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Abstract

Nowadays, optical communications and networks support the spread of the Internet in every aspect. It is no exaggeration to say that data travels in the form of light across the planet. Photons reach our homes using the FTTH technologies, across oceans hundreds of fiber links interconnect continents with data rates of Tbps, while satellites communicate with each other with beams of light. Even inside the cloud infrastructures of big technological giants such as Google, Amazon, Microsoft etc., the data exchange between servers is performed over fiber links, while soon photons will interconnect the processors inside a motherboard. This book captures state-of-the-art developments in the science and technology about optical communications and networks. First, it presents their historical development, focusing on state-of-the-art services and trends. It presents the structure of the optical fiber, studying the propagation in it. It also presents the technologies of optical devices such as couplers, amplifiers, transmitters etc. and studies modulation and detection

schemes. Emphasis is placed on optical multiplexing techniques and especially on WDM and its functional components such as multiplexers etc. Since all-optical networking is a contemporary challenge, this book studies optical switching, routing, wavelength assignment and conversion, and gives the operating principles of optical devices such as add/drop multiplexers, OXCs etc. Moreover, this book presents architectures and protocols at all optical networking scales. In particular, it presents architectures of local area optical broadcast-and-select networks, studying various synchronous and asynchronous transmission protocols, multiple access protocols and their performance. Additionally, it presents the key technologies of optical access networks, such as FTTx, new generation PONs and free space links. Finally, it gives the design principles of optical MANs, such as SONET/SDH, as well as the OTN architecture. This book concludes by describing the principles of OBS networks studying the burst assembly mechanism and various signaling protocols.

