ASIC System Design with VHDL: A Paradigm

Steven S. Leung

Michael A. Shanblatt

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Stanley Mazor,Patricia Langstraat

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ASIC System Design with VHDL: A Paradigm Steven S. Leung,Michael A. Shanblatt,1989-06-30 Beginning in the mid 1980 s VLSI technology had begun to advance in two directions Pushing the limit of integration ULSI Ultra Large Scale Integration represents the frontier of the semiconductor processing technology in the campaign to conquer the submicron realm The application of ULSI however is at present largely confined in the area of memory designs and as such its impact on traditional microprocessor based system design is modest If advancement in this direction is merely a natural extrapolation from the previous integration generations then the rise of ASIC Application Specific Integrated Circuit is an unequivocal signal that a directional change in the discipline of system design is in effect In contrast to ULSI ASIC employs only well proven technology and hence is usually at least one generation behind the most advanced processing technology In spite of this apparent disadvantage ASIC has become the mainstream of VLSI design and the technology base of numerous entrepreneurial opportunities ranging from PC clones to supercomputers Unlike ULSI whose complexity can be hidden inside a memory chip or a standard component and thus can be accommodated by traditional system design methods ASIC requires system designers to master a much larger body of knowledge spanning from processing technology and circuit techniques to architecture principles and algorithm characteristics Integrating knowledge in these various areas has become the precondition for integrating devices and functions into an ASIC chip in a market oriented environment But knowledge is of two kinds *ASIC System Design with VHDL: A Paradigm* Steven S. Leung,Michael A. Shanblatt,2012-12-06 Beginning in the mid 1980 s VLSI technology had begun to advance in two directions Pushing the limit of integration ULSI Ultra Large Scale Integration represents the frontier of the semiconductor processing technology in the campaign to conquer the submicron realm The application of ULSI however is at present largely confined in the area of memory designs and as such its impact on traditional microprocessor based system design is modest If advancement in this direction is merely a natural extrapolation from the previous integration generations then the rise of ASIC Application Specific Integrated Circuit is an unequivocal signal that a directional change in the discipline of system design is in effect In contrast to ULSI ASIC employs only well proven technology and hence is usually at least one generation behind the most advanced processing technology In spite of this apparent disadvantage ASIC has become the mainstream of VLSI design and the technology base of numerous entrepreneurial opportunities ranging from PC clones to supercomputers Unlike ULSI whose complexity can be hidden inside a memory chip or a standard component and thus can be accommodated by traditional system design methods ASIC requires system designers to master a much larger body of knowledge spanning from processing technology and circuit techniques to architecture principles and algorithm characteristics Integrating knowledge in these various areas has become the precondition for integrating devices and functions into an ASIC chip in a market oriented environment But knowledge is of two kinds *ASIC system design with VHDL* Steven S. Leung,Michael A. Shanblatt,□□□□□□□□□□,1993 **ASIC System**

Desing with VHDL ,1989   *A Guide to VHDL* Stanley Mazor,Patricia Langstraat,2012-12-06 A Guide to VHDL Second Edition is intended for the working engineer who needs to develop document simulate and synthesize a design using the VHDL language It is for system and chip designers who are working with VHDL CAD tools and who have some experience programming in Fortran Pascal or C and have used a logic simulator A Guide to VHDL Second Edition includes a number of paper exercises and computer lab experiments If a compiler simulator is available to the reader then the lab exercises included in the chapters can be run to reinforce the learning experience For practical purposes this book keeps simulator specific text to a minimum but does use the Synopsys VHDL Simulator command language in a few cases A Guide to VHDL Second Edition is designed as a primer and its contents are appropriate for an introductory course in VHDL The VHDL language was updated in 1992 with some minor improvements In most cases the language is upward compatible Although this book is based primarily on the VHDL 1987 standard this new second edition indicates the significant changes in the 1992 language to assist the designer in writing upwardly compatible code   Hardware Design and Simulation in VAL/VHDL Larry M. Augustin,David C. Luckham,Benoit A. Gennart,Youm Huh,A. Stanculescu,2012-12-06 The VHSIC Hardware Description Language VHDL provides a standard machine processable notation for describing hardware VHDL is the result of a collaborative effort between IBM Intermetrics and Texas Instruments sponsored by the Very High Speed Integrated Cir cuits VHSIC program office of the Department of Defense beginning in 1981 Today it is an IEEE standard 1076 1987 and several simulators and other automated support tools for it are available commercially By providing a standard notation for describing hardware especially in the early stages of the hardware design process VHDL is expected to reduce both the time lag and the cost involved in building new systems and upgrading existing ones VHDL is the result of an evolutionary approach to language devel opment starting with high level hardware description languages existing in 1981 It has a decidedly programming language flavor resulting both from the orientation of hardware languages of that time and from a ma jor requirement that VHDL use Ada constructs wherever appropriate During the 1980 s there has been an increasing current of research into high level specification languages for systems particularly in the software area and new methods of utilizing specifications in systems de velopment This activity is worldwide and includes for example object oriented design various rigorous development methods mathematical verification and synthesis from high level specifications VAL VHDL Annotation Language is a simple further step in the evolution of hardware description languages in the direction of applying new methods that have developed since VHDL was designed   Quick-Turnaround ASIC Design in VHDL N. Bouden-Romdhane,Vijay Madisetti,J.W. Hines,2012-12-06 From the Foreword Modern digital signal processing applications provide a large challenge to the system designer Algorithms are becoming increasingly complex and yet they must be realized with tight performance constraints Nevertheless these DSP algorithms are often built from many constituent canonical subtasks e g IIR and FIR filters FFTs that can be reused in other subtasks Design is then a problem of composing

these core entities into a cohesive whole to provide both the intended functionality and the required performance In order to organize the design process there have been two major approaches The top down approach starts with an abstract concise functional description which can be quickly generated On the other hand the bottom up approach starts from a detailed low level design where performance can be directly assessed but where the requisite design and interface detail take a long time to generate In this book the authors show a way to effectively resolve this tension by retaining the high level conciseness of VHDL while parameterizing it to get good fit to specific applications through reuse of core library components Since they build on a pre designed set of core elements accurate area speed and power estimates can be percolated to high level design routines which explore the design space Results are impressive and the cost model provided will prove to be very useful Overall the authors have provided an up to date approach doing a good job at getting performance out of high level design The methodology provided makes good use of extant design tools and is realistic in terms of the industrial design process The approach is interesting in its own right but is also of direct utility and it will give the existing DSP CAD tools a highly competitive alternative The techniques described have been developed within ARPAs RASSP Rapid Prototyping of Application Specific SignalProcessors project and should be of great interest there as well as to many industrial designers Professor Jonathan Allen Massachusetts Institute of Technology **VHDL Designer's Reference** Jean-Michel Bergé,Alain Fonkoua,Serge Maginot,Jacques Rouillard,2012-12-06 too vast too complex too grand for description John Wesley Powell 1870 discovering the Grand Canyon VHDL is a big world A beginner can be easily disappointed by the generality of this language This generality is explained by the large number of domains covered from specifications to logical simulation or synthesis To the very beginner VHDL appears as a kit He is quickly aware that his problem may be solved with VHDL but does not know how He does not even know how to start In this state of mind all the constraints that can be set to his modeling job by using a subset of the language or a given design methodology may be seen as a life preserver The success of the introduction of VHDL in a company depends on solutions to many questions that should be answered months before the first line of code is written Why choose VHDL Which VHDL tools should be chosen Which modeling methodology should be adopted How should the VHDL environment be customized What are the tricks Where are the traps What are the differences between VHDL and other competing HDLs Answers to these questions are organized according to different concerns buying the tools organizing the environment and designing Decisions taken in each of these areas may have many consequences on the way to the acceptance and efficiently use of VHDL in a company **VLSI Design of Neural Networks** Ulrich Ramacher,Ulrich Rückert,2012-12-06 The early era of neural network hardware design starting at 1985 was mainly technology driven Designers used almost exclusively analog signal processing concepts for the recall mode Learning was deemed not to cause a problem because the number of implementable synapses was still so low that the determination of weights and thresholds could be left to conventional computers Instead designers tried to directly map neural parallelity into

hardware The architectural concepts were accordingly simple and produced the so called interconnection problem which in turn made many engineers believe it could be solved by optical implementation in adequate fashion only Furthermore the inherent fault tolerance and limited computation accuracy of neural networks were claimed to justify that little effort is to be spend on careful design but most effort be put on technology issues As a result it was almost impossible to predict whether an electronic neural network would function in the way it was simulated to do This limited the use of the first neuro chips for further experimentation not to mention that real world applications called for much more synapses than could be implemented on a single chip at that time Meanwhile matters have matured It is recognized that isolated definition of the effort of analog multiplication for instance would be just as inappropriate on the part ofthe chip designer as determination of the weights by simulation without allowing for the computing accuracy that can be achieved on the part of the user

Fundamentals and Standards in Hardware Description Languages Jean Mermet,2012-12-06 The second half of this century will remain as the era of proliferation of electronic computers They did exist before but they were mechanical During next century they may perform other mutations to become optical or molecular or even biological Actually all these aspects are only fancy dresses put on mathematical machines This was always recognized to be true in the domain of software where machine or high level languages are more or less rigourous but immaterial variations of the universaly accepted mathematical language aimed at specifying elementary operations functions algorithms and processes But even a mathematical machine needs a physical support and this is what hardware is all about The invention of hardware description languages HDL s in the early 60 s was an attempt to stay longer at an abstract level in the design process and to push the stage of physical implementation up to the moment when no more technology independant decisions can be taken It was also an answer to the continuous exponential growth of complexity of systems to be designed This problem is common to hardware and software and may explain why the syntax of hardware description languages has followed with a reasonable delay of ten years the evolution of the programming languages at the end of the 60 s they were Algol like a decade later Pascal like and now they are C or ADA like They have also integrated the new concepts of advanced software specification languages **Analysis and Design of Digital Systems with VHDL** Allen Mark Dewey,1997 ANALYSIS AND DESIGN OF DIGITAL SYSTEMS WITH VHDL integrates industry standard hardware description language VHDL technology into the undergraduate digital logic course Author Allen Dewey observes that the widespread use of VHDL in specifying digital system designs is driving change and innovation in industry and defining a new skill set that engineering students must master to design model communicate and implement digital systems VHDL provides a formal mechanism for describing digital systems in a format easily processed by computers succinctly capturing the basic concepts of digital systems engineering and harnessing the power of design automation technology This book first presents combinational and sequential systems and their design along with logic families and integrated circuits It then interlocks these subjects with

discussions of structural and data flow modeling synchronous behavior and algorithmic modeling of digital systems in VHDL This dual track organization of conceptual and VHDL related material makes the book easily adaptable to one or two semester courses and a variety of teaching approaches *Synchronization Design for Digital Systems* Teresa H. Meng,2012-12-06 Synchronization is one of the important issues in digital system design While other approaches have always been intriguing up until now synchro nous operation using a common clock has been the dominant design philo sophy However we have reached the point with advances in technology where other options should be given serious consideration This is because the clock periods are getting much smaller in relation to the interconnect propagation delays even within a single chip and certainly at the board and backplane level To a large extent this problem can be overcome with care ful clock distribution in synchronous design and tools for computer aided design of clock distribution However this places global constraints on the design making it necessary for example to redesign the clock distribution each time any part of the system is changed In this book some alternative approaches to synchronization in digital sys tem design are described and developed We owe these techniques to a long history of effort in both digital system design and in digital communica tions the latter field being relevant because large propagation delays have always been a dominant consideration in design While synchronous design is discussed and contrasted to the other techniques in Chapter 6 the dom inant theme of this book is alternative approaches *Advances in Hardware Design and Verification* Hon Li,David Probst,2016-01-09 CHARM 97 is the ninth in a series of working conferences devoted to the development and use of formal techniques in digital hardware design and verification This series is held in collaboration with IFIP WG 10 5 Previous meetings were held in Europe every other year *ASIC & EDA* ,1994 <u>Nonlinear Digital Filters</u> Ioannis Pitas,Anastasios N. Venetsanopoulos,2013-03-14 The function of a filter is to transform a signal into another one more suit able for a given purpose As such filters find applications in telecommunica tions radar sonar remote sensing geophysical signal processing image pro cessing and computer vision Numerous authors have considered deterministic and statistical approaches for the study of passive active digital multidimen sional and adaptive filters Most of the filters considered were linear although the theory of nonlinear filters is developing rapidly as it is evident by the numerous research papers and a few specialized monographs now available Our research interests in this area created opportunity for cooperation and co authored publications during the past few years in many nonlinear filter families described in this book As a result of this cooperation and a visit from John Pitas on a research leave at the University of Toronto in September 1988 the idea for this book was first conceived The difficulty in writing such a mono graph was that the area seemed fragmented and no general theory was available to encompass the many different kinds of filters presented in the literature However the similarities of some families of nonlinear filters and the need for such a monograph providing a broad overview of the whole area made the pro ject worthwhile The result is the book now in your hands typeset at the Department of Electrical Engineering of the University of Toronto during the summer of 1989

<u>Formal Methods in Computer-Aided Design</u> Ganesh Gopalakrishnan,Phillip Windley,2003-07-31 This book constitutes the refereed proceedings of the Second International Conference on Formal Methods in Computer Aided Design FMCAD 98 held in Palo Alto California USA in November 1998 The 27 revised full papers presented were carefully reviewed and selected from a total of 55 submissions Also included are four tools papers and four invited contributions The papers present the state of the art in formal verification methods for digital circuits and systems including processors custom VLSI circuits microcode and reactive software From the methodological point of view binary decision diagrams model checking symbolic reasoning symbolic simulation and abstraction methods are covered *Automatic Programming Applied to VLSI CAD Software: A Case Study* Dorothy E. Setliff,Rob A. Rutenbar,2012-12-06 This book and the research it describes resulted from a simple observation we made sometime in 1986 Put simply we noticed that many VLSI design tools looked alike That is at least at the overall software architecture level the algorithms and data structures required to solve problem X looked much like those required to solve problem X Unfortunately this resemblance is often of little help in actually writing the software for problem X given the software for problem X In the VLSI CAD world technology changes rapidly enough that design software must continually strive to keep up And of course VLSI design software and engineering design software in general is often exquisitely sensitive to some aspects of the domain technology in which it operates Modest changes in functionality have an unfortunate tendency to require substantial and time consuming internal software modifications Now observing that large engineering software systems are technology dependent is not particularly clever However we believe that our approach to xiv Preface dealing with this problem took an interesting new direction We chose to investigate the extent to which automatic programming ideas cold be used to synthesize such software systems from high level specifications This book is one of the results of that effort *IEICE Transactions on Fundamentals of Electronics, Communications and Computer Sciences* ,1992 *Neural Networks and Speech Processing* David P. Morgan,Christopher L. Scofield,2012-12-06 We would like to take this opportunity to thank all of those individ uals who helped us assemble this text including the people of Lockheed Sanders and Nestor Inc whose encouragement and support were greatly appreciated In addition we would like to thank the members of the Lab oratory for Engineering Man Machine Systems LEMS and the Center for Neural Science at Brown University for their frequent and helpful discussions on a number of topics discussed in this text Although we both attended Brown from 1983 to 1985 and had offices in the same building it is surprising that we did not meet until 1988 We also wish to thank Kluwer Academic Publishers for their profes sionalism and patience and the reviewers for their constructive criticism Thanks to John McCarthy for performing the final proof and to John Adcock Chip Bachmann Deborah Farrow Nathan Intrator Michael Perrone Ed Real Lance Riek and Paul Zemany for their comments and assistance We would also like to thank Khrisna Nathan our most unbi ased and critical reviewer for his suggestions for improving the content and accuracy of this text A special thanks goes to Steve Hoffman who was instrumental in helping us perform the experiments described in

Chapter 9   Computational Electronics Karl Hess,J.P. Leburton,U. Ravaioli,2013-03-14 Large computational resources are of ever increasing importance for the simulation of semiconductor processes devices and integrated circuits The Workshop on Computational Electronics was intended to be a forum for the dis cussion of the state of the art of device simulation Three major research areas were covered conventional simulations based on the drift diffusion and the hydrodynamic models Monte Carlo methods and other techniques for the solution of the Boltzmann transport equation and computational approaches to quantum transport which are relevant to novel devices based on quantum interference and resonant tunneling phenomena Our goal was to bring together researchers from various disciplines that contribute to the advancement of device simulation These include Computer Sci ence Electrical Engineering Applied Physics and Applied Mathematics The suc cess of this multidisciplinary formula was proven by numerous interactions which took place at the Workshop and during the following three day Short Course on Computational Electronics The format of the course including a number of tutorial lectures and the large attendance of graduate students stimulated many discussions and has proven to us once more the importance of cross fertilization between the different disciplines

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