100 GIGABIT ETHERNET TRANSPORT

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As optical networks demand ever increasing data rates, driven by video sharing, high-definition video on demand, network computing, and other applications, much research effort has been devoted to the development of 100G converged transport and Ethernet for carrier networks and enterprise applications. *IEEE Communications Magazine* previously published a series on 100GbE development in the supplemental issues of *IEEE Application & Practice* in November and December 2007. In this follow-up series we present two columns and six articles covering new developments in 100GbE, including discussions on key enabling technologies, implementation and field experiments, network requirements, and an update on the progress toward the establishment of 100GbE standards.

The introductory section contains columns from a standards body and a carrier operator. The first of these, "100 Gigabit Ethernet and Beyond" by J. D'Ambrosia, discusses development in the nearly completed IEEE P802.3ba standard for 40 Gb/s and 100 Gb/s Ethernet, and previews future-generation Ethernet that will operate at even higher data rates. The second column, "The Road to 100G Deployment" by G. Wellbrock *et al.*, reviews a carrier's field trials leading to the first commercial deployment of 100 Gb/s technology in a live network in Europe.

Following the introduction, the six contributor articles discuss the evolution of optical transport networks (OTNs) using 100Gb/s Ethernet (100GbE). The first article, "OTN Evolving with 100GbE" by J. Roese *et al.*, looks at the system requirements and enabling technologies for ITU-T Recommendation G.709, recently revised for 40GbE and 100GbE transport.

The second article, "Optical Transceivers for 100GbE and Its Transport" by J. Anderson *et al.*, covers progress in the manufacture of 100G transceivers at client and line sides, the 100G form-factor Pluggable Multi-Source Agreement (CFP MSA), and the Optical Internetworking Forum (OIF) 100G Transponder Module Implementation Agreement, respectively.

The third article, "100GbE PHY and MAC Layer Implementations" by H. Toyoda *et al.*, looks at cutting-edge implementations of 100GbE using a parallel processed physical coding sublayer (PCS) on aFPGA, and low-power design of complementary metal oxide semiconductor (CMOS) 10:4 gearbox large-scale integration (LSI).

The fourth article, "FEC for 100G Transport Networks" by F. Chang *et al.*, looks at the importance of forward error correction (FEC) coding for 40 and 100 Gb/s dense wavelength-division multiplex (DWDM) amplified transmission, providing a historical overview of technological progress from block codes to concatenated codes, to the newest soft-decision FEC codes.

The fifth article, "Ultra-High-Capacity DWDM Transmission System" from J. Yu *et al.*, investigates high-speed optical signal generation and digital coherent detection of multilevel modulation formats such as quaternary phase shift keying (QPSK), 8-PSK, 8-quadrature amplitude modulation (QAM), and 16-QAM.

The last article, "Advanced Optical Modulation and Multiplexing Technologies for High-Capacity OTN" by Y. Miyamoto *et al.*, looks at the challenges of high spectral efficiency, and discusses novel no-guard-interval orthogonal frequency-division multiplexing (OFDM) as a suitable modulation format for achieving beyond 100 Gb/s per wavelength channel.

Finally, please join us in acknowledging all the contributors who submitted manuscripts and made possible this installment of this series, as well as all the reviewers who helped with thoughtful and timely reviews. Future issues of the 100G Ethernet series will continue to cover core technologies and applications that are enabling new and emerging 100G system development and deployment. We thank Dr. Nim Cheung, Editor-in-Chief, for his support and guidance, and Ms. Devika Mittra and Ms. Jennifer Porcello for their assistance and endeavor in preparing the issue for publication.

BIOGRAPHIES

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