

All-Optical Networking: Concepts and Enabling Technologies

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Abstract

Format: This is an interactive half-day workshop, augmented by a series of experimental demonstrations that help to solidify the underlying concepts.

Motivation: The evolution of DWDM Optical Networking has revolutionized the telecommunications industry. The increased capacity, especially in the core network (long-haul and metro) has kept up with the demand brought about by the growth of the Internet. Due to the Telecommunications Act of 1996, however, the capacity growth at **the edge** of the network (or the last mile) has not kept up with the growth in the core. This has led to a bandwidth misdistribution. It is believed that in the next few years, lower-cost optical networking is expected to continue the revolution at the edge in order to meet the demands. This is because of expected introduction of new and enabling technologies such as OCDMA and HWDM.

Workshop Objectives: Upon successful completion of this short course, the students/attendees are expected to **see the light** and claim a fundamental knowledge of the concepts and techniques involved in this still evolving technology. He/she should be able to learn and understand the following principles:

- Fundamentals of optical communications
- Key components and building blocks of an optical communication system
- Main properties of physical media for both guided (i.e. fiber) transmission and spatial (unguided) transmission.
- Multiplexing Space.
 - WDM optical networking (BWDM, CWDM, DWDM, HWDM)
 - Optical CDMA principles
- Enabling technologies
 - Optical amplifiers
 - Optical Add/Drop Multiplexers
 - Optical Cross-Connect Systems
 - Opaque and transparent networks
- Fundamentals of networks architectures in the core and the edge.
- Prediction of how this industry could evolve.
 - Visions for an All-Optical Internet

Demonstrations: Logistics permitting, his workshop will be complemented with a series of experimental demonstrations that help to solidify the underlying fundamentals.

Note: This course has been developed and condensed from numerous tutorials and short courses presented at various conferences and universities by the author.

Biography

Mohammad T. Fatehi received his B.E. from the American University of Beirut, Beirut, Lebanon and his M.Sc. as well as his Ph.D from Ohio State University, Columbus, Ohio, all in Electrical Engineering. Currently, he is a research faculty member at the [Advanced Communications Research Institute](#) (ACRI), Department of Electrical Engineering, [Sharif University of Technology](#).

Formerly, he was a Distinguished Member of Technical Staff (DMTS) at Bell Laboratories (AT&T, Lucent Technologies, and Agere Systems), Holmdel, NJ. At Bell Labs, he has consistently been a major contributor to advancement of DWDM optical networking r/evolution including: all-optical performance motoring and fault location, switching, and other optical networking innovations.

Prior to joining Bell Labs in 1986, he was a member of the faculty of the department of Physical Medicine and Rehabilitation, College of Medicine, the Ohio State University. He was also the director and the co-founder of the Ohio State University Human Gait Laboratory (OSU Gait Lab). Gait Lab is now a standard clinical and diagnostic tool for locomotion studies. He also pioneered the development of early PC-based electromyography for clinical applications.

Dr. Fatehi holds more than 100 issued patents [worldwide](#) including over 30 [US patents](#), mostly relating to optical networking enablers. He is well published and has given paper presentations, short courses, tutorials and workshops at numerous national and international conferences as well as teaching in traditional and [virtual classrooms](#). He is a Senior Member of the IEEE and a member of the American Paraplegia Society.