IEEE

IEEE INGR

International Network Generations Roadmap

2022 Edition

Optics

IEEE Future NETWORKS

An IEEE 5G and Beyond Technology Roadmap

futurenetworks.ieee.org/roadmap

Table of Contents

Tables

Figures

ABSTRACT

Optical networks have long played a central role in telecommunication networks, forming the fiber backbone of the Internet. Over time fiber optic systems have evolved and found deployment increasingly closer to the network edge. Today, optical systems extend to the server network interface cards and home access networks. New application areas have emerged such as the use of free space communications using LiFi technologies, space communication networks between satellites and ground stations. Looking ahead, optical systems in many areas will continue to be driven by the need for higher speeds and capacity in order to keep up with traffic demands. In addition to faster interfaces speeds, parallel fiber or spatial division multiplexing will be used for future capacity growth. In several application areas, new functionality is expected such as low latency in Xhaul networks and optical switching and co-packaged optics in data centers. LiFi will become critical for mitigating RF interference for in-building networks. Intense research is underway to develop quantum networks to connect quantum computers. This general trend toward new functionalities for optical systems, moving beyond capacity growth in fiber networks, is driven in large part by the increasing performance and demands of today's user equipment and applications. From the network edge to the data centers, components are reliant on optics. The integration of optics into these new applications and the higher levels of functionality demanded of optics motivate the use of roadmaps to guide research and development and overcome future roadblocks.

Key words:

Optical networks, Xhaul, LiFi, space communications, wavelength division multiplexing, spatial division multiplexing, quantum networks, data center interconnect, data center networks, co-packaged optics.

CONTRIBUTORS

Dan Kilper (Co-Chair)	CONNECT, Trinity College Dublin, Ireland
Thas A Nirmalathas (Co-Chair)	The University of Melbourne, Australia
Tom Hausken	OSA
Reza Vaez-Ghaemi	Viavis Solutions
HwanSeok Chung	ETRI, S Korea
Prakash Ramchandran	Cloud24x7
Volker Jungnickel	HHI Germany
Murat Yuksel	University of Central Florida, USA
Surgey Ten	Corning, USA
Rudra Dutta	North Carolina State University, USA
Paolo Monti	Chalmers University of Technology, Sweden
Lena Wosinska	Chalmers University of Technology, Sweden
Peter Andrekson	Chalmers University of Technology, Sweden
Suresh Subramaniam	George Washington University, USA
Ahsutosh Dutta	Applied Physics Laboratory, John Hopkins University, USA
KRS Murthy	i3 World, USA
Zuqing Zhu	University of Science and Technology of China, China
Brad Kloza	IEEE Future Networks Initiative
Matthew Borst	IEEE Future Networks Initiative

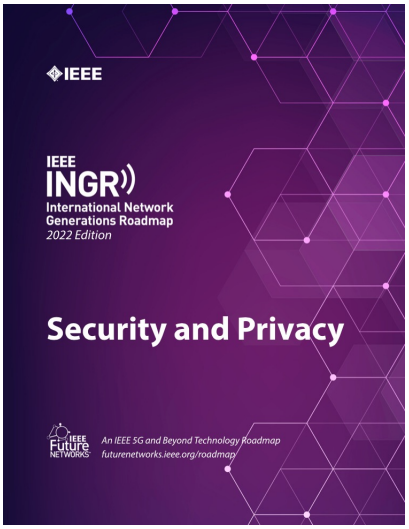
Other Working Group Members
Haydar Çukurtepe (TED University, Turkey)
Rentao Gu (Beijing University of Post and Telecommunications, China)

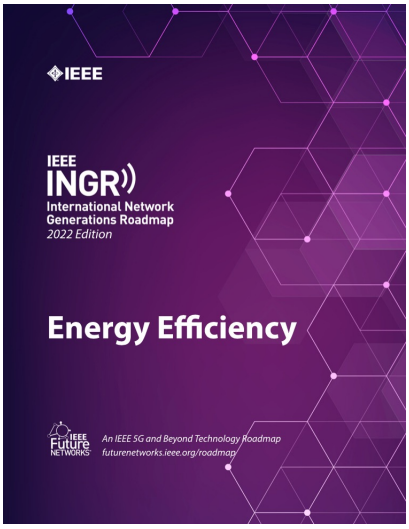
Want to read the full chapter?

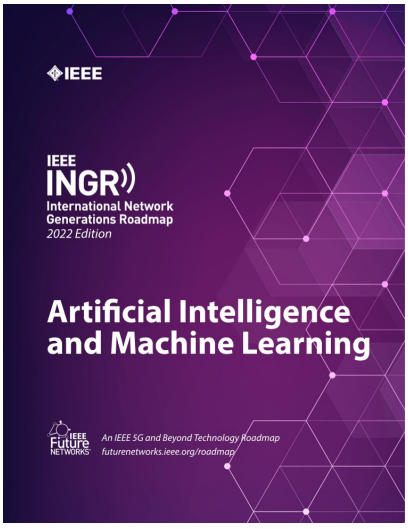
Accessing full INGR chapters is easy and affordable.

Step 1. Click here to join the Future Networks initiative (free for any IEEE Society member, and low-cost for non-members)

Step 2. Return to the INGR page to download full chapters.







14 chapters available!