Foreword

We are moving towards a society which requires that we have access to information at our finger tips *when we need it*, *where we need it*, and *in whatever format we need it*. The information is provided to us through our global mesh of communication networks, whose current implementations, e.g., today's Internet and asynchronous transfer mode (ATM) networks, do not have the capacity to support the foreseeable bandwidth demands. High-capacity optical networks employing wavelength division multiplexing (WDM) will provide the bandwidth capability for current and future needs.

Design of such high-speed networks in various settings is the focus of this book. As described in (Mukherjee, 1997), a local area WDM network will typically consist of a number of nodes which are connected via two-way optical fibers either to some physical network medium or directly to other nodes. The simplest and most popular interconnection device for a local area WDM network is the passive-star coupler which provides a broadcast medium. The broadcast capability of the star coupler combined with multiple WDM channels allows for a wide range of possible media access protocols (Mukherjee, 1992a; Mukherjee, 1992b). Also, since the star coupler is a passive device, it is fairly reliable. A typical design problem in this setting is to optimize the number of amplifiers in the network and hence, the overall cost of the network. This is the problem described in Chapters 3 and 4 of this book.

Optical networks proposed for a larger geographical domain employ other physical devices. A broadcast optical network does not allow the reuse of wavelengths to create more simultaneous connections. It is anticipated that the next generation of optical networks will make use of optical routers and switching elements to allow all-optical lightpaths to be set up from a source node to a destination node, thus bypassing electronic bottlenecks at intermediate switching nodes. Also, WDM will

allow multiple lightpaths to share each fiber link. The concept of WDM lightpaths is analogous to a multilane express highway which can be used to bypass stoplights on city roads. The use of wavelength converters in such wavelength-routed WDM optical networks is the focus of Chapter 5 of this book.

Optics has many desirable characteristics, but it also possesses some not-so-desirable properties. It is beneficial to correct several of these "mismatches" using intelligent networking algorithms, one example of which is presented in Chapter 6 of this book. The work presented here estimates the on-line Bit-Error Rate (BER) on candidate routes and wavelengths in an optical network before setting up a lightpath. It is crucial to incorporate physical layer device characteristics and constraints in WDM network design and control to realize feasible and realistic solutions.

The field of optical WDM networks has experienced widespread attention and growth in recent years. This book, I believe, will be a welcome addition to the literature focusing on this exciting technology!

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