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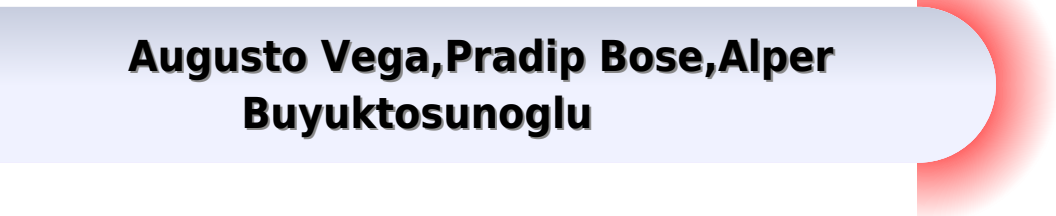
Resilient Computing: when Dependability meets Cybersecurity

Paulo Esteves-Verissimo, Professor,
Computer Science and Engineering,
University of Luxembourg
Wednesday, October 16, 12:00 - 13:00
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Resilient Computing Systems

**Augusto Vega, Pradip Bose, Alper
Buyuktosunoglu**



Resilient Computing Systems:

Resilient Computing Systems Tom Anderson, 1985

Resilient Computing Systems T. Anderson, 1997-05

Resilient Computing Systems T. Anderson, 1985-01

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

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

Resilient Computer System Design Victor Castano,Igor Schagaev,2015-04-15 This book presents a paradigm for designing new generation resilient and evolving computer systems including their key concepts elements of supportive theory methods of analysis and synthesis of ICT with new properties of evolving functioning as well as implementation schemes and their prototyping The book explains why new ICT applications require a complete redesign of computer systems to address challenges of extreme reliability high performance and power efficiency The authors present a comprehensive treatment for designing the next generation of computers especially addressing safety critical autonomous real time military banking and wearable health care systems

Software Design for Resilient Computer Systems Igor Schagaev,Eugene Zouev,Kaegi Thomas,2020 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 With this second edition of Software Design for Resilient Computer Systems the book is thoroughly updated to contain the newest advice regarding software resilience With additional chapters on computer system performance and system resilience as well as online resources the new edition is ideal for researchers and industry professionals 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 Due to the wide reaching nature of the content this book applies to a host of industries and research areas including military aviation intensive health care industrial control and space exploration

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 ACom2 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 Predictably Dependable Computing Systems Brian Randell, Jean-Claude Laprie, Hermann Kopetz, Bev Littlewood, 2013-11-11 **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 Reliability of Computer Systems and Networks Martin L. Shooman, 2003-03-25 With computers becoming embedded as controllers in everything from network servers to the routing of subway schedules to NASA missions there is a critical need to ensure that systems continue to function even when a component fails In this book bestselling author Martin Shooman draws on his expertise in reliability engineering and software engineering to provide a complete and authoritative look at fault tolerant computing He clearly explains all fundamentals including how to use redundant elements in system design to ensure the reliability of computer systems and networks Market Systems and Networking Engineers Computer Programmers IT Professionals **IT Infrastructure** Ralf Süß, Yannik Süß, 2024-05-06 Embark on a comprehensive journey into the intricate world of IT infrastructure with an in depth look into the transformational role of secure private data centers in today s digital era This exploration uncovers the multi faceted domains of IaaS PaaS and SaaS examining the primary components of modern IT infrastructure compute storage backup and beyond As technology continues to surge forward cyber threats evolve in tandem prompting a dire need for reinforced data center security and resilience This book provides readers with a holistic layered understanding of IT operations in our interconnected age You will dive deep into the heart of technological advancements appreciating the symbiotic relationship between evolving hardware capabilities and the progressive nature of cloud services You will understand the intricacies of data center design management and the strategic role they play amid the growing reliance on both private and public clouds As industries pivot towards a more digital first approach this book serves as a guiding star illuminating the pathways challenges and opportunities of the vast IT infrastructure landscape What You Will Learn Trace the rich history and evolution of data centers over the last 60 years Get comprehensive insights into cloud services architecture from IaaS to SaaS Gain in depth knowledge of data center facilities infrastructure and security Know best practices in storage provisioning administration and cost management Develop strategies and tools for ensuring data center security and resilience Understand the multi faceted world of IT support service in modern digital environments Who This Book Is For IT professionals from system administrators and network architects to IT managers and data center

overseers plus students and tech enthusiasts seeking deep insights into IT infrastructure Computer Telephony Encyclopedia Richard Grigonis,2000-01-08 If you want to grasp the full length and breadth of the rapidly developing computer telephony field this book is the place to start Author Richard Grigonis thoroughly explains even the most abstruse ideas in a concise manner that is aimed at all kinds of readers students business executives telecom managers call center supervisors or entrep **Principles of Computer System Design** Jerome H. Saltzer,M. Frans Kaashoek,2009-05-21

Principles of Computer System Design is the first textbook to take a principles based approach to the computer system design It identifies examines and illustrates fundamental concepts in computer system design that are common across operating systems networks database systems distributed systems programming languages software engineering security fault tolerance and architecture Through carefully analyzed case studies from each of these disciplines it demonstrates how to apply these concepts to tackle practical system design problems To support the focus on design the text identifies and explains abstractions that have proven successful in practice such as remote procedure call client service organization file systems data integrity consistency and authenticated messages Most computer systems are built using a handful of such abstractions The text describes how these abstractions are implemented demonstrates how they are used in different systems and prepares the reader to apply them in future designs The book is recommended for junior and senior undergraduate students in Operating Systems Distributed Systems Distributed Operating Systems and or Computer Systems Design courses and professional computer systems designers Concepts of computer system design guided by fundamental principles Cross cutting approach that identifies abstractions common to networking operating systems transaction systems distributed systems architecture and software engineering Case studies that make the abstractions real naming DNS and the URL file systems the UNIX file system clients and services NFS virtualization virtual machines scheduling disk arms security TLS Numerous pseudocode fragments that provide concrete examples of abstract concepts Extensive support The authors and MIT OpenCourseWare provide on line free of charge open educational resources including additional chapters course syllabi board layouts and slides lecture videos and an archive of lecture schedules class assignments and design projects **Fault**

Tolerance Peter A. Lee,Thomas Anderson,2012-12-06 The production of a new version of any book is a daunting task as many authors will recognise In the field of computer science the task is made even more daunting by the speed with which the subject and its supporting technology move forward Since the publication of the first edition of this book in 1981 much research has been conducted and many papers have been written on the subject of fault tolerance Our aim then was to present for the first time the principles of fault tolerance together with current practice to illustrate those principles We believe that the principles have so far stood the test of time and are as appropriate today as they were in 1981 Much work on the practical applications of fault tolerance has been undertaken and techniques have been developed for ever more complex situations such as those required for distributed systems Nevertheless the basic principles remain the same

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 *Computer Safety, Reliability, and Security* Michael Douglas Harrison, Mark-Alexander Sujan, 2008-09-11 This book constitutes the refereed proceedings of the 27th International Conference on Computer Safety Reliability and Security SAFECOMP 2008 held in Newcastle upon Tyne UK in September 2008 The 32 revised full papers presented together with 3 keynote papers and a panel session were carefully reviewed and selected from 115 submissions The papers are organized in topical sections on software dependability resilience fault tolerance security safety cases formal methods dependability modelling as well as security and dependability Active System Control Igor Schagaev, Brian Kirk, 2025-01-21 Now in its second edition this book introduces an approach to active system control This approach when applied through design and development improves our technological systems It extends concepts of system control using data accumulation state and structural dependencies The authors define these properties in terms of reliability performance and energy efficiency and self adaption They describe how they bridge the gap between data accumulation and analysis in terms of interpolation with the real physical models when data used for interpretation of the system conditions The authors introduce a principle of active system control and safety an approach that explains what a model of a system should have making computer systems more efficient a crucial new concern in application domains such as safety critical embedded and low power autonomous systems like transport healthcare and other dynamic systems with moving substances and elements On a theoretical level this book further extends the concept of fault tolerance introducing a system level of design for improving overall efficiency On a practical level it illustrates how active system approach might help our systems become self evolving This updated new edition of Active System Control contains new chapters on the system software concept and the future of active systems control and a chapter containing case studies of unsolved aviation safety incidents *Failsafe Control Systems* K. Warwick, M.T. Tham, 2012-12-06 11 2 Study objectives 147 11 3 Approach to analysis 147 11 4 Presentation and discussion of results 151 11 5 Conclusions 165 12 Accident management and failure analysis G C Meggitt 170 12 1 Introduction 170 12 2 Nuclear safety 170 12 3 The accident 171 12 4 The accident response 171 12 5 The automatic response 171 12 6 The tailored response 173 12 7 The emergency plan 181 13 Decision support systems and emergency management M Grauer 182 13 1 Introduction 182 13 2 The problem 183 13 3 The multiple criteria approach 184 3 13 4 Overview of the 1 decision support software 186 13 5 A case study from chemical industry 189 13 6 Conclusions 195 References 196 14 Safety integrity management using expert systems Dr P Andow 198 14 1 Introduction 198 14 2 Safety and risk analysis 198 14 3 The effects of applying safety and risk analysis 199 14 4 Safety integrity management 201 14 5

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Rugged Embedded Systems Augusto Vega, Pradip Bose, Alper Buyuktosunoglu, 2016-12-02 Rugged Embedded Systems Computing in Harsh Environments describes how to design reliable embedded systems for harsh environments including architectural approaches cross stack hardware software techniques and emerging challenges and opportunities A harsh environment presents inherent characteristics such as extreme temperature and radiation levels very low power and energy budgets strict fault tolerance and security constraints etc that challenge the computer system in its design and operation To guarantee proper execution correct safe and low power in such scenarios this contributed work discusses multiple layers that involve firmware operating systems and applications as well as power management units and communication interfaces This book also incorporates use cases in the domains of unmanned vehicles advanced cars and micro aerial robots and space exploration as examples of computing designs for harsh environments Provides a deep understanding of embedded systems for harsh environments by experts involved in state of the art autonomous vehicle related projects Covers the most important challenges fault tolerance power efficiency and cost effectiveness faced when developing rugged embedded systems Includes case studies exploring embedded computing for autonomous vehicle systems advanced cars and micro aerial robots and space exploration

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