

Hardware/Software Co-Design for Data Flow Dominated Embedded Systems

Ralf Niemann

Foreword by Peter Marwedel

Springer Science+Business Media, B.V.

Hardware Software Co Design For Data Flow Dominated Embedded Systems

Joris van den Hurk, Jochen A.G. Jess



Hardware Software Co Design For Data Flow Dominated Embedded Systems:

Hardware/Software Co-Design for Data Flow Dominated Embedded Systems Ralf Niemann, 1998-10-31 Introduces different tasks of hardware software co design including system specification hardware software partitioning co synthesis and co simulation Summarizes and classifies co design tools and methods for these tasks and presents the co design tool COOL useful for solving co design tasks for the class of data flow dominated embedded systems Primary emphasis is on hardware software partitioning and the co synthesis phase and their coupling A mathematical formulation of the hardware software partitioning problem is given and several novel approaches are presented and compared for solving the partitioning problem Annotation copyrighted by Book News Inc Portland OR

Hardware/Software Co-Design for Data Flow Dominated Embedded Systems Ralf Niemann, 1998-11-14 Many of the modern applications of microelectronics require huge amounts of computations Despite all recent improvements in fabrication technologies some of these computations have to be performed in hardware in order to meet deadlines However controlling computations by software is frequently preferred due to the larger flexibility Hence in general modern applications require a mix of software based and hardware based computations Applications using this mix can be designed with the help of hardware software co design systems Many such co design systems have been described so far references can be found in this book but many of these are based on heuristics In this book Niemann describes a co design system which is based on sound modeling techniques This system has the following salient features Precise cost and performance figures Design decisions for implementing a certain function in hardware or software are based on cost and performance figures for the different design alternatives Hence good designs can only be expected if these figures are accurate In order to achieve excellent accuracy Niemann takes a new approach the cost of software implementations is derived from the data available about the target processors and from knowledge about the code size the performance of software implementations is computed by compiling the given function and then using static analysis for computing worst case execution times the cost of hardware implementation is estimated by running higher level synthesis tools the performance of hardware implementations is again computed by using static analysis

Hardware / Software Co-Design For Data Flow Dominated Embedded Systems Niemann, 2008-02-01

Hardware-Software Co-Design of Embedded Systems F. Balarin, 1997-05-31 Embedded systems are informally defined as a collection of programmable parts surrounded by ASICs and other standard components that interact continuously with an environment through sensors and actuators The programmable parts include micro controllers and Digital Signal Processors DSPs Hardware Software Co Design of Embedded Systems The POLIS Approach is intended to give a complete overview of the POLIS system including its formal and algorithmic aspects and will be of interest to embedded system designers automotive electronics consumer electronics and telecommunications micro controller designers CAD developers and students

Electronic System-Level HW/SW Co-Design of Heterogeneous Multi-Processor Embedded Systems Luigi

Pomante,2016-06-15 Modern electronic systems consist of a fairly heterogeneous set of components Today a single system can be constituted by a hardware platform frequently composed of a mix of analog and digital components and by several software application layers The hardware can include several heterogeneous microprocessors e g GPP DSP GPU etc dedicated ICs ASICs and or FPGAs memories a set of local connections between the system components and some interfaces between the system and the environment sensors actuators etc Therefore on the one hand multi processor embedded systems are capable of meeting the demand of processing power and flexibility of complex applications On the other hand such systems are very complex to design and optimize so that the design methodology plays a major role in determining the success of the products For these reasons to cope with the increasing system complexity the approaches typically used today are oriented towards co design methodologies working at the higher levels of abstraction Unfortunately such methodologies are typically customized for the specific application suffer of a lack of generality and still need a considerable effort when real size project are envisioned Therefore there is still the need for a general methodology able to support the designer during the high level steps of a co design flow enabling an effective design space exploration before tackling the low level steps and thus committing to the final technology This should prevent costly redesign loops In such a context the work described in this book composed of two parts aims at providing models methodologies and tools to support each step of the co design flow of embedded systems implemented by exploiting heterogeneous multi processor architectures mapped on distributed systems as well as fully integrated onto a single chip The first part focuses on issues like the analysis of system specification languages and the analysis of existing system level HW SW co simulation methodologies to support heterogeneous multi processor architectures The second part focuses mainly on Design Space Exploration and it presents both some theoretical advancements with respect to the first part and the development of a prototypal framework that provides practical exploitation of the proposed concepts

System Level Hardware/Software Co-Design Joris van den Hurk,Jochen A.G. Jess,2013-04-17

Hierarchical design methods were originally introduced for the design of digital ICs and they appeared to provide for significant advances in design productivity Time to Market and first time right design These concepts have gained increasing importance in the semiconductor industry in recent years In the course of time the supportive quality of hierarchical methods and their advantages were confirmed System Level Hardware Software Co design An Industrial Approach demonstrates the applicability of hierarchical methods to hardware software codesign and mixed analogue digital design following a similar approach Hierarchical design methods provide for high levels of design support both in a qualitative and a quantitative sense In the qualitative sense the presented methods support all phases in the product life cycle of electronic products ranging from requirements analysis to application support Hierarchical methods furthermore allow for efficient digital hardware design hardware software codesign and mixed analogue digital design on the basis of commercially available formalisms and design tools In the quantitative sense hierarchical methods have prompted a

substantial increase in design productivity System Level Hardware Software Co design An Industrial Approach reports on a six year study during which time the number of square millimeters of normalized complexity an individual designer contributed every week rose by more than a factor of five Hierarchical methods therefore enabled designers to keep track of the ever increasing design complexity while effectively reducing the number of design iterations in the form of redesigns System Level Hardware Software Co design An Industrial Approach is the first book to provide a comprehensive coherent system design methodology that has been proven to increase productivity in industrial practice The book will be of interest to all managers designers and researchers working in the semiconductor industry Function/Architecture Optimization and Co-Design of Embedded Systems Bassam Tabbara, Abdallah Tabbara, Alberto L. Sangiovanni-Vincentelli, 2012-12-06 Function Architecture Co Design is a new paradigm for the design and implementation of embedded systems Function Architecture Optimization and Co Design of Embedded Systems presents the authors work in developing a function architecture optimization and co design formal methodology and framework for control dominated embedded systems The approach incorporates both data flow and control optimizations performed on a suitable novel intermediate design task representation The aim is not only to enhance productivity of the designer and system developer but also to improve quality of the final synthesis outcome Function Architecture Optimization and Co Design of Embedded Systems discusses the proposed function architecture co design methodology focusing on design representation optimization validation and synthesis Throughout the text the difference between behavior specification and implementation is emphasized The current need in co design to move from synthesis based technology to compiler based technology is pointed out The authors describe and show how performing data flow and control optimizations at the high abstraction level can lead to significant size and performance improvements in both the synthesized hardware and software The work builds on bodies of research in the silicon and software compilation domains The aforementioned techniques are specialized to the embedded systems domain It is recognized that guided optimization can be applied on the internal design representation no matter what the abstraction level and need not be restricted to the final stages of software assembly code generation or hardware synthesis Function Architecture Optimization and Co Design of Embedded Systems will be of primary interest to researchers developers and professionals in the field of embedded systems design Particle Swarm Optimization Alex Lazinica, 2009-01-01 Particle swarm optimization PSO is a population based stochastic optimization technique influenced by the social behavior of bird flocking or fish schooling PSO shares many similarities with evolutionary computation techniques such as Genetic Algorithms GA The system is initialized with a population of random solutions and searches for optima by updating generations However unlike GA PSO has no evolution operators such as crossover and mutation In PSO the potential solutions called particles fly through the problem space by following the current optimum particles This book represents the contributions of the top researchers in this field and will serve as a valuable tool for professionals in this interdisciplinary field **Software Design for Six Sigma** Basem S.

El-Haik,Adnan Shaout,2011-02-16 This proposal constitutes an algorithm of design applying the design for six sigma thinking tools and philosophy to software design The algorithm will also include conceptual design frameworks mathematical derivation for Six Sigma capability upfront to enable design teams to disregard concepts that are not capable upfront learning the software development cycle and saving development costs The uniqueness of this book lies in bringing all those methodologies under the umbrella of design and provide detailed description about how these methods QFD DOE the robust method FMEA Design for X Axiomatic Design TRIZ can be utilized to help quality improvement in software development what kinds of different roles those methods play in various stages of design and how to combine those methods to form a comprehensive strategy a design algorithm to tackle any quality issues in the design stage **Hardware/Software**

Co-Design Jørgen Staunstrup,Wayne Wolf,2013-04-17 Introduction to Hardware Software Co Design presents a number of issues of fundamental importance for the design of integrated hardware software products such as embedded communication and multimedia systems This book is a comprehensive introduction to the fundamentals of hardware software co design Co design is still a new field but one which has substantially matured over the past few years This book written by leading international experts covers all the major topics including fundamental issues in co design hardware software co synthesis algorithms prototyping and emulation target architectures compiler techniques specification and verification system level specification Special chapters describe in detail several leading edge co design systems including Cosyma LYCOS and Cosmos Introduction to Hardware Software Co Design contains sufficient material for use by teachers and students in an advanced course of hardware software co design It also contains extensive explanation of the fundamental concepts of the subject and the necessary background to bring practitioners up to date on this increasingly important topic Organic and

Pervasive Computing -- ARCS 2004 Christian Müller-Schloer,Theo Ungerer,2004-03-18 This book constitutes the refereed proceedings of the International Conference on Architecture of Computing Systems ARCS 2004 held in Augsburg Germany in March 2004 The 22 revised full papers presented together with the abstracts of two invited lectures were carefully reviewed and selected from 50 submissions The papers are organized in topical sections on organic computing peer to peer computing reconfigurable hardware hardware wireless architectures and networking and applications Readings in

Hardware/Software Co-Design Giovanni De Micheli,Rolf Ernst,Wayne Wolf,2002 This title serves as an introduction and reference for the field with the papers that have shaped the hardware software co design since its inception in the early 90s

Electronic Chips & Systems Design Languages Jean Mermet,2013-03-09 Electronic Chips Systems Design Languages outlines and describes the latest advances in design languages The challenge of System on a Chip SOC design requires designers to work in a multi lingual environment which is becoming increasingly difficult to master It is therefore crucial for them to learn almost in real time from the experiences of their colleagues in the use of design languages and how these languages have become more advanced to cope with system design System designers as well as students willing to

become system designers often do not have the time to attend all scientific events where they could learn the necessary information This book will bring them a selected digest of the best contributions and industry strength case studies All the levels of abstraction that are relevant from the informal user requirements down to the implementation specifications are addressed by different contributors The author together with colleague authors who provide valuable additional experience presents examples of actual industrial world applications Furthermore the academic concepts presented in this book provide excellent theories to student readers and the concepts described are up to date and in so doing provide most suitable root information for Ph D postgraduates

Wireless Transceiver Systems Design Wolfgang Eberle, 2008-06-17 1 During the last 30 years wireless in communications has grown from a niche market to an economically vital consumer mass market The first wave with the breakthrough of 2G mobile telephony focused on speech placed wireless communication in the consumer mass market In the current second wave services are extended toward true multimedia including interactive video audio gaming and broadband Internet These high data rate services however led to a separate IP centric family of wireless personal WPANs and local area networks WLANs outside the 2G 3G mobile path Since diversity between data and voice centric solutions and the competition between standardized and proprietary approaches is today more blocking than enabling effective development of successful products a third major wave is unavoidable a consolidation of both worlds in portable devices with flexible multistandard communication capabilities enabled for quality of service 2 aware multimedia services At the same time the dominance of wired desktop personal computers has been undermined by the appearance of numerous portable and smart devices laptops notebooks personal digital assistants and gaming devices Since these devices target low cost consumer markets or face wired competition time to market is crucial designed in flexibility is important power operation is a key asset yet device cost shall be at a minimum This book approaches this design tradeoff challenge from the perspective of the system architect The system architect is concerned both in an efficient design process and in a competitive design result

Electronic Engineering and Computing Technology Len Gelman, 2010-04-21 Electronic Engineering and Computing Technology contains sixty one revised and extended research articles written by prominent researchers participating in the conference Topics covered include Control Engineering Network Management Wireless Networks Biotechnology Signal Processing Computational Intelligence Computational Statistics Internet Computing High Performance Computing and industrial applications Electronic Engineering and Computing Technology will offer the state of art of tremendous advances in electronic engineering and computing technology and also serve as an excellent reference work for researchers and graduate students working with on electronic engineering and computing technology

Automated Methods in Cryptographic Fault Analysis Jakub Breier, Xiaolu Hou, Shivam Bhasin, 2019-03-19 This book presents a collection of automated methods that are useful for different aspects of fault analysis in cryptography The first part focuses on automated analysis of symmetric cipher design specifications software implementations and hardware circuits The second

part provides automated deployment of countermeasures The third part provides automated evaluation of countermeasures against fault attacks Finally the fourth part focuses on automating fault attack experiments The presented methods enable software developers circuit designers and cryptographers to test and harden their products

System Level Design with .Net Technology El Mostapha Aboulhamid, Frederic Rousseau, 2018-10-03 The first book to harness the power of NET for system design System Level Design with NET Technology constitutes a software based approach to design modeling verification and simulation World class developers who have been at the forefront of system design for decades explain how to tap into the power of this dynamic programming environment for more effective and efficient management of metadata and introspection and interoperability between tools Using readily available technology the text details how to capture constraints and requirements at high levels and describes how to percolate them during the refinement process Departing from proprietary environments built around System Verilog and VHDL this cutting edge reference includes an open source environment ESys NET that readers can use to experiment with new ideas algorithms and design methods and to expand the capabilities of their current tools It also covers Modeling and simulation including requirements specification IP reuse and applications of design patterns to hardware software systems Simulation and validation including transaction based models accurate simulation at cycle and transaction levels cosimulation and acceleration technique as well as timing specification and validation Practical use of the ESys NET environment Worked examples end of chapter references and the ESys NET implementation test bed make this the ideal resource for system engineers and students looking to maximize their embedded system designs

System-Level Synthesis Ahmed Amine Jerraya, Jean Mermet, 2012-12-06 System Level Synthesis deals with the concurrent design of electronic applications including both hardware and software The issue has become the bottleneck in the design of electronic systems including both hardware and software in several major industrial fields including telecommunications automotive and aerospace engineering The major difficulty with the subject is that it demands contributions from several research fields including system specification system architecture hardware design and software design Most existing book cover well only a few aspects of system level synthesis The present volume presents a comprehensive discussion of all the aspects of system level synthesis Each topic is covered by a contribution written by an international authority on the subject

Specification and Design Methodology for Real-Time Embedded Systems Randall S. Janka, 2012-12-06 Specification and design methodology has seen significant growth as a research area over the last decade tracking but lagging behind VLSI design technology in general and the CAD industry in particular The commercial rush to market tries to leverage existing technology which fuels CAD design tool development Paralleling this is very active basic and applied research to investigate and move forward rational and effective methodologies for accomplishing digital design especially in the field of hardware software codesign It is this close relationship between industry and academia that makes close cooperation between researchers and practitioners so important and monographs like this that combine both abstract

concept and pragmatic implementation deftly bridge this often gaping chasm It was at the IEEE ACM Eighth International Symposium on Hardware Software Codesign where I met the author of this monograph Dr Randall Janka who was presenting some of his recent dissertation research results on specification and design methodology or as he has so succinctly defined this sometimes ambiguous concept the tools and rules Where so many codesign researchers are trying to prove out different aspects of codesign and using toy applications to do so Dr Janka had developed a complete specification and design methodology and prototyped the infrastructure and proven its viability utility and effectiveness using a demanding real world application of a real time synthetic aperture radar imaging processor that was implemented with embedded parallel processors

14th Symposium on Integrated Circuits and Systems Design Sociedade Brasileira de Computação, 2001

Annotation Papers from a September 2001 symposium report on recent advances in areas of integrated circuits and systems design including embedded systems rapid prototyping formal methods codesign CAD and test analog digital and physical design and low power and low voltage Specific topics include communication architectures for system on chip using the CAN protocol and reconfigurable computing technology for Web based smart house automation and optimizing BBD based verification analyzing variable dependencies Other subjects include interconnection length estimation at logic level an environment to aid the synthesis of threephase analogue waveform using AHDL and extending sequencing graphs for reconfigurable applications modeling This work lacks a subject index c Book News Inc

The Enigmatic Realm of **Hardware Software Co Design For Data Flow Dominated Embedded Systems**: Unleashing the Language is Inner Magic

In a fast-paced digital era where connections and knowledge intertwine, the enigmatic realm of language reveals its inherent magic. Its capacity to stir emotions, ignite contemplation, and catalyze profound transformations is nothing in short supply of extraordinary. Within the captivating pages of **Hardware Software Co Design For Data Flow Dominated Embedded Systems** a literary masterpiece penned with a renowned author, readers set about a transformative journey, unlocking the secrets and untapped potential embedded within each word. In this evaluation, we shall explore the book's core themes, assess its distinct writing style, and delve into its lasting affect the hearts and minds of those who partake in its reading experience.

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