly for long lived systems Dependable systems which continuously deliver trustworthy services must evolve to accommodate changes e g new fault tolerance requirements or variations in available resources The addition of this evolutionary dimension to dependability leads to the notion of resilient computing Among the various aspects of resilience we focus on adaptivity Dependability relies on fault tolerant computing at runtime applications being augmented with fault tolerance mechanisms FTMs As such on line adaptation of FTMs is a key challenge towards resilience In related work on line adaption of FTMs is most often performed in a preprogrammed manner or consists in tuning some parameters Besides FTMs are replaced monolithically All the envisaged FTMs must be known at design time and deployed from the beginning However dynamics occurs along multiple dimensions and developing a system for the worst case scenario is impossible According to runtime observations new FTMs can be developed off line but integrated on line We denote this ability as agile adaption as opposed to the preprogrammed one In this thesis we present an approach for developing flexible fault tolerant systems in which FTMs can be adapted at runtime in an agile manner through fine grained modifications for minimizing impact on the initial architecture We first propose a classification of a set of existing FTMs based on criteria such as fault model application characteristics and necessary resources Next we analyze these FTMs and extract a generic execution scheme which pinpoints the common parts and the variable features between them Then we demonstrate the use of state of the art tools and concepts from the field of software engineering such as component based software engineering and reflective component based middleware for developing a library of fine grained adaptive FTMs We evaluate the agility of the approach and illustrate its usability throughout two examples of integration of the library first in a design driven development process for applications in pervasive computing and second in a toolkit for developing applications for WSNs   Wireless Artificial Intelligent Computing Systems and Applications Zhipeng Cai,Yongxin Zhu,Yonghao Wang,Meikang Qiu,2025-06-25 The 3 volume set LNCS 15686 15688 constitutes the proceedings of the 19th International Conference on Wireless Artificial Intelligent Computing Systems and Applications WASA 2025 which took place in Tokyo Japan during June 24 26 2025 The 70 full papers and 34 short papers included in the proceedings were carefully reviewed and selected from 282 submissions The proceedings also contain 10 papers from the AICom2 symposium WASA is a prestigious annual gathering that serves as a global platform for researchers academics and industry professionals to explore and exchange cuttingedge ideas research findings and innovative solutions at the dynamic intersection of wireless technologies and artificial intelligence AI computing systems   Architecture of Computing Systems - ARCS 2012 Andreas Herkersdorf,Kay Römer,Uwe Brinkschulte,2012-02-11 This book constitutes the refereed proceedings of the 25th

International Conference on Architecture of Computing Systems ARCS 2012 held in Munich Germany in February March 2012 The 20 revised full papers presented in 7 technical sessions were carefully reviewed and selected from 65 submissions The papers are organized in topical sections on robustness and fault tolerance power aware processing parallel processing processor cores optimization and communication and memory **Adaptive, Dynamic, and Resilient Systems** Niranjan Suri,Giacomo Cabri,2014-06-23 As the complexity of today s networked computer systems grows they become increasingly difficult to understand predict and control Addressing these challenges requires new approaches to building these systems Adaptive Dynamic and Resilient Systems supplies readers with various perspectives of the critical infrastructure that systems of netwo **Fehlertolerierende Rechensysteme / Fault-tolerant Computing Systems** Winfried Görke,Holger Sörensen,2012-12-06 Dieses Buch enth lt die Beitr ge der 4 GI ITG GMA Fachtagung ber Fehlertolerierende Rechensysteme die im September 1989 in einer Reihe von Tagungen in M nchen 1982 Bonn 1984 sowie Bremerhaven 1987 veranstaltet wurde Die 31 Beitr ge darunter 4 eingeladene sind teils in deutscher berwiegend aber in englischer Sprache verfa t Insgesamt wird durch diese Beitr ge die Entwicklung der Konzeption und Implementierung fehlertoleranter Systeme in den letzten zwei Jahren vor allem in Europa dokumentiert S mtliche Beitr ge berichten ber neue Forschungs oder Entwicklungsergebnisse **Predictably Dependable Computing Systems** Brian Randell,Jean-Claude Laprie,Hermann Kopetz,Bev Littlewood,2013-11-11 *Software Design for Resilient Computer Systems* Igor Schagaev,Kaegi Thomas,2016-02-13 This book addresses the question of how system software should be designed to account for faults and which fault tolerance features it should provide for highest reliability The authors first show how the system software interacts with the hardware to tolerate faults They analyze and further develop the theory of fault tolerance to understand the different ways to increase the reliability of a system with special attention on the role of system software in this process They further develop the general algorithm of fault tolerance GAFT with its three main processes hardware checking preparation for recovery and the recovery procedure For each of the three processes they analyze the requirements and properties theoretically and give possible implementation scenarios and system software support required Based on the theoretical results the authors derive an Oberon based programming language with direct support of the three processes of GAFT In the last part of this book they introduce a simulator using it as a proof of concept implementation of a novel fault tolerant processor architecture ERRIC and its newly developed runtime system feature wise and performance wise The content applies to industries such as military aviation intensive health care industrial control space exploration etc

Failsafe Control Systems K. Warwick,M.T. Tham,2012-12-06

Approximate Arithmetic Circuit Architectures for FPGA-based Systems Salim Ullah,Akash Kumar,2023-02-27 This book presents various novel architectures for FPGA optimized accurate and approximate operators their detailed accuracy and performance analysis various techniques to model the behavior of approximate operators and thorough application level analysis to evaluate the impact of approximations on the final output quality and performance metrics As multiplication is one of the most commonly used and computationally expensive operations in various error resilient applications such as digital signal and image processing and machine learning algorithms this book particularly focuses on this operation The book starts by elaborating on the various sources of error resilience and opportunities available for approximations on various layers of the computation stack It then provides a detailed description of the state of the art approximate computing related works and highlights their limitations Fault-Tolerant Computing Systems Mario Dal Cin,Wolfgang Hohl,2012-12-06 5th International GI ITG GMA Conference N rnberg September 25 27 1991 Proceedings **Technological Innovations in Adaptive and Dependable Systems: Advancing Models and Concepts** De Florio, Vincenzo,2012-03-31 This book provides high quality effective approaches to design develop maintain evaluate and benchmark adaptive and dependable systems that are built to sustain quality of service and experience despite the occurrence of potentially significant and sudden changes or failures in their infrastructure and surrounding environments Provided by publisher **Dependable Computing Systems** Hassan B. Diab,Albert Y. Zomaya,2005-10-05 A team of recognized experts leads the way to dependable computing systems With computers and networks pervading every aspect of daily life there is an ever growing demand for dependability In this unique resource researchers and organizations will find the tools needed to identify and engage state of the art approaches used for the specification design and assessment of dependable computer systems The first part of the book addresses models and paradigms of dependable computing and the second part deals with enabling technologies and applications Tough issues in creating dependable computing systems are also tackled including Verification techniques Model based evaluation Adjudication and data fusion Robust communications primitives Fault tolerance Middleware Grid security Dependability in IBM mainframes Embedded software Real time systems

Each chapter of this contributed work has been authored by a recognized expert This is an excellent textbook for graduate and advanced undergraduate students in electrical engineering computer engineering and computer science as well as a must have reference that will help engineers programmers and technologists develop systems that are secure and reliable

Reliability Assessment and Optimization of Complex Systems Akshay Kumar,Ashok Singh Bhandari,Mangey Ram,2024-10-31 Reliability Assessment and Optimization of Complex Systems delves into a range of tools and techniques for designing optimized complex systems Each chapter explores system modeling and the implementation of various metaheuristics for optimization purposes This book provides readers in the domain of applied mathematics with a comprehensive understanding of system reliability analysis and improvement thereby offering substantial value to their knowledge and expertise System reliability has become the paramount attribute of any production unit The process of maximizing system reliability while adhering to multiple constraints is referred to as reliability optimization There are two primary approaches to enhancing a system s performance and reliability developing a product with reduced failures failure avoidance or incorporating resilience to ensure the system continues functioning even in the event of a failure fault tolerance Explains the process and application of reliability based design optimization Covers many metaheuristic approaches such as reliability cost and the MTTF of the system Provides the workings and applications of multi objective optimizations

Structronic Systems: Smart Structures, Devices And Systems (In 2 Parts) Ardeshir Guran,Horn-sen Tzou,Gary L Anderson,Michihiro Natori,Ulrich Gabbert,Junji Tani,Elmar Breitbach,1998-04-04 This book is concerned with electrostructural systems particularly the interaction between the control of the structural and electrical electronic components Structronics is a new emerging area with many potential applications in the design of high performance structures adaptive structures high precision systems and micro systems As structures are increasingly being controlled by electronics the problems of structural engineering can be separated less and less from those of electronic engineering and control engineering This graduate level book fills a gap in the literature by considering these problems while giving an overview of the current state of analysis modelling and control for structronic systems It is a coherent compendium written by leading experts in this new research area and gives readers a sophisticated toolbox that will allow them to tackle the modelling and control of smart structures The inclusion of an extensive up to date bibliography and index makes this volume an invaluable standard for professional reference Because of the large number of contributions to the present volume it has been subdivided into two parts of which this is Part I This book will be of interest to engineers materials scientists physicists and applied mathematicians The synergistic integration of active smart materials structures sensors actuators and control electronics has redefined the concept of structures from a conventional passive elastic system to an active life like structronic structure electronic system with inherent self sensing diagnosis and control capabilities Because of its multi disciplinary nature the development of structronic systems has attracted researchers and scientists from many disciplines such as

structures materials control electronics mathematics manufacturing electromechanics and mechanics In practical applications this new structronic system can be used as a component of high performance machines or structural systems or be an integrated structure itself performing designated function s Most common active smart materials such as piezoelectrics shape memory alloys electro and magneto strictive materials and polyelectrolyte gels have been reviewed in Part I Application examples are also provided and research issues reported on While the first part focuses primarily on materials and structures Part II emphasizes control applications and intelligent systems With the information provided in this two volume book scientists and researchers can easily grasp the state of the art of smart materials and structronic systems and are ready to pursue their own research and development endeavors **Report on selected solutions of law, business and technologies preventing crimes** Anna Zalcewicz,2018 Raport jest pierwszym tego typu opracowaniem w polskim pi miennictwie szczeg lnie w tak oryginalnym i profesjonalnym uj ciu Integraln i niezwykle wa n dla percepcji raportu cz stanowi za czniki kt re poszerzaj zakres wiedzy zawartej w opracowaniu u atwiaj c jej zrozumienie Raport zawiera autorskie uj cie zjawiska relatywnie nowego w praktyce ycia gospodarczego i proponuje zasady oraz metody zarz dzania nim Charakteryzuje si w a ciwym interdyscyplinarnym podej ciem Napisano go na podstawie aktualnej g wnie angielskiej literatury oraz z wykorzystaniem bada w asnych autor w Odpowiada na pilne i rosn ce zapotrzebowanie praktyki gospodarczej Jest innowacyjn pozycj na polskim rynku wydawniczym Prof dr hab Bohdan Jeli ski Uniwersytet Gda ski Praca jest oryginalnym osi gni ciem naukowym wype niaj cym luk w s abo zbadanym jak dot d obszarze zapobiegania przest pczo ci w sektorach finansowym ubezpieczeniowym i energetycznym oraz w obszarze zarz dzania zasobami ludzkimi Proponowane rozwi zania przyczyni si do poprawy skuteczno ci dzia ania w analizowanych sektorach P k dr hab Tomasz Ko mider prof ASW Akademia Sztuki Wojennej w Warszawie Raport prezentuje innowacyjne rozwi zania w kwestii zar wno produkt w zapobiegaj cych przest pczo ci jak i proces w zarz dczych przedstawionych w szczeg lno ci w rozdziale dotycz cym zarz dzania lud mi Opracowanie ukazuje r wnie z jakimi wyzwaniami natury prawnej mo e mierzy si w przysz o ci ustawodawca na szczeblu krajowym i ponadnarodowym w tym unijnym Raport mo e przyczyni si tak e do podj cia dalszych bada nad cyberprzest pczo ci w Polsce Dr hab Krystyna Nizio prof US Uniwersytet Szczeci ski **Robust Intelligent Systems** Alfons Schuster,2008-08-06 Our time recognizes robustness as an important all pervading feature in the world around us Despite its omnipresence robustness is not entirely understood rather dif cult to de ne and despite its obvious value in many situations rather dif cult to achieve One of the goals of this edited book is to report on the topic of robustness from a variety and diverse range of elds and perspectives We are interested for instance in fundamental strategies nature applies to make systems robust and arguably intelligent and how these strategies may hold as general design principles in modern technology A particular focus is on computer based systems and appli tions This in mind the book has four main sections Part I has a look at robustness in terms of underlying technologies and infrastr tures upon which many computer based intelligent systems reside and inves gates robustness on

the hardware and software level but also in larger environments such as the Internet and self managing systems The contributions in Part II target robustness in research areas that are inspired by biology including brain computer interfaces biological networks and biological immune systems for example Part III involves the exciting eld of arti cial intelligence The chapters here discuss the value of robustness as a general design principle for arti cial intelligence stressing its potential in areas such as humanoid robotics and image processing **Designing a New Class of Distributed Systems** Rao Mikkilineni,2011-11-02 Designing a New Class of Distributed Systems closely examines the Distributed Intelligent Managed Element DIME Computing Model a new model for distributed systems and provides a guide to implementing Distributed Managed Workflows with High Reliability Availability Performance and Security The book also explores the viability of self optimizing self monitoring autonomous DIME based computing systems Designing a New Class of Distributed Systems is designed for practitioners as a reference guide for innovative distributed systems design Researchers working in a related field will also find this book valuable

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