# Hardware Software Co Design Vhdl And Ada 95 Code

Electronic Chips & Systems Design Languages
Hardware/Software Co-Design
Hardware-Software Co-Synthesis of Distributed Embedded Systems
Fourth International Workshop on Hardware/Software Co-Design, Codes/CASHE '96
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Proceedings of the Third International Workshop on Hardware/Software Codesign
Readings in Hardware/software Co-design
The Polis Approach
Unleash the System On Chip using FPGAs and Handel C
March 24-26, 1997, Braunschweig, Germany
Design of Systems on a Chip: Design and Test
RTL Hardware Design Using VHDL
The hArtes Toolchain
A Practical Introduction to Hardware/Software Codesign
A Practical Introduction to Hardware/Software Codesign
Hardware/Software Co-design for Heterogeneous Multi-core Platforms
Handbook of Hardware/Software Codesign
Hardware/Software Co-Design for Data Flow Dominated Embedded Systems
Hardware-Software Co-Design of Embedded Systems
System Level Hardware/Software Co-Design
Energy Efficient Hardware-Software Co-Synthesis Using Reconfigurable Hardware
Methods in Hardware/Software Co-Design
Digital Design (Verilog)

Development of Educational Materials Teaching Hardware-software Co-design: Laboratories and a Debugger Interface for an 8051 VHDL Model
Hardware/Software Co-Design



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*Electronic Chips & Systems Design Languages* IEEE
Co-Synthesis of Hardware and Software for Digital Embedded Systems, with a Foreword written by Giovanni De Micheli, presents techniques that are useful in building complex embedded systems. These techniques provide a competitive advantage over purely hardware or software implementations of time-constrained embedded systems. Recent advances in chip-level synthesis have made it possible to synthesize application-specific circuits under strict timing constraints. This work advances the state of the art by formulating the problem of system synthesis using both application-specific as well as reprogrammable components, such as off-the-shelf processors. Timing constraints are used to determine what part of the system functionality must be delegated to dedicated application-specific hardware while the rest is delegated to software that runs on the processor. This co-synthesis of hardware and software from behavioral specifications makes it possible to realize real-time embedded systems using off-the-shelf parts and a relatively small amount of application-specific circuitry that can be mapped to semi-custom VLSI such as gate arrays. The ability to perform detailed analysis of timing performance provides the opportunity of improving the system definition by creating better phototypes. Co-Synthesis of Hardware and Software for Digital Embedded Systems is of interest to CAD researchers and developers who want to branch off into the expanding field of hardware/software co-design, as well as to digital system designers who are interested in the present power and limitations of CAD techniques and their likely evolution.
Hardware/Software Co-Design Springer Science & Business Media
This book is concerned with studying the co-design methodology in general, and how to determine the more suitable interface mechanism in a co-design system in particular. This is based on the characteristics of the application and those of the target architecture of the system. Guidelines are provided to support the designer's choice of the interface mechanism. Some new trends in co-design and system acceleration are also introduced.
*Hardware-Software Co-Synthesis of Distributed Embedded Systems* IEEE
As electronic technology reaches the point where complex systems can be integrated on a single chip, and higher degrees of performance can be achieved at lower costs, designers must devise new ways to undertake the laborious task of coping with the numerous, and non-trivial, problems that arise during the conception of such systems. On the other hand, shorter design cycles (so that electronic products can fit into shrinking market windows) put companies, and consequently designers, under pressure in a race to obtain reliable products in the minimum period of time. New methodologies, supported by automation and abstraction, have appeared which have been crucial in making it possible for system designers to take over the traditional electronic design process and embedded systems is one of the fields that these methodologies are mainly targeting. The inherent complexity of these systems, with hardware and software components that usually execute concurrently, and the very tight cost and performance constraints, make them specially suitable to introduce higher levels of abstraction and automation, so as to allow the designer to better tackle the many problems that appear during their design. Advanced Techniques for Embedded Systems Design and Test is a comprehensive book presenting recent developments in methodologies and tools for the specification, synthesis, verification, and test of embedded systems, characterized by the use of high-level languages as a road to productivity. Each specific part of the design process, from specification through to test, is looked at with a constant emphasis on behavioral methodologies. Advanced Techniques for Embedded Systems Design and Test is essential reading for all researchers in the design and test communities as well as system designers and CAD tools developers.
*Fourth International Workshop on Hardware/Software Co-Design, Codes/CASHE '96* John Wiley & Sons
Hardware/software co-design requires the smooth interaction of both disciplines and the 16 selected papers from the March 1996 workshop summarize some of the most important aspects of this growing area of computer science. The sessions focus on issues in transformation based co-design and communicat
FPGA Prototyping by VHDL Examples Springer
The recent evolution of digital technology has resulted in the design of digital processors with increasingly complex capabilities. The implementation of hardware/software co-design methodologies provides new opportunities for the development of low power, high speed DSPs and processor networks. Dedicated digital processors are digital processors with an application specific computational task. Dedicated Digital Processors presents an integrated and accessible approach to digital processor design principles, processes, and implementations based upon the author's considerable experience in teaching digital systems design and digital signal processing. Emphasis is placed on presentation of hardware/software co-design methods, with examples and illustrations provided throughout the text. System-on-a-chip and embedded systems are described and examples of high speed real-time processing are given. Coverage of standard and emerging DSP architectures enable the reader to make an informed selection when undertaking their own designs. Presents readers with the elementary building blocks for the design of digital hardware systems and processor networks Provides a unique evaluation of standard DSP architectures whilst providing up-to-date information on the latest architectures, including the TI 55x and TigerSharc chip families and the Virtex FPGA (field-programmable gate array) Introduces the concepts and methodologies for describing and designing hardware VHDL is presented and used to illustrate the design of a simple processor A practical overview of hardware/software codesign with design techniques and considerations illustrated with examples of real-world designs Fundamental reading for graduate and senior undergraduate students of computer and electronic engineering, and Practicing engineers developing DSP applications.
Proceedings of the Fifth International Workshop on Hardware/Software Co-Design (Codes/CASHE '97) Springer Science & Business Media
This textbook serves as an introduction to the subject of

embedded systems design, with emphasis on integration of custom hardware components with software. The key problem addressed in the book is the following: how can an embedded systems designer strike a balance between flexibility and efficiency? The book describes how combining hardware design with software design leads to a solution to this important computer engineering problem. The book covers four topics in hardware/software codesign: fundamentals, the design space of custom architectures, the hardware/software interface and application examples. The book comes with an associated design environment that helps the reader to perform experiments in hardware/software codesign. Each chapter also includes exercises and further reading suggestions. Improvements in this second edition include labs and examples using modern FPGA environments from Xilinx and Altera, which will make the material in this book applicable to a greater number of courses where these tools are already in use. More examples and exercises have been added throughout the book. “If I were teaching a course on this subject, I would use this as a resource and text. If I were a student who wanted to learn codesign, I would look for a course that at least used a similar approach. If I were an engineer or engineering manager who wanted to learn more about codesign from a very practical perspective, I would read this book first before any other. When I first started learning about codesign as a practitioner, a book like this would have been the perfect introduction.” --Grant Martin, Tensilica--

System Synthesis with VHDL Springer Science & Business Media

Electronic Chips & Systems Design Languagesoutlines 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.

**Proceedings, March 18-20, 1996, Pittsburgh, Pennsylvania** John Wiley & Sons

Cyber-physical systems are the natural extension of the so-called "Internet of Things". They are "systems of collaborating computational elements controlling physical entities." Cyber Physical Systems of Systems (CPSoS) are considered "The Next Computing Revolution" after Mainframe computing (60's-70's), Desktop computing & Internet (80's-90's) and Ubiquitous computing (00's); because all aspects of daily life are rapidly evolving towards humans interacting among themselves as well as their environment via computational devices (often mobile), and because in most cases systems will employ their computational capabilities to interact among themselves. CPSoS enable the physical world to merge with the cyber one. Using sensors, the embedded systems monitor and collect data from physical processes, such as the steering of a vehicle, energy consumption, or human health functions. The systems are networked making the data globally available. CPSoS make it possible for software applications to directly interact with events in the physical world, for example to measure and react to changes in blood pressure or peaks in energy consumption. Embedded hardware and software systems crucially expand the functionality and competitiveness of vehicles, aircraft, medical equipment, production plants and household appliances. Connecting these systems to a virtual environment of globally networked services and information systems opens completely new areas of innovation and novel business platforms. Future CPSoS will have many sophisticated, interconnected parts that must instantaneously exchange, parse, and act on detailed data in a highly coordinated manner. Continued advances in science and engineering will be necessary to enable advances in design and development of these complex systems. Multi-scale, multi-layer, multi-domain, and multi-system integrated infrastructures will require new foundations in system science and engineering. Scientists and engineers with an understanding of otherwise physical systems will need to work in tandem with computer and information scientists to achieve effective, workable designs. In this tutorial, basic and advanced issues on the design of the future heterogeneous CPSoS are presented including relevant Blockchain technologies, reconfigurable systems, advanced sensor interfaces and human-centered design processes. Certain advanced tools for the design and implementation of the cyber parts of the CPSoS (i.e. FPGA design tools from Xilinx) are also covered.

SynDEVS Co-Design Flow Springer Science & Business Media

With the rapid advances in technology, the conventional academic and research departments of Electronics engineering, Electrical Engineering, Computer Science, Instrumentation Engineering over the globe are forced to come together and update their curriculum with few common interdisciplinary courses in order to come out with the engineers and researchers with muli-dimensional capabilities. The gr- ing perception of the ‘Hardware becoming Soft’ and ‘Software becoming Hard’ with the emergence of the FPGAs has made its impact on both the hardware and software professionals to change their mindset of working in narrow domains. An interdisciplinary field where ‘Hardware meets the Software’ for undertaking se- ingly unfeasible tasks is System on Chip (SoC) which has become the basic pl- form of modern electronic appliances. If it wasn’t for SoCs, we wouldn’t be driving our car with foresight of the traffic congestion before hand using GPS. Without the omnipresence of the SoCs in our every walks of life, the society is wouldn’t have evidenced the rich benefits of the convergence of the technologies such as audio, video, mobile, IPTV just to name a few. The growing expectations of the consumers have placed the field of SoC design at the heart of at variance trends. On one hand there are challenges owing to design complexities with the emergence of the new processors, RTOS, software protocol stacks, buses, while the brutal forces of deep submicron effects such as crosstalk, electromigration, timing closures are challe- ing the design metrics.

*Hardware and Software* Springer Science & Business Media

Models in System Design tracks the general trend in electronics in terms of size, complexity and difficulty of maintenance. System design is by nature combined with prototyping, mixed domain

design, and verification, and it is no surprise that today's modeling and models are used in various levels of system design and verification. In order to deal with constraints induced by volume and complexity, new methods and techniques have been defined. Models in System Design provides an overview of the latest modeling techniques for use by system designers. The first part of the book considers system level design, discussing such issues as abstraction, performance and trade-offs. There is also a section on automating system design. The second part of the book deals with some of the newest aspects of embedded system design. These include co-verification and prototyping. Finally, the book includes a section on the use of the MCSE methodology for hardware/software co-design. Models in System Design will help designers and researchers to understand these latest techniques in system design and as such will be of interest to all involved in embedded system design.

**September 22-24, 1994, Grenoble, France** Springer Science & Business Media

Rapid energy estimation for energy efficient applications using field-programmable gate arrays (FPGAs) remains a challenging research topic. Energy dissipation and efficiency have prevented the widespread use of FPGA devices in embedded systems, where energy efficiency is a key performance metric. Helping overcome these challenges, Energy Efficient Hardware-Software Co-Synthesis Using Reconfigurable Hardware offers solutions for the development of energy efficient applications using FPGAs. The book integrates various high-level abstractions for describing hardware and software platforms into a single, consistent application development framework, enabling users to construct, simulate, and debug systems. Based on these high-level concepts, it proposes an energy performance modeling technique to capture the energy dissipation behavior of both the reconfigurable hardware platform and the target applications running on it. The authors also present a dynamic programming-based algorithm to optimize the energy performance of an application running on a reconfigurable hardware platform. They then discuss an instruction-level energy estimation technique and a domain-specific modeling technique to provide rapid and fairly accurate energy estimation for hardware-software co-designs using reconfigurable hardware. The text concludes with example designs and illustrative examples that show how the proposed co-synthesis techniques lead to a significant amount of energy reduction. This book explores the advantages of using reconfigurable hardware for application development and looks ahead to future research directions in the field. It outlines the range of aspects and steps that lead to an energy efficient hardware-software application synthesis using FPGAs.

Co-verification of Hardware and Software for ARM SoC Design Springer Science & Business Media

Concurrent design, or co-design of hardware and software is extremely important for meeting design goals, such as high performance, that are the key to commercial competitiveness. Hardware/Software Co-Design covers many aspects of the subject, including methods and examples for designing: (1) general purpose and embedded computing systems based on instruction set processors; (2) telecommunication systems using general purpose digital signal processors as well as application specific instruction set processors; (3) embedded control systems and applications to automotive electronics. The book also surveys the areas of emulation and prototyping systems with field programmable gate array technologies, hardware/software synthesis and verification, and industrial design trends. Most contributions emphasize the design methodology, the requirements and state of the art of computer aided co-design tools, together with current design examples.

Co-Synthesis of Hardware and Software for Digital Embedded Systems CRC Press

This handbook presents fundamental knowledge on the hardware/software (HW/SW) codesign methodology. Contributing expert authors look at key techniques in the design flow as well as selected codesign tools and design environments, building on basic knowledge to consider the latest techniques. The book enables readers to gain real benefits from the HW/SW codesign methodology through explanations and case studies which demonstrate its usefulness. Readers are invited to follow the progress of design techniques through this work, which assists readers in following current research directions and learning about state-of-the-art techniques. Students and researchers will appreciate the wide spectrum of subjects that belong to the design methodology from this handbook.

**SynDEVS Co-Design Flow** CRC Press

Hardware description languages (HDL) such as VHDL and Verilog have found their way into almost every aspect of the design of digital hardware systems. Since their inception they gradually proved to be an essential part of modern design methodologies and design automation tools, ever exceeding their original goals of being description and simulation languages. Their use for automatic synthesis, formal proof, and testing are good examples. So far, HDLs have been mainly dealing with digital systems. However, integrated systems designed today require more and more analog parts such as A/D and D/A converters, phase locked loops, current mirrors, etc. The verification of the complete system therefore asks for the use of a single language. Using VHDL or Verilog to handle analog descriptions is possible, as it is shown in this book, but the real power is coming from true mixed-signal HDLs that integrate discrete and continuous semantics into a unified framework. Analog HDLs (AHDL) are considered here a subset of mixed-signal HDLs as they intend to provide the same level of features as HDLs do but with a scope limited to analog systems, possibly with limited support of discrete semantics. Analog and Mixed-Signal Hardware Description Languages covers several aspects related to analog and mixed-signal hardware description languages including: The use of a digital HDL for the description and the simulation of analog systems The emergence of extensions of existing standard HDLs that provide true analog and mixed-signal HDLs. The use of analog and mixed-signal HDLs for the development of behavioral models of analog (electronic) building blocks (operational amplifier, PLL) and for the design of microsystems that do not only involve electronic parts. The use of a front-end tool that eases the description task with the help of a graphical paradigm, yet generating AHDL descriptions automatically. Analog and Mixed-Signal Hardware Description Languages is the first book to show how to use these new hardware description languages in the design of electronic components and systems. It is necessary reading for researchers and designers working in electronic design.

**Hardware-Software Co-Design of Embedded Systems** Elsevier

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). Embedded systems are often used in life-critical situations, where reliability and safety are more important criteria than performance. Today, embedded systems are designed with an ad hoc approach that is heavily based on earlier experience with similar products and on manual design. Use of higher-level languages such as C helps structure the design somewhat, but with increasing complexity it is not sufficient. Formal verification and automatic synthesis of implementations are the surest ways to guarantee safety. Thus, the POLIS system which is a co-design environment for embedded systems is based on a formal model of computation. POLIS was initiated in 1988 as a research project at the University of California at Berkeley and, over the years, grew into a full design methodology with a software system supporting it. 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. Hardware-Software Co-Design of Embedded Systems: The POLIS Approach will be of interest to embedded system designers (automotive electronics, consumer electronics and telecommunications), micro-controller designers, CAD developers and students.

Volume 42 - Supplement 27 Springer Science & Business Media
New manufacturing technologies have made possible the integration of entire systems on a single chip. This new design paradigm, termed system-on-chip (SOC), together with its associated manufacturing problems, represents a real challenge for designers. SOC is also reshaping approaches to test and validation activities. These are beginning to migrate from the traditional register-transfer or gate levels of abstraction to the system level. Until now, test and validation have not been supported by system-level design tools so designers have lacked the infrastructure to exploit all the benefits stemming from the adoption of the system level of abstraction. Research efforts are already addressing this issue. This monograph provides a state-of-the-art overview of the current validation and test techniques by covering all aspects of the subject including: modeling of bugs and defects; stimulus generation for validation and test purposes (including timing errors; design for testability.

Coding for Efficiency, Portability, and Scalability Springer Science & Business Media
Hardware/software co-design requires the smooth interaction of both disciplines and the 16 selected papers from the March 1996 workshop summarize some of the most important aspects of this growing area of computer science. The sessions focus on issues in transformation based co-design and communicat

**Encyclopedia of Computer Science and Technology** Springer Science & Business Media
This title serves as an introduction ans reference for the field, with the papers that have shaped the hardware/software co-design since its inception in the early 90s.

*Embedded Systems Design with 8051 Microcontrollers* Springer Science & Business Media
This book is the second of two volumes addressing the design challenges associated with new generations of semiconductor technology. The various chapters are compiled from tutorials presented at workshops in recent years by prominent authors from all over the world. Technology, productivity and quality are the main aspects under consideration to establish the major requirements for the design and test of upcoming systems on a chip.

**Proceedings, March 18-20, 1996, Pittsburgh, Pennsylvania** Springer Science & Business Media
This is a practical book for computer engineers who want to understand or implement hardware/software systems. It focuses on problems that require one to combine hardware design with software design – such problems can be solved with hardware/software codesign. When used properly, hardware/software co- sign works better than hardware design or software design alone: it can improve the overall performance of digital systems, and it can shorten their design time. Hardware/software codesign can help a designer to make trade-offs between the ?exibility and the performanceof a digital system. To achieve this, a designer needs to combine two radically different ways of design: the sequential way of dec-position in time, using software, with the parallel way of decomposition in space, using hardware. Intended Audience This book assumes that you have a basic understandingof hardware that you are - miliar with standard digital hardware componentssuch as registers, logic gates, and components such as multiplexers and arithmetic operators. The book also assumes that you know how to write a program in C. These topics are usually covered in an introductory course on computer engineering or in a combination of courses on digital design and software engineering.