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Crossbar-Based Interconnection Networks

Blocking, Scalability, and Reliability

Springer

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Preface

Interconnection networks are used in multiprocessor systems in order to establish the connection between the various nodes such as processors and memory modules. Blocking problem has always been considered as one of the most challenging issues in these networks, which degrades network performance and consequently the performance of the whole system. In the meantime, the main option for dealing with this problem is the use of non-blocking crossbar networks. However, there are engineering and scaling difficulties to use these networks in large-scale systems; the number of pins on a VLSI chip cannot exceed a few hundreds, which restricts the size of the largest crossbar that should be integrated into a single VLSI chip. However, there is a reasonable solution to the exploitation of the crossbar network in large-scale systems. The solution is using small-size crossbar networks as building blocks for larger network sizes. So far, this idea has led to a variety of topologies designed to meet the problems of blocking and scalability. Therefore, having the knowledge of different types of these crossbar-based networks and their strengths and weaknesses is essential in the design and selection of efficient interconnection networks.

Based on the above discussions, the focus of this book is on the *Crossbar-Based Interconnection Networks* to provide different perspectives required to recognize these momentous networks. This book consists of the following chapters:

Chapter 1 (*Introduction*): This chapter contains some introductory information for understanding the role of interconnection networks in multiprocessor systems, blocking problem, crossbar network and scalability problem, and existing solutions to address the scalability and blocking problems.

Chapter 2 (*Interconnection Networks*): This chapter presents a classification of interconnection networks and then attempts to provide the necessary information to recognize any of the networks.

Chapter 3 (*Blocking Problem*): This chapter is focused on the problem of blocking and analysis of different existing solutions to solve the problems of blocking and scalability.

Chapter 4 (*Fault-Tolerant Multistage Interconnection Networks*): Use of fault-tolerant multistage interconnection networks is a scalable solution to the blocking problem reduction. Therefore, this chapter analyzes a variety of different approaches to improve fault tolerance on multistage interconnection networks.

Chapter 5 (*Scalable Crossbar Network*): This chapter discusses the scalable crossbar network, which is a non-blocking interconnection network and uses small-size crossbar switches as switching elements.

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