

Principles And Practices Of Interconnection Networks

Principles and Practices of Interconnection Networks **Interconnection Networks Topological Structure and Analysis of Interconnection Networks** *Interconnections for Computer Communications and Packet Networks* **Graph Theory and Interconnection Networks** **Design of Interconnection Networks for Programmable Logic** *Interconnected Networks* **Crossbar-Based Interconnection Networks** *Universal Routing Strategies for Interconnection Networks* **Crossbar-Based Interconnection Networks Topological Structure and Analysis of Interconnection Networks** *SCI: Scalable Coherent Interface* *Design of Interconnection Networks for Programmable Logic* **Perspectives for Parallel Optical Interconnects** *Interconnections Universal Routing Strategies for Interconnection Networks* **Design of Cost-Efficient Interconnect Processing Units** **Fundamentals of Reliability Engineering** *Interconnecting the Network of Networks* **From Parallel to Emergent Computing** *Combinatorial Network Theory Networks for Grid Applications* **Interconnection Networks Proceedings of International Conference on Communication and Computational Technologies** **Interconnection Networks for Large-scale Parallel Processing** *High Performance Datacenter Networks* **Designing Network On-Chip Architectures in the Nanoscale Era** **Tutorial, Interconnection Networks for Parallel and Distributed Processing** **On-Chip Networks, Second Edition** *Graph Symmetry* *The Competitive Internet Service Provider* *Wireless Personal Area Networks* **Field-Programmable Logic and Applications: Reconfigurable Computing Is Going Mainstream** *Python in a Nutshell Arrangement Graphs* *Interconnection Networks and Data Prefetching for Large-scale Multiprocessors* *Architectures of Optical Interconnection Networks for High Performance Computing* *Unique Chips and Systems* **Cloud Network Management** **IP Telephony** **Interconnection Reference**

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High Performance Datacenter Networks Sep 10 2020 Datacenter networks provide the communication substrate for large parallel computer systems that form the ecosystem for high performance computing (HPC) systems and modern Internet applications. The design of new datacenter networks is motivated by an array of applications ranging from communication intensive climatology, complex material simulations and molecular dynamics to such Internet applications as Web search, language translation, collaborative Internet applications, streaming video and voice-over-IP. For both Supercomputing and Cloud Computing the network enables distributed applications to communicate and interoperate in an orchestrated and efficient way. This book describes the design and engineering tradeoffs of datacenter networks. It describes interconnection networks from topology and network architecture to routing algorithms, and presents opportunities for taking advantage of the emerging technology trends that are influencing router microarchitecture. With the emergence of "many-core" processor chips, it is evident that we will also need "many-port" routing chips to provide a bandwidth-rich network to avoid the performance limiting effects of Amdahl's Law. We provide an overview of conventional topologies and their routing algorithms and show how technology, signaling rates and cost-effective optics are motivating new network topologies that scale up to millions of hosts. The book also provides detailed case studies of two high performance parallel computer systems and their networks. Table of Contents: Introduction / Background / Topology Basics / High-Radix Topologies / Routing / Scalable Switch Microarchitecture / System Packaging / Case Studies / Closing Remarks

Interconnection Networks and Data Prefetching for Large-scale Multiprocessors Oct 31 2019

Interconnection Networks Dec 14 2020 Most of the articles in this book deal with static or point-to-point Interconnection Networks. In particular, new constructions are proposed based on different tools from discrete mathematics. Many new records have been established in the table of the maximum number of vertices of graphs with maximum degree D ; and diameter D . Properties of these networks (and of more classical ones) are analyzed in many of the other papers. About 40% of the articles deal with fault tolerance or vulnerability properties using either combinatorial tools or probabilistic ones.

Interconnections Aug 22 2021 Perlman, a bestselling author and senior consulting engineer for Sun Microsystems, provides insight for building more robust, reliable, secure and manageable networks. Coverage also includes routing and addressing strategies, VLANs, multicasting, IPv6, and more.

Tutorial, Interconnection Networks for Parallel and Distributed Processing Jul 09 2020

Cloud Network Management Jul 29 2019 Data storage, processing, and management at remote location over dynamic networks is the most challenging task in cloud networks. Users' expectations are very high for data accuracy, reliability, accessibility, and availability in pervasive cloud environment. It was the core motivation for the Cloud Networks Internet of Things (CNIoT). The exponential growth of the networks and data management in CNIoT must be implemented in fast growing service sectors such as logistic and enterprise management. The network based IoT works as a bridge to fill the gap between IT and cloud networks, where data is easily accessible and available. This book provides a framework for the next generation of cloud networks, which is the emerging part of 5G partnership projects. This contributed book has following salient features, A cloud-based next generation networking technologies. Cloud-based IoT and mobility management technology. The proposed book is a reference for research scholars and course supplement for cloud-IoT related subjects such as distributed networks in computer/ electrical engineering. Sanjay Kumar Biswash is working as an Assistant professor in NIIT University, India. He held Research Scientist position, Institute of Cybernetics, National Research Tomsk Polytechnic University, Russia. He was PDF at LNCC, Brazil and SDSU, USA. He was a visiting researcher to the UC, Portugal. Sourav Kanti Addya is working as an Assistant professor in NITK, Surathkal, India. He was a PDF at IIT Kharagpur, India. He was a visiting scholar at SDSU, USA. He obtained national level GATE scholarship. He is a member of IEEE, ACM.

Topological Structure and Analysis of Interconnection Networks Sep 03 2022 The advent of very large scale integrated circuit technology has enabled the construction of very complex and large interconnection networks. By most accounts, the next generation of supercomputers will achieve its gains by increasing the number of processing elements, rather than by using faster processors. The most difficult technical problem in constructing a supercomputer will be the design of the interconnection network through which the processors communicate. Selecting an appropriate and adequate topological structure of interconnection networks will become a critical issue, on which many research efforts have been made over the past decade. The book is aimed to attract the readers' attention to such an important research area. Graph theory is a fundamental and powerful mathematical tool for designing and analyzing interconnection networks, since the topological structure of an interconnection network is a graph. This fact has been universally accepted by computer scientists and engineers. This book provides the most basic problems, concepts

and well-established results on the topological structure and analysis of interconnection networks in the language of graph theory. The material originates from a vast amount of literature, but the theory presented is developed carefully and skillfully. The treatment is generally self-contained, and most stated results are proved. No exercises are explicitly exhibited, but there are some stated results whose proofs are left to the reader to consolidate his understanding of the material.

Perspectives for Parallel Optical Interconnects Sep 22 2021 This volume is a monograph on parallel optical interconnects. It presents not only the state-of-the-art in this domain but also the necessary physical and chemical background. It also provides a discussion of the potential for future devices. Both experts and newcomers to the area will appreciate the authors' proficiency in providing the complete picture of this rapidly growing field. Optical interconnects are already established in telecommunications and should eventually find their way being applied to chip and even gate level connections in integrated systems. The inspiring environment of the Basic Research Working Group on Optical Information Technology WOIT (3199), together with the excellent and complementary skills of its participants, make this contribution highly worthwhile. G. Metakides

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Graph Theory and Interconnection Networks Jul 01 2022 The advancement of large scale integrated circuit technology has enabled the construction of complex interconnection networks. Graph theory provides a fundamental tool for designing and analyzing such networks. Graph Theory and Interconnection Networks provides a thorough understanding of these interrelated topics. After a brief introduction to graph terminology, the book presents well-known interconnection networks as examples of graphs, followed by in-depth coverage of Hamiltonian graphs. Different types of problems illustrate the wide range of available methods for solving such problems. The text also explores recent progress on the diagnosability of graphs under various models.

IP Telephony Interconnection Reference Jun 27 2019 Addressing the growth of IP telephony service offerings within the corporate and residential realm, IP Telephony Interconnection Reference: Challenges, Models, and Engineering examines the technical and regulatory issues related to IP telephony interconnection at the large scale. It describes business and interconnection models, reviews emerging ar

Interconnecting the Network of Networks Apr 17 2021 This book describes the transformation of telecommunications from national network monopolies to a new system, the "network of networks," and the glue that holds it together, interconnection. By their very nature, monopoly-owned networks provided a small number of standardized, nationwide services. Over the past two decades, however, new forces in the world economy began to unravel this traditional system. The driving force behind the change was the shift toward an information-based economy. Especially for large organizations, the price, control, security, and reliability of telecommunications became variables requiring organized attention. Thus, monopoly began to give way to the "network of networks," the foundation of today's telecommunications and Internet infrastructure. Taking a broad, multidisciplinary perspective Eli Noam discusses the importance and history of interconnection policy, as well as recent policy reforms both within the United States and around the globe. Other important topics he discusses include interconnection prices, the unbundling of interconnection, and the technology of interconnection. He concludes with an examination of social and policy issues, including the free flow of content, universal service and privacy protection, and the future of telecommunications.

Networks for Grid Applications Jan 15 2021 This book constitutes the thoroughly refereed post-conference proceedings of the Second International Conference on Networks for Grid Applications, GridNets 2008, held in Beijing, China in October 2008. The 19 revised full papers presented together with 4 invited presentations were carefully reviewed and selected from 37 submissions. The papers address the whole spectrum of grid networks, ranging from formal approaches for grid management to case studies in optical switching.

Interconnection Networks for Large-scale Parallel Processing Oct 12 2020 Parallel computer systems are being used to forecast the weather, make maps, simulate chemical reactions, control air traffic, guide missiles, provide robots with vision, and manage ballistic missile defense. A major problem in designing large-scale parallel systems is the construction of an interconnection network to provide interprocessor communications. This book presents the theoretical basis and a number of case studies that demonstrate how this work is done. This revision includes the most recent research in the field.

Topological Structure and Analysis of Interconnection Networks Dec 26 2021 The advent of very large scale integrated circuit technology has enabled the construction of very complex and large interconnection networks. By most accounts, the next generation of supercomputers will achieve its gains by increasing the number of processing elements, rather than by using faster processors. The most difficult technical problem in constructing a supercomputer will be the design of the interconnection network through which the processors communicate. Selecting an appropriate and adequate topological structure of interconnection networks will become a critical issue, on which many research efforts have been made over the past decade. The book is aimed to attract the readers' attention to such an important research area. Graph theory is a fundamental and powerful mathematical tool for designing and analyzing interconnection networks, since the topological structure of an interconnection network is a graph. This fact has been universally accepted by computer scientists and engineers. This book provides the most basic problems, concepts and well-established results on the topological structure and analysis of interconnection networks in the language of graph theory. The material originates from a vast amount of literature, but the theory presented is developed carefully and skillfully. The treatment is generally self-contained, and most stated results are proved. No exercises are explicitly exhibited, but there are some stated results whose proofs are left to the reader to consolidate his understanding of the material.

Interconnection Networks Oct 04 2022 Foreword -- Foreword to the First Printing -- Preface -- Chapter 1 -- Introduction -- Chapter 2 -- Message Switching Layer -- Chapter 3 -- Deadlock, Livelock, and Starvation -- Chapter 4 -- Routing Algorithms -- Chapter 5 -- CollectiveCommunicationSupport -- Chapter 6 -- Fault-Tolerant Routing -- Chapter 7 -- Network Architectures -- Chapter 8 -- Messaging Layer Software -- Chapter 9 -- Performance Evaluation -- Appendix A -- Formal Definitions for Deadlock Avoidance -- Appendix B -- Acronyms -- References -- Index.

Design of Interconnection Networks for Programmable Logic Oct 24 2021 Programmable Logic Devices (PLDs) have become the key implementation medium for the vast majority of digital circuits designed today. While the highest-volume devices are still built with full-fabrication rather than field programmability, the trend towards ever fewer ASICs and more FPGAs is clear. This makes the field of PLD architecture ever more important, as there is stronger demand for faster, smaller, cheaper and lower-power programmable logic. PLDs are 90% routing and 10% logic. This book focuses on that 90% that is the programmable routing: the manner in which the programmable wires are connected and the circuit design of the programmable switches themselves. Anyone seeking to understand the design of an FPGA needs to become literate in the complexities of programmable routing architecture. This book builds on the state-of-the-art of programmable interconnect by providing new methods of investigating and measuring interconnect structures, as well as new programmable switch basic circuits. The early portion of this book provides an excellent survey of interconnection structures and circuits as they exist today. Lemieux and Lewis then provide a new way to design sparse crossbars as they are used in PLDs, and show that the method works with an empirical validation. This is one of a few routing architecture works that employ analytical methods to deal with the routing architecture design. The analysis permits interesting insights not typically possible with the standard empirical

approach.

Design of Interconnection Networks for Programmable Logic May 31 2022 Programmable Logic Devices (PLDs) have become the key implementation medium for the vast majority of digital circuits designed today. While the highest-volume devices are still built with full-fabrication rather than field programmability, the trend towards ever fewer ASICs and more FPGAs is clear. This makes the field of PLD architecture ever more important, as there is stronger demand for faster, smaller, cheaper and lower-power programmable logic. PLDs are 90% routing and 10% logic. This book focuses on that 90% that is the programmable routing: the manner in which the programmable wires are connected and the circuit design of the programmable switches themselves. Anyone seeking to understand the design of an FPGA needs to become literate in the complexities of programmable routing architecture. This book builds on the state-of-the-art of programmable interconnect by providing new methods of investigating and measuring interconnect structures, as well as new programmable switch basic circuits. The early portion of this book provides an excellent survey of interconnection structures and circuits as they exist today. Lemieux and Lewis then provide a new way to design sparse crossbars as they are used in PLDs, and show that the method works with an empirical validation. This is one of a few routing architecture works that employ analytical methods to deal with the routing architecture design. The analysis permits interesting insights not typically possible with the standard empirical approach.

Python in a Nutshell Jan 03 2020 Demonstrates the programming language's strength as a Web development tool, covering syntax, data types, built-ins, the Python standard module library, and real world examples.

Principles and Practices of Interconnection Networks Nov 05 2022 This book offers a detailed and comprehensive presentation of the basic principles of interconnection network design clearly illustrating them with numerous examples and case studies. It incorporates hardware-level descriptions of concepts.

Graph Symmetry May 07 2020 The last decade has seen two parallel developments, one in computer science, the other in mathematics, both dealing with the same kind of combinatorial structures: networks with strong symmetry properties or, in graph-theoretical language, vertex-transitive graphs, in particular their prototypical examples, Cayley graphs. In the design of large interconnection networks it was realised that many of the most frequently used models for such networks are Cayley graphs of various well-known groups. This has spawned a considerable amount of activity in the study of the combinatorial properties of such graphs. A number of symposia and congresses (such as the bi-annual IWIN, starting in 1991) bear witness to the interest of the computer science community in this subject. On the mathematical side, and independently of any interest in applications, progress in group theory has made it possible to make a realistic attempt at a complete description of vertex-transitive graphs. The classification of the finite simple groups has played an important role in this respect.

Interconnections for Computer Communications and Packet Networks Aug 02 2022 This book introduces different interconnection networks applied to different systems. Interconnection networks are used to communicate processing units in a multi-processor system, routers in communication networks, and servers in data centers. Queuing techniques are applied to interconnection networks to support a higher utilization of resources. There are different queuing strategies, and these determine not only the performance of the interconnection network, but also the set of requirements to make them work effectively and their cost. Routing algorithms are used to find routes to destinations and directions in what information travels. Additional properties, such as avoiding deadlocks and congestion, are sought. Effective routing algorithms need to be paired up with these networks. The book will introduce the most relevant interconnection networks, queuing strategies, and routing algorithm. It discusses their properties and how these leverage the performance of the whole interconnection system. In addition, the book covers additional topics for memory management and congestion avoidance, used to extract higher performance from the interconnection network.

On-Chip Networks, Second Edition Jun 07 2020 This book targets engineers and researchers familiar with basic computer architecture concepts who are interested in learning about on-chip networks. This work is designed to be a short synthesis of the most critical concepts in on-chip network design. It is a resource for both understanding on-chip network basics and for providing an overview of state-of-the-art research in on-chip networks. We believe that an overview that teaches both fundamental concepts and highlights state-of-the-art designs will be of great value to both graduate students and industry engineers. While not an exhaustive text, we hope to illuminate fundamental concepts for the reader as well as identify trends and gaps in on-chip network research. With the rapid advances in this field, we felt it was timely to update and review the state of the art in this second edition. We introduce two new chapters at the end of the book. We have updated the latest research of the past years throughout the book and also expanded our coverage of fundamental concepts to include several research ideas that have now made their way into products and, in our opinion, should be textbook concepts that all on-chip network practitioners should know. For example, these fundamental concepts include message passing, multicast routing, and bubble flow control schemes.

Proceedings of International Conference on Communication and Computational Technologies Nov 12 2020 This book offers a collection of high-quality peer-reviewed research papers presented at the Second International Conference on Communication and Computational Technologies (ICCCT 2019), held at Rajasthan Institute of Engineering and Technology, Jaipur, Rajasthan, India, on 30–31 August 2019. In contributions prepared by researchers from academia and industry alike, the book discusses a wide variety of industrial, engineering and scientific applications of emerging techniques.

SCI: Scalable Coherent Interface Nov 24 2021 Scalable Coherent Interface (SCI) is an innovative interconnect standard (ANSI/IEEE Std 1596-1992) addressing the high-performance computing and networking domain. This book describes in depth one specific application of SCI: its use as a high-speed interconnection network (often called a system area network, SAN) for compute clusters built from commodity workstation nodes. The editors and authors, coming from both academia and industry, have been instrumental in the SCI standardization process, the development and deployment of SCI adapter cards, switches, fully integrated clusters, and software systems, and are closely involved in various research projects on this important interconnect. This thoroughly cross-reviewed state-of-the-art survey covers the complete hardware/software spectrum of SCI clusters, from the major concepts of SCI, through SCI hardware, networking, and low-level software issues, various programming models and environments, up to tools and application experiences.

Wireless Personal Area Networks Mar 05 2020 Wireless Personal Area Networks provides an in-depth analysis of the recent IEEE 802.15.4 standard for low data rate wireless personal area networks (LR-WPANs), including suggestions to improve performance and comparisons with the related 802.15.1 (Bluetooth) standard. It assesses the suitability of the standard for the development and deployment of wireless sensor networks as well as providing guidance and insight into the relative advantages and disadvantages of various performance solutions. Wireless Personal Area Networks: Provides a comprehensive, in-depth look at the issues surrounding WPAN network operation and performance. Investigates multi-cluster networks and compares how they can be implemented. Analyzes the performance of a single cluster under different traffic and power management regimes including uplink vs. downlink traffic, acknowledged vs. unacknowledged traffic, saturation vs. non-saturation, and the like. Discusses security issues in WPANs such as different security threats, their impact on performance, standard security mechanisms, and security policies. Compares the IEEE 802.15.4 standard with the related Bluetooth IEEE 802.15.1 standard in terms of suitability for implementing wireless sensor networks. This reference is a valuable tool for developers and researchers getting acquainted with various aspects of IEEE 802.15.4 technology. Graduate students studying courses such as Performance Evaluation, Wireless Sensor Networks and Queuing Theory will also find this book very insightful.

Universal Routing Strategies for Interconnection Networks Jul 21 2021 This book presents the history and state of the art of universal routing strategies, which can be applied to networks independently of their respective topologies. It opens with a self-contained introduction, accessible also to newcomers. The main original results are new universal network protocols for store-and-forward and wormhole routing with small buffers or without buffers; these results are presented in detail and their potential applications are discussed. The book ends with a summary of open problems and an outlook of future directions in the area of routing theory.

Field-Programmable Logic and Applications: Reconfigurable Computing Is Going Mainstream Feb 02 2020 This book constitutes the refereed proceedings of the 12th International Conference on Field-Programmable Logic and Applications, FPL 2002, held in Montpellier, France, in September 2002. The 104 revised regular papers and 27 poster papers presented together with three invited contributions were carefully reviewed and selected from 214 submissions. The papers are organized in topical sections on rapid prototyping, FPGA synthesis, custom computing engines, DSP applications, reconfigurable fabrics, dynamic reconfiguration, routing and placement, power estimation, synthesis issues, communication applications, new technologies, reconfigurable architectures, multimedia applications, FPGA-based arithmetic, reconfigurable processors, testing and fault-tolerance, crypto applications, multitasking,

compilation techniques, etc.

Interconnected Networks Apr 29 2022 This volume provides an introduction to and overview of the emerging field of interconnected networks which include multilayer or multiplex networks, as well as networks of networks. Such networks present structural and dynamical features quite different from those observed in isolated networks. The presence of links between different networks or layers of a network typically alters the way such interconnected networks behave – understanding the role of interconnecting links is therefore a crucial step towards a more accurate description of real-world systems. While examples of such dissimilar properties are becoming more abundant – for example regarding diffusion, robustness and competition – the root of such differences remains to be elucidated. Each chapter in this topical collection is self-contained and can be read on its own, thus making it also suitable as reference for experienced researchers wishing to focus on a particular topic.

Arrangement Graphs Dec 02 2019

Design of Cost-Efficient Interconnect Processing Units Jun 19 2021 Streamlined Design Solutions Specifically for NoC To solve critical network-on-chip (NoC) architecture and design problems related to structure, performance and modularity, engineers generally rely on guidance from the abundance of literature about better-understood system-level interconnection networks. However, on-chip networks present several distinct challenges that require novel and specialized solutions not found in the tried-and-true system-level techniques. A Balanced Analysis of NoC Architecture As the first detailed description of the commercial Spidergon STNoC architecture, Design of Cost-Efficient Interconnect Processing Units: Spidergon STNoC examines the highly regarded, cost-cutting technology that is set to replace well-known shared bus architectures, such as STBus, for demanding multiprocessor system-on-chip (SoC) applications. Employing a balanced, well-organized structure, simple teaching methods, numerous illustrations, and easy-to-understand examples, the authors explain: how the SoC and NoC technology works why developers designed it the way they did the system-level design methodology and tools used to configure the Spidergon STNoC architecture differences in cost structure between NoCs and system-level networks From professionals in computer sciences, electrical engineering, and other related fields, to semiconductor vendors and investors – all readers will appreciate the encyclopedic treatment of background NoC information ranging from CMPs to the basics of interconnection networks. The text introduces innovative system-level design methodology and tools for efficient design space exploration and topology selection. It also provides a wealth of key theoretical and practical MPSoC and NoC topics, such as technological deep sub-micron effects, homogeneous and heterogeneous processor architectures, multicore SoC, interconnect processing units, generic NoC components, and embeddings of common communication patterns.

Universal Routing Strategies for Interconnection Networks Feb 25 2022 This book presents the history and state of the art of universal routing strategies, which can be applied to networks independently of their respective topologies. It opens with a self-contained introduction, accessible also to newcomers. The main original results are new universal network protocols for store-and-forward and wormhole routing with small buffers or without buffers; these results are presented in detail and their potential applications are discussed. The book ends with a summary of open problems and an outlook of future directions in the area of routing theory.

Fundamentals of Reliability Engineering May 19 2021 This book presents fundamentals of reliability engineering with applications in evaluating reliability of multistage interconnection networks. In the first part of the book, it introduces the concept of reliability engineering, elements of probability theory, probability distributions, availability and data analysis. The second part of the book provides an overview of parallel/distributed computing, network design considerations, and more. The book covers a comprehensive reliability engineering methods and its practical aspects in the interconnection network systems. Students, engineers, researchers, managers will find this book as a valuable reference source.

Architectures of Optical Interconnection Networks for High Performance Computing Sep 30 2019 High performance computing systems have made a spectacular progress over four decades. As microprocessor speeds reach the GHz region, fundamental communication limit further progress. Optical technology is promising to release the communication bottleneck by offering increased bandwidth and reduced latency and power. Recent breakthroughs are now leading to new opportunities in the creation of optical interconnection networks for high performance computing systems. The optical medium, however, presents challenges which complicate the design of optical interconnection networks. In this work, two optical interconnection network architectures are presented, in an attempt to address the requirements of HPC systems in terms of bandwidth, latency, and power while understanding and abiding by the properties and limitations of optical switching and transmission technologies. We conclude that optical interconnection networks offer advantages that will inevitably lead to their integration in HPC systems. This integration, when it happens, will require a paradigm shift in interconnection network design and architecture. The work presented is an example of this paradigm shift.

Combinatorial Network Theory Feb 13 2021 A basic problem for the interconnection of communications media is to design interconnection networks for specific needs. For example, to minimize delay and to maximize reliability, networks are required that have minimum diameter and maximum connectivity under certain conditions. The book provides a recent solution to this problem. The subject of all five chapters is the interconnection problem. The first two chapters deal with Cayley digraphs which are candidates for networks of maximum connectivity with given degree and number of nodes. Chapter 3 addresses Bruijn digraphs, Kautz digraphs, and their generalizations, which are candidates for networks of minimum diameter and maximum connectivity with given degree and number of nodes. Chapter 4 studies double loop networks, and Chapter 5 considers broadcasting and the Gossiping problem. All the chapters emphasize the combinatorial aspects of network theory. Audience: A vital reference for graduate students and researchers in applied mathematics and theoretical computer science.

Crossbar-Based Interconnection Networks Mar 29 2022 This unique text/reference provides an overview of crossbar-based interconnection networks, offering novel perspectives on these important components of high-performance, parallel-processor systems. A particular focus is placed on solutions to the blocking and scalability problems. Topics and features: introduces the fundamental concepts in interconnection networks in multi-processor systems, including issues of blocking, scalability, and crossbar networks; presents a classification of interconnection networks, and provides information on recognizing each of the networks; examines the challenges of blocking and scalability, and analyzes the different solutions that have been proposed; reviews a variety of different approaches to improve fault tolerance in multistage interconnection networks; discusses the scalable crossbar network, which is a non-blocking interconnection network that uses small-sized crossbar switches as switching elements. This invaluable work will be of great benefit to students, researchers and practitioners interested in computer networks, parallel processing and reliability engineering. The text is also essential reading for course modules on interconnection network design and reliability.

From Parallel to Emergent Computing Mar 17 2021 Modern computing relies on future and emergent technologies which have been conceived via interaction between computer science, engineering, chemistry, physics and biology. This highly interdisciplinary book presents advances in the fields of parallel, distributed and emergent information processing and computation. The book represents major breakthroughs in parallel quantum protocols, elastic cloud servers, structural properties of interconnection networks, internet of things, morphogenetic collective systems, swarm intelligence and cellular automata, unconventionality in parallel computation, algorithmic information dynamics, localized DNA computation, graph-based cryptography, slime mold inspired nano-electronics and cytoskeleton computers. Features Truly interdisciplinary, spanning computer science, electronics, mathematics and biology Covers widely popular topics of future and emergent computing technologies, cloud computing, parallel computing, DNA computation, security and network analysis, cryptography, and theoretical computer science Provides unique chapters written by top experts in theoretical and applied computer science, information processing and engineering From Parallel to Emergent Computing provides a visionary statement on how computing will advance in the next 25 years and what new fields of science will be involved in computing engineering. This book is a valuable resource for computer scientists working today, and in years to come.

Unique Chips and Systems Aug 29 2019 Which came first, the system or the chip? While integrated circuits enable technology for the modern information age, computing, communication, and network chips fuel it. As soon as the integration ability of modern semiconductor technology offers presents opportunities, issues in power consumption, reliability, and form-factor present challenges. The demands of emerging software applications can only be met with unique systems and chips. Drawing on contributors from academia, research, and industry, Unique Systems and Chips explores unique approaches to designing future computing and communication chips and systems. The book focuses on specialized hardware and systems as opposed to general-purpose chips and systems. It covers early conception and simulation, mid-development, application, testing, and performance. The chapter authors introduce new ideas and innovations in unique aspects of chips and system design, then go on to provide in-depth analysis of these ideas. They explore ways in which these chips and systems may be used in further designs or products, spurring

innovations beyond the intended scopes of those presented. International in flavor, the book brings industrial and academic perspectives into focus by presenting the full spectrum of applications of chips and systems.

Crossbar-Based Interconnection Networks Jan 27 2022 This unique text/reference provides an overview of crossbar-based interconnection networks, offering novel perspectives on these important components of high-performance, parallel-processor systems. A particular focus is placed on solutions to the blocking and scalability problems. Topics and features: introduces the fundamental concepts in interconnection networks in multi-processor systems, including issues of blocking, scalability, and crossbar networks; presents a classification of interconnection networks, and provides information on recognizing each of the networks; examines the challenges of blocking and scalability, and analyzes the different solutions that have been proposed; reviews a variety of different approaches to improve fault tolerance in multistage interconnection networks; discusses the scalable crossbar network, which is a non-blocking interconnection network that uses small-sized crossbar switches as switching elements. This invaluable work will be of great benefit to students, researchers and practitioners interested in computer networks, parallel processing and reliability engineering. The text is also essential reading for course modules on interconnection network design and reliability.

Designing Network On-Chip Architectures in the Nanoscale Era Aug 10 2020 Going beyond isolated research ideas and design experiences, Designing Network On-Chip Architectures in the Nanoscale Era covers the foundations and design methods of network on-chip (NoC) technology. The contributors draw on their own lessons learned to provide strong practical guidance on various design issues. Exploring the design process of the network, the first part of the book focuses on basic aspects of switch architecture and design, topology selection, and routing implementation. In the second part, contributors discuss their experiences in the industry, offering a roadmap to recent products. They describe Tiler's TILE family of multicore processors, novel Intel products and research prototypes, and the TRIPS operand network (OPN). The last part reveals state-of-the-art solutions to hardware-related issues and explains how to efficiently implement the programming model at the network interface. In the appendix, the microarchitectural details of two switch architectures targeting multiprocessor system-on-chips (MPSoCs) and chip multiprocessors (CMPs) can be used as an experimental platform for running tests. A stepping stone to the evolution of future chip architectures, this volume provides a how-to guide for designers of current NoCs as well as designers involved with 2015 computing platforms. It cohesively brings together fundamental design issues, alternative design paradigms and techniques, and the main design tradeoffs—consistently focusing on topics most pertinent to real-world NoC designers.

The Competitive Internet Service Provider Apr 05 2020 Due to the dramatic increase in competition over the last few years, it has become more and more important for Internet Service Providers (ISPs) to run an efficient business and offer an adequate Quality of Service. The Competitive Internet Service Provider is a comprehensive guide for those seeking to do just that. Oliver Heckmann approaches the issue from a system point of view, looking not only at running a network, but also at connecting the network with peering and transit partners or planning the expansion of the network. The Competitive Internet Service Provider: Offers an advanced reference on the topic, drawing on state-of-the-art research in network technology. Clearly defines the criteria enabling ISPs to operate with the greatest efficiency and deliver adequate Quality of Service. Discusses the implications of the future multiservice Internet and multimedia applications such as Voice over IP, peer-to-peer, or network games. Delivers a comparative evaluation of different feasible Quality of Service approaches. Explores scientific methods such as queuing theory, network calculus, and optimization theory. Illustrates concepts throughout with mathematical models and simulations. This invaluable reference will provide academic and industrial researchers in the field of network and communications technology, graduate students on telecommunications courses, as well as ISP managers, engineers and technicians, equipment manufacturers and consultants, with an understanding of the concepts and issues involved in running a successful ISP.