

OFC/NFOEC 2014 Archive

Technical Conference 9-14 March 2014

Exposition 11-13 March 2014

Moscone Center, San Francisco, California, USA

SAN FRANCISCO, March 14, 2014—Amongst the 800 presentations, 550 exhibitors and 12,700 attendees, the 2014 OFC Conference and Exposition left the optical communications community with valuable insights into the latest research in the field, current products and services on the market today and future industry trends. Space-division multiplexing (SDM), silicon photonics, 1 Tb/s optical networking were hot topics on the technical side, while data centers, photonics integration, 100G+ coherent transmission and software-defined networking (SDN) were prominent topics on the exhibit side.

“OFC is the only place where professionals in the optical communications space can get an all inclusive look at every side of the industry,” said OFC 2014 General Co-Chair Ed Murphy of JDSU. “We say OFC is the most comprehensive event for optical networking and after a week like this, you can see it lives up to that designation. OFC is critical for anyone who wants to stay on top of the field and advance their career or business.”

Experts and Luminaries

Keynote speakers from the business side (Ciena CEO Gary Smith, MIT’s David Clark) as well as the technical side (Robert Tkach, Alcatel-Lucent Bell Labs) provided unique perspectives on everything from network evolution to packet optical technologies to SDM.

Hot Topics & Current Trends

Visit any one of the dozens of show floor programs and buzz words such as SDN, 100G coherent, Gigabit Ethernet and silicon photonics could be heard at every level of the supply chain. Panels on SDN explored monetization and virtualization, while workshops and technical papers looked at the viability of SDM for addressing the bandwidth capacity crunch.

Business News

Companies made news with more than 100 announcements in 100G coherent modules, optical transceivers for data centers, software-based solutions and more. Analysts at “The Buzz” panel provided an insider’s perspective on the latest news coming out of the conference. “100G is here. 200G is happening and 400G is around the corner,” said moderator Julie Kunstler of Ovum. “Everything that was promised is here or on its way.” Companies also provided insights through their participation in show floor programming such as Market Watch, covering 100G, data center architecture and PIC vs. Silicon Photonics, and Service Provider Summit, covering packet

optical convergence and network evolution.

“Each year, OFC is the place to go to hear groundbreaking research from respected experts from academia and industry and to understand the latest business news and trends,” said AT&T’s Kathy Tse, 2014 OFC Program Co-Chair and 2015 OFC General Co-Chair. “This year we saw groups from around the world announcing the latest results in SDN, SDM and silicon photonics, among others. There is something for everyone at OFC and I’m excited to keep this year’s momentum going as we head to Los Angeles in 2015.”

Join OFC in Los Angeles, Calif., USA for next year’s event, March 22 – 26, 2015 at the Los Angeles Convention Center.

About OFC

For more than 35 years, OFC has been the premier destination for converging breakthrough research and innovation in telecommunications, optical networking, fiber optics and, recently, datacom and computing. Consistently ranked in the top 200 tradeshows in the United States, and named one of the Fastest Growing Trade Shows in 2012 by TSNN, the conference unites service providers, systems companies, enterprise customers, IT businesses, and component manufacturers, with researchers, engineers, and development teams from around the world. OFC includes dynamic business programming, an exposition of more than 550 companies, and cutting-edge peer-reviewed research that, combined, showcase the trends and pulse of the entire optical networking and communications industry. OFC is managed by The Optical Society (OSA) and co-sponsored by OSA, the IEEE Communications Society (IEEE/ComSoc), and the IEEE Photonics Society. OFC 2015 takes place March 22-26 at the Los Angeles Convention Center, Los Angeles, California, USA.

Download pages from the OFC program book.

[Agenda of Sessions](#)

[Abstracts](#)

[Key to Authors](#)

2014 OFC Committees

General Chairs

Yun Chung, *Korea Advanced Inst. of Science & Tech, Korea, Republic of*

Ed Murphy, *JDSU, USA*

Vishnu Shukla, *Verizon Labs, USA*

Program Chairs

Chris Doerr, *Acacia, USA*

Ken-ichi Sato, *Nagoya Univ., Japan*
Kathy Tse, *AT&T, USA*

1. Optical Network Architecture, Control and Services

Martin Birk, *AT&T Labs, USA*, Subcommittee Chair
Zeljko Bulut, *Coriant, USA*
Tom Issenhuth, *Microsoft, USA*
Ron Johnson, *Cisco, USA*
Bernhard Kubis, *ADVA Optical, Germany*
Matthew Ma, *Tata Communications, USA*
Inder Monga, *Esnet, USA*
Takuya Ohara, *NTT, Japan*
Daniel Peterson, *Verizon, USA*
Ronald A. Skoog, *Applied Communications Sciences, USA*

2: Optical Networking Technologies and Demonstrations

Thomas Wood, *LGS Innovations, USA*, Subcommittee Chair
Carlo Cavazzoni, *Telecom Italia, Italy*
Jim Jaques, *LGS Innovations, USA*
Inuk Kang, *Seoul National Univ., Korea, Republic of*
Stephen Liu, *Verizon, USA*
Thierry Marcot, *France Telecom/Orange Labs, France*
Takehiro Tsuritani, *KDDI, Japan*
Sheri Woodward, *AT&T Labs, USA*
Xi Wang, *Fujitsu Labs of America, USA*
Richard Younce, *Tellabs, USA*

3: FTTx Technologies, Deployment and Applications

Rajesh Yadav, *Verizon, USA*, Subcommittee Chair
Pedram Dashti, *Google, USA*
Frank Escher, *Deutsche Telecom, Germany*
Ed Harstead, *Alcatel-Lucent, USA*
Denis Khotimsky, *ZTE, USA*
Shunji Kimura, *NTT Access Network Lab, Japan*
Susumu Kinoshita, *Fujitsu, Japan*
Yuanqiu Luo, *Huawei, USA*
Albert Rafel, *BT, UK*
Fabrice Bourgart, *France Telecom, France*

4. Market Watch and Service Provider Summit

Steve Plote, *BTI Systems, USA*, Subcommittee Chair
Sam Liu, *Juniper Networks, USA*, SPS lead
Frank Chang, *Inphi Corp., USA*, MW lead
Ray Mota, *ACG, USA*
Ian Redpath, *Ovum, USA*

5. Fibers and Optical Propagation Effects

Misha Brodsky, *AT&T Labs, USA, Subcommittee Chair*

Shahraam Afshar, *Univ. of Adelaide, Australia*

Scott Bickman, *Corning, USA*

Liang Dong, *Clemson Univ., USA*

Tetsuya Nakanishi, *Sumitomo Electric Industries, Ltd., Japan*

Stojan Radic, *Univ. of California, San Diego, USA*

Thierry F. Taunay, *OFS Labs., USA*

Moshe Tur, *Tel Aviv Univ., Israel*

Sergei Turitsyn, *Aston Univ., UK*

Alexey Turukhin, *TE SubCom, USA*

6. Fiber Devices and Their Waveguide-based Equivalents: Amplifiers, Lasers, Sensors, and Performance Monitors

Lutz Rapp, *Coriant, Germany, Subcommittee Chair*

Kazi Abedin, *OFS Labs., USA*

Zuyuan He, *Shanghai Jiao Tong Univ., China*

Dahv Kliner, *nLight, USA*

Peter Krummrich, *Technical Univ. of Dortmund, Germany*

Bill Kuo, *Univ. of California, San Diego, USA*

Shu Namiki, *AIST, Japan*

Yoichi Oikawa, *Trimatiz Ltd., Japan*

Radan Slavik, *Univ. of Southampton, UK*

Camille Sophie Brès, *Ecole polytechnique fédérale de Lausanne, Switzerland*

Yoshinori Yamamoto, *Sumitomo, Japan*

7. Optical Devices for Switching, Filtering, and Interconnects

Juerg Leuthold, *Swiss Federal Inst. of Tech., Inst. of Photonics Systems, Switzerland, Subcommittee Chair*

Markus C. Amann, *Technische Universität München*

Daoxin Dai, *Zhejiang Univ., China*

Jurgen Michel, *MIT, USA*

Katsunari Okamoto, *AiDi Corp, Japan*

Andrew Poon, *Hong Kong Univ. of Science and Tech.*

Milos Popovic, *Univ. of Colorado*

Roland Ryf, *Bell Labs, Alcatel Lucent, USA*

Takashi Saida, *NTT, Japan*

Tsung-Yang (Jason) Liow, *Inst. of Micro Electronics (IME), Singapore*

Joris van Campenhout, *IMEC, Belgium*

8. Optoelectronic Devices

Yuliya Akulova, *JDSU, USA, Subcommittee Chair*

Larry Coldren, *Unv. of California, Santa Barbara, USA*

Po Dong, *Bell Labs, Alcatel-Lucent, USA*

Jonathan Klamkin, *Boston Univ., USA*

Dan Kuchta, *IBM T. J. Watson Research Ctr, USA*

Shinji Matsuo, *NTT Photonics Labs., Japan*
Huapu Pan, *Huawei Technologies, USA*
Gunther Roelkens, *Ghent Univ./IMEC, Belgium*
Liming Zhang, *Bell Labs, Alcatel-Lucent, USA*
Lars Zimmermann, *IHP, Germany*

9. Digital Transmission Systems

Ezra Ip, *NEC Labs America, USA, Subcommittee Chair*
Milorad Cvijetic, *Univ. of Arizona, USA*
Michael Eiselt, *ADVA Optical Networking, Germany*
Fabrizio Forghieri, *Cisco, Italy*
Ronald Freund, *Fraunhofer Inst. HHI, Germany*
Lara Garrett, *TE SubCom, USA*
Benny Mikkelsen, *Acacia Inc., USA*
Mark Shtaif, *Tel Aviv Univ., Israel*
Takashi Sugihara, *Mitsubishi Electric Corp., Japan*
Dirk van den Borne, *Juniper, Germany*
Chongjin Xie, *Bell-Labs, Alcatel-Lucent, USA*

10. Transmission Subsystems and Network Elements

William Shieh, *Univ. of Melbourne, Australia, Subcommittee Chair*
Gabiella Bosco, *Politecnico di Torino, Italy*
Chris Fludger, *Cisco, Germany*
Gernot Goeger, *Huawei Technologies, Germany*
Noriaki Kaneda, *Bell Labs, Alcatel-Lucent, USA*
Reinhold Noe, *Univ. of Paderborn, Germany*
Leslie Rusch, *Laval Univ., Canada*
Etsushi Yamazaki, *NTT Labs, Japan*
Lianshan Yan, *Southwestern Jiaotong Univ., China*
Changyuan Yu, *National Univ. of Singapore, Singapore*
Xiang Zhou, *AT&T Labs, USA*

11. Optical Processing and Analog Systems

Marco Presi, *Scuola Superiore Sant' Anna, Italy, Subcommittee Chair*
Nicola Calabretta, *Technische Universiteit Eindhoven, Netherlands*
Woo-Young Choi, *Yonsei Univ., Korea*
Leif Johansson, *Freedom Photonics, USA*
Satoki Kawanishi, *Optoquest, Japan*
Guifang Li, *Univ. of Central Florida, USA*
Richard Penty, *Univ. of Cambridge, UK*
Perikles Petropoulos, *Univ. of Southampton, UK*
Michael Sauer, *Corning Inc., USA*
Andreas Stoehr, *Univ. of Duisburg-Essen, DE*
Kenneth K.Y. Wong, *The Univ. of Hong Kong, Hong Kong*
Jianping Yao, *Univ. of Ottawa, Canada*

12. Core Networks

Lyndon Ong, *Ciena, USA, Subcommittee Chair*
Angela Chiu, *AT&T Labs, USA*
Oscar Gonzalez de Dios, *Telefonica, Spain*
Akira Hirano, *NTT Network Innovations Labs., Japan*
Esther Le Rouzic, *Orange Labs, Networks and Carriers, France*
Darli Mello, *Univ. of Brasilia, Brazil*
Annalisa Morea, *Bell Labs, Alcatel-Lucent, France*
Hans-Juergen Schmidtke, *Juniper Networks, USA*
Motoyoshi Sekiya, *Fujitsu Labs. of America, USA*
Luis Velasco, *Universitat Politecnica de Catalunya, Spain*
Georgios Zervas, *Univ. of Bristol, UK.*

13. Access Networks

Derek Nasset, *British Telecom, UK, Subcommittee Chair*
Philippe Chanclou, *France Telecom, France*
Neda Cvijetic, *NEC Labs America, USA*
Joerg-Peter Elbers, *ADVA Optical Networks, Germany*
Junichi Kani, *NTT Labs, Japan*
Chang-Hee Lee, *KAIST, Korea, Republic of*
Sangsoo Lee, *ETRI, Korea, Republic of*
David Piehler, *Neophotonics, USA*
Jianming Tang, *Univ. of Bangor, UK*
Antonio Teixeira, *Univ. of Aveiro, Portugal*
Peter Vetter, *Bell Labs, Alcatel-Lucent, USA*

14. Optical Interconnection Networks for Datacom and Computercom

Loukas Paraschis, *Cisco, USA, Subcommittee Chair*
Drew Alduino, *Intel, USA*
Nathan Farrington, *Facebook, USA*
Ali Ghiasi, *Ghiasi Quantum LLC, USA*
Odile Liboiron-Ladouceur, *McGill Univ., Canada*
The'linh Nguyen, *Finisar, USA*
George Papen, *Univ. of California San Diego, USA*
Laurent Schares, *IBM, USA*
Ryohei Urata, *Google, USA*
Naoya Wada, *NICT, Japan*
Xuezhe Zheng, *Oracle, USA*

OFC Steering Committee

IEEE/Communications Society

Loudon Blair, *Ciena Corp., USA, Chair*
Vincent Chan, *MIT, USA*
Robert Doverspike, *AT&T, USA*
Ori Gerstel, *Cisco Systems Inc., Israel*

IEEE/Photonics Society

Ekaterina Golovchenko, *Tyco Telecommunications, USA*

Seb Savory, *Univ. College London, UK*

Leo Spiekman, *Alphion Corp., USA*

Atul K. Srivastava, *NTT Electronics Corporation, USA*

The Optical Society (OSA)

E. Bert Basch, *Verizon, USA*

Lynn Nelson, *AT&T, USA*

Clint Schow, *IBM T. J. Watson Res. Ctr., USA*

Ann VonLehmen, *Applied Communication Sciences, USA*

Ex-Officio

Yun Chung, *KAIST, Republic of Korea*

Chris Doerr, *Acacia Communications, Inc., USA*

Andrew Lord, *BT Labs, UK*

Ed Murphy, *JDSU, USA*

Shu Namiki, *AIST, Japan*

Ken-ichi Sato, *Nagoya University, Japan*

Vishnu Shukla, *Verizon Labs, USA*

Kathy Tse, *AT&T, USA*

Peter Winzer, *Bell Labs, Alcatel Lucent, USA*

Invited Speakers

Category 1. Optical Network Architecture, Control and Services

- **Benefits and Challenges of TeliSonera's PanEuropean Network**, Mattias Fridstrom; *TeliaSonera, USA*
- **Multi-layer Restoration - The Role/Impact on Optical**, Matthias Gunkel; *Deutsche Telekom, Germany*
- **Network Virtualization**, Aihua Guo; *Adva Optical, Germany*
- **Optical Networking Applications in the Mobile Backhaul and Fronthaul**, Anuj Jain; *Reliance Infotel, India*
- **Considerations for Multi-layer Network Optimization**, John Leddy; *Comcast, USA*
- **Metro Transport Architectures for the Future**, Wendell Liu; *AT&T, USA*
- **The DE-CIX Network**, Arnold Nipper; *DE-CIX, USA*
- **The Equinix Network**, Lane Patterson; *Equinix, USA*
- **Impact of a Centralized Versus Distributed Peering Network**, Brough Turner; *netBlazr Inc, USA*

Category 2. Optical Networking Technologies and Demonstrations

- **Next Generation Photonic Node Architecture Using Software-defined Universal Transceivers**, Yasuhiko Aoki; *Fujitsu Laboratories Ltd., Japan*
- **Technology Requirements for Bandwidth on Demand**, Robert Doverspike; *AT&T Labs-Research, USA*
- **Field Trial of Direct-detection and Multi-carrier Based 100G Transceivers**, Kwangjoon Kim; *Electronics and Telecommunications Research Inst., Republic of Korea*
- **Engineering Silicon Photonics Solutions for Metro WDM**, Torben Nielsen; *Acacia Communications, USA*
- **Comparing Terrestrial and Submarine Fiber Optic Networks**, Bruce Nyman; *TE Subsea Communications, USA*
- **100G/400G Project in Japan**, Hiroshi Onaka; *Fujitsu Laboratories Ltd., Japan*
- **CORONET: Testbeds, Cloud Computing, and Lessons Learned**, Ann Von Lehmen; *Applied Communication Sciences, USA*

Category 3. FTTx Technologies, Deployment and Applications

- **SDN and Potential Applicability to Access Networks**, Nabil Bitar; *Verizon, USA*
- **Flexible TWDM PON**, Ning Cheng; *Huawei, USA*
- **PON Resilience**, Frank Effenberger; *Huawei, USA*
- **Gain-Controlled Optical Amplifier Technologies for Long-Reach High-Splitting-Ratio PON Systems**, Masamichi Fujiwara; *NTT, Japan*
- **Evolution of MSO Networks and Outside Plant Fiberization**, Marek Hajduczenia; *Bright House Networks, Portugal*
- **FTTdp: ONU Complexity Reduction**, Michael McGarry; *Univ. of Texas at El Paso, USA*
- **PON Evolution for Residential and Business Applications**, Vincent O'Byrne; *Verizon, USA*
- **Synchronization Requirements on Broadband Access Networks for Mobile Backhaul**, Bill Powell; *Alcatel Lucent, USA*

Category 5. Fibers and Optical Propagation Effects

- **Plastic Optical Fibers for Sensing Applications**, Francis Berghmans; *Vrije Universiteit Brussel, Belgium*
- **New OTDR Measurement and Monitoring Techniques**, Andre Champavere; *JDSU, USA*
- **Dispersion Fluctuation Invariant Fibers**, John Fini; *OFS, USA*
- **Ultralow Loss Fiber Advances**, Masaki Hirano; *Sumitomo, Japan*
- **MMF for High Data Rate and Short Length Application**, Mingjun Li; *Corning, USA*

- **Fibers Supporting OAM and Their Applications**, Siddharth Ramachandran; *Boston Univ., USA*
- **Special Fibers for Fiber-optics Sensors**, Kay Schuster; *IPhT, Jena, Germany*
- **Dispersionless Low-loss Miniature Slow Light Delay Lines Based on Optical Fibers**, Misha Sumetsky; *OFS, USA*

Category 6. Fiber and Waveguide-Based Devices: Amplifiers, Lasers, Sensors, and Performance Monitors

- **Optical Frequency Combs for Telecom and Datacom Applications**, Nikola Alic; *UCSD, USA*
- **Modeling Raman Amplification in Multimode and Multicore Fibers**, Cristian Antonelli; *Universita degli Studi dell Aquila, Italy*
- **Fiber Based Fan-in and Fan-out Devices for Few Mode Communications**, Ian Giles; *Phoenix Photonics, UK*
- **Techniques to Detect and Stop Fiber Fuses**, Kenji Kurokawa; *NTT Access Network Service Systems Laboratories, Japan*
- **How to Connect Multicore and Multimode Fibers**, Ryo Nagase; *Chiba Inst. of Technology, Japan*
- **Challenges of Few Mode Amplifiers**, Massimiliano Salsi; *Alcatel Lucent, France*
- **Multicore EDFAs**, Yukihiro Tsuchida; *Furukawa Electric Co. Ltd., Japan*
- **High-Power Lasers**, Andreas Tunnermann; *Friedrich Schiller Universitat Jena, Germany*

Category 7. Optical Devices for Switching, Filtering, and Interconnects

- **SiN Photonics**, John E. Bowers; *Univ. of California Santa Barbara, USA*
- **What Devices do Data Centers Need?**, Cedric Lam; *Google, USA*
- **Advanced Filtering Technology**, Dan Marom; *The Hebrew Univ. of Jerusalem, Israel*
- **Couplers for Multicore Fibers and 3D Waveguide Technology**, Nicholas Psaila; *Optoscribe, UK*
- **Graphene and Beyond for Ultrafast Optical Communications and Interconnects**, Fengnian Xia; *Yale University, USA*

Category 8. Optoelectronic Devices

- **Coherent Transmitters and Receivers for Pluggable Modules**, Young-Kai Chen; *Bell Labs, Alcatel Lucent, USA*
- **High Density Optical Interconnectors for High Performance Computing**, Fuad Doany; *IBM, USA*
- **3-um Silicon Photonic Devices and Circuits**, Dazeng Feng; *Kotura Inc., USA*
- **Reliability of VCSELs for >25Gb/s**, Jim Guenter; *Finisar, USA*

- **Long Wavelength VCSELs as Sources for Si Photonics**, Eli Kapon; *Ecole Polytechnique Federale de Lausanne, Switzerland*
- **Modulators Integrated with Segmented Drives**, Tomoaki Kato; *NEC Corp., Japan*
- **A CMOS Wafer-scale, Hybrid-integrated WDM Platform for TB/s Optical Interconnects**, Guoliang Li; *Skorpios Inc., USA*
- **Integrated Coherent Receivers (InP or Si - based)**, Milan Mashanovitch; *Freedom Photonics LLC and UCSB, USA*
- **Long Wavelength High Speed VCSELs for Long Haul and Data Centers**, Markus Ortsiefer; *Vertilas GmbH, Germany*
- **Optoelectronic Integrated Circuits for 100G Ethernet and Coherent Networks Based on Multi-Guide Vertical Integration Platform**, Sasa Ristic; *OneChip Photonics, Canada*

Category 9. Digital Transmission Systems

- **4D-modulation Formats for Long-haul Transmission**, Pontus Johannisson; *Chalmers Univ., Sweden*
- **100G Submarine Networks and Beyond**, Matt Mazurczyk; *TE Subcom, USA*
- **Single-carrier and Dual-carrier 400-Gb/s and 1-Tb/s Transmission Systems**, Greg Raybon; *Bell Labs, Alcatel Lucent, USA*
- **Petabit/s Transmission Using Multicore Fibers**, Akihide Sano; *NTT, Japan*
- **Ultra-high Capacity Transmission with Few-mode Silica and Photonic Crystal Fibers**, Vincent Sleiffer; *Technical Univ. of Eindhoven, The Netherlands*
- **Long-haul Transmission Using Multicore Fibers**, Hidenori Takahashi; *KDDI Labs, Japan*
- **Using Orbital Angular Momentum Modes for Optical Transmission**, Jian Wang; *Huazhong Univ. of Science and Technology, China*
- **Mode Division Multiplexed Transmission Systems**, Peter Winzer; *Bell Labs, Alcatel Lucent, USA*

Category 10. Transmission Subsystems and Network Elements

- **InP-based High-speed Transponder**, Robert Griffin; *Oclaro Inc, UK*
- **Linear Optical Modulator**, Akimasa Kaneko; *NTT, Japan*
- **Energy Efficient Digital Signal Processing**, Maxim Kuschnerov; *Coriant, Germany*
- **OFDM Subbands**, Moshe Nazarathy; *Technion--Israel Inst. of Technology, Israel*
- **Direct Detection Optical OFDM**, Wei-Ren Peng; *KDDI, Japan*
- **Energy Efficient FEC for Optical Transmission Systems**, Laurent Schmalen; *Bell Labs, Alcatel Lucent, Germany*
- **High-speed ASIC for Optical Communications**, Jon Stanley; *Fujitsu Semiconductor Europe GmbH, UK*

- **Low Noise and Regenerative Phase Sensitive Amplifier Subsystem for Optical Repeater Transmission**, Takeshi Umeki; *NTT, Japan*

Category 11. Optical Processing and Analog Subsystems

- **High-Power Microwave Photodiodes**, Andreas Beling; *Univ. Of Virginia, USA*
- **Processing with QD-SOAs**, Giampiero Contestabile; *SSSUP, Italy*
- **Tunable QAM Transmitter Based on Direct Modulation Laser**, Joseph Kakande; *Alcatel Lucent, UK*
- **Ultra High-Speed Fiber Wireless Transport**, Tetsuya Kawanishi ; *NICT, Japan*
- **Integrated Silicon Photonics Links for High Bandwidth Data Transport**, Hai-Feng Liu; *Intel, USA*
- **Analog and Digital Photonics for Future Military Systems**, Paul Matthews ; *Northrop Grumman Corp., USA*
- **Optical Combs for Sensor Applications**, Nate Newbury; *NIST, USA*
- **The Optical FPGA**, Michael Roelens; *Finisar, Australia*
- **Photonic Interconnects for Data Centers**, Tolga Tekin; *Fraunhofer, IZM*

Category 12. Core Networks

- **Benefits of Active Stateful PCE for Flexgrid Networks**, Filippo Cugini; *CNIT, Italy*
- **QoS and Performance of Optical Metro Networks**, Annie Gravey; *Telecom Bretagne, France*
- **Adaptive Reconfiguration of Sub-lambda and Wavelength Paths for Unpredictable Traffic Demands**, Akiro Kadohata; *NTT, Japan*
- **Network OS**, Victor Lopez; *Telefonica, Spain*
- **Optical Networking Experimentation in Brazil**, Julio Oliveira; *CPqD, Brazil*
- **On the Role of Open-Source Optical Network Planning**, Pablo Pavon Marino; *Universidad Politécnica de Cartagena (UPCT), Spain*
- **Survivability in Virtualized Networks**, Dominic Schupke; *Nokia Siemens Networks, Germany*
- **Experimentation in Hitless Spectrum Defragmentation**, Kyosuke Sone; *Fujitsu Laboratories Ltd., Japan*
- **Flexgrid and Complexity**, Massimo Tornatore; *Politecnico di Milano, Italy*
- **Energy Efficiency and Reliability Tradeoffs in Optical Networks**, Lena Wosinska; *KTH ONLab, Sweden*

Category 13. Access Networks

- **Digital Coherent Technology for Long-Reach Optical Access**, Domanic Lavery; *UCL, UK*
- **Optical Component Technology Options for NGPON2 Systems**, Robert Murano; *Photop Aegis Inc., USA*

- **Burst-mode Electronic Dispersion Compensation**, Peter Ossieur; *Tyndall National Inst., Ireland*
- **Access and Data Center**, George Porter; *Univ. of California San Diego, USA*
- **Nyquist Signaling for Spectrally-Efficient Optical Access Networks**, Jacklyn Reis; *Universidade de Aveiro, Portugal*
- **Discrete Multi-tone for 100Gb/s Optical Access Networks**, Tomoo Takahara; *Fujitsu Labs. Ltd, Japan*

Category 14. Optical Interconnections and Networks for Datacom and Computercom

- **Evolution of Data Center System Architectures**, Claudio DeSanti; *Cisco, USA*
- **Large Scale Data Warehouse Build Out Based on Commodity Ethernet Fabrics**, Ariel Hendel; *Broadcom, USA*
- **The Innovations and Future Needs of WDM Transport for Inter-data-center Interconnections**, Bikash Koley; *Google, USA*
- **Hybrid Silicon Photonics Integration**, Ashok Krishnamoorthy; *Oracle, USA*
- **The Role of Optical Interconnections in Future Data Centers of Large Enterprises**, Brad Spiers; *Bank of America, USA*
- **The Evolution 10 Gb/s 850 nm VCSEL to 25-56 Gb/s**, Jim Tatum; *Finisar, USA*

Tutorial Speakers

OFC tutorial presentations are one-hour instructional talks designed to provide reviews of important progress in research. Speakers are chosen through a highly selective nominations process to keep attendees at the forefront of optical communications.

1. Optical Network Architecture, Control and Services (Tutorial)

- **Network Function Virtualization**, Diego Lopez; *Telefonica, Spain*

3. FTTx Technologies, Deployment and Applications (Tutorial)

- **Conformance Testing of Interoperability in SIEPON**, Ken-Ichi Suzuki; *NTT Access Network Service Systems Labs., Japan*

5. Fibers and Optical Propagation Effects (Tutorial)

- **Methods for mapping of local fiber characteristics with sub-molecular accuracy**, Eugene Myslevets; *UCSD, USA*

6. Fiber devices and their waveguide based equivalents: Amplifiers, Lasers, Sensors, and Performance Monitors (Tutorial)

- **Amplification technologies for future capacity and reach enhancements**, Peter Andrekson; *Chalmers Univ., Sweden*

7. Optical Devices for Switching, Filtering, and Interconnects (Tutorial)

- **Mid-IR Photonics**, William Green; *IBM Watson Research Labs, USA*

8. Optoelectronic Devices (Tutorial)

- **Widely tunable lasers**, Mike Larson; *JDSU, USA*

9. Digital Transmission Systems (Tutorial)

- **Advanced coded modulation for ultra-high speed optical transmission**, Ivan Djordjevic; *Univ. of Arizona, USA*
- **State of the art in 100G transport and beyond**, Kim Roberts; *Ciena, USA*

10. Transmission Subsystems and Network Elements (Tutorial)

- **Carrier Recovery Algorithms and Real-time DSP Implementation for Coherent Receivers**, Timo Pfau; *Bell Labs, Alcatel Lucent, USA*
- **Superchannel for next generation optical networks**, Xiang Liu, Chandrasekhar Sethumadhavan; *Bell Labs, Alcatel Lucent, USA*

11. Optical Processing and Analog Systems (Tutorial)

- **Arbitrary microwave waveform generation**, Andrew Weiner; *Purdue Univ., USA*
- **TeraHertz Photonics for Communications**, Alwyn Seeds; *UCL, UK*

12. Core Networks (Tutorial)

- **Optical Network Requirements for Cloud**, Doug Freimuth; *IBM, USA*

13. Access Networks (Tutorial)

- **Coherent and DSP Technologies for Optical Access Networks**, Dayou Qian; *NEC Labs America, USA*
- **High-speed Optical Wireless Communications Technologies**, Volker Jungnickel; *Heinrich Hertz Inst., Germany*
- **Optical Technologies and Architectures for Backhaul/Fronthaul of Big Mobile Data**, Yukihiko Okumura; *NTT Docomo Inc, Japan*

14. Optical Interconnections and Networks for Datacom and Computercom (Tutorial)

- **Optical Interconnection Networks for High Performance Exascale Cluster Computing**, Keren Bergman; *Columbia Univ., USA*

Workshops and Panels

OFC Workshops provide opportunities to discuss and debate the latest technologies. Workshop topics are controversial in nature and meant to be highly interactive, amongst both the speakers and the audience. The format of each session is determined by the organizers. In the past, many workshops have consisted of a series of short presentations (5 to 10 minutes) from people involved in the field followed by a panel discussion driven by questions from the audience.

The 2013 conference featured workshops in current areas of interest in optical communications. The workshops provide an interactive learning environment and are open to all conference registrants.

Like invited and tutorial speakers, workshop and panel topics and organizers are chosen through a highly selective nominations process.

1. Optical Network Architecture, Control and Services

- **Workshop:** Are Optical Standards Keeping Up?
Organizer: Chris Cole, *Finisar, USA*; and Bikash Koley, *Google, USA*
- **Panel:** 100G Deployment on Submarine Links
Organizer: Alexei Pilipetski, *TE Subcomm, USA*; and Michel Belanger, *Ciena, Canada* \
- **Panel:** SDN for Transport Networks
Organizer: Atsushi Iwata, *NEC, USA*; and Saurav Das, *Consultant, USA*

2. Optical Networking Technologies and Demonstrations

Workshop: [Low Cost 100G Interfaces for Metro Access: Standardized or Proprietary?](#)

Organizer: Tiejun (T.J.) Xia, *Verizon, USA*; Deborah Brungard, *AT&T, USA*

Panel: [Energy-efficiency in Telecommunication Operator Networks: A Reality Check](#)

Organizer: Christoph Lange, *Deutsche Telekom Innovation Laboratories, Germany*

Panel: [Flexible Rate OTU for Beyond 100G](#)

Organizer: Maarten Vissers, *Huawei, The Netherlands*

3. FTTx Technologies, Deployment and Applications

Workshop: [Just How Many Versions of Standards-based PON Systems Does the Industry Need?](#)

Organizer: Denis Khotimsky, *Verizon, USA*; and Fabrice Bourgart, *France Telecom, France*

Panel: [How Can Residential Broadband Networks Support the Small Cell Backhaul of the Future?](#)

Organizer: Ed Harstead, *Alcatel Lucent, USA*

5. Fibers and Optical Propagation Effects

Workshop: [Will the Optimum Space-division Multiplexing System and Fiber Be Determined by Fiber Nonlinearities?](#)

Organizer: Cristian Antonelli, *Univ. of L'Aquila, Italy*; Rene Essiambre, *Bell Labs, Alcatel Lucent, USA*

6. Fiber devices and their waveguide based equivalents: Amplifiers, Lasers, Sensors, and Performance Monitors

Workshop: [Optical Amplifiers for Spatial Division Multiplexing: Can they be Competitive?](#)

Organizer: Peter Krummrich, *TU Dortmund, Germany*

7. Optical Devices for Switching, Filtering, and Interconnects

Coming soon.

8. Optoelectronic Devices

Workshop: [Packaging and Reliability of Si Photonics: Will it Spoil the Dream?](#)

Organizer: Daniel Kuchta, *IBM, USA and Joris Van Campenhout, Interuniversity Microelectronics Center (IMEC), Belgium*

9. Digital Transmission Systems

Workshop: [Will Single-fiber Space-division Multiplexing Ever Find a Commercial Application?](#)

Organizer: Chongjin Xie, *Bell Labs, Alcatel Lucent, USA*; Gernot Goeger, *Huawei Technologies, Germany*

10. Transmission Subsystems and Network Elements

Workshop: [DSP for Short Reach Applications: Why Bother?](#)

Organizer: Chris Fludger, *Cisco Optical, Germany*; Ton Koonen, *Eindhoven University of Technology, The Netherlands*; Leslie Rusch, *Université Laval, Québec, Canada*

11. Optical Processing and Analog Systems

Workshop: [What is the Role of Optics in Gb/s Wireless Access](#)

Organizer: Guifang Li, *Univ. of Central Florida, USA*; Andreas Stoer, *Univ. of Duisburg-Essen, Germany*; Michael Sauer, *Corning Inc., USA*; Janping Yao, *University of Ottawa, Canada*

12. Core Networks

Workshop: [Does SDN Spell the End for GMPLS?](#)

Organizer: Lyndon Ong, *Ciena, USA*; Hans-Juergen Schmidtke, *Juniper, USA*; Oscar Gonzalez de Dios, *Telefonica, Spain*

13. Access Networks

Workshop: [DSP for Short Reach Applications: Why Bother?](#)

Organizer: Chris Fludger, *Cisco Optical, Germany*; Ton Koonen, *Eindhoven University of Technology, The Netherlands*; Leslie Rusch, *Université Laval, Québec, Canada*

Workshop: [Software-Defined Optical Access: Hope or Hype?](#)

Organizer: Neda Cvijetic, *NEC Labs America, USA*; Antonio Teixeira, *Universidade de Aveiro, Portugal*

14. Optical Interconnections and Networks for Datacom and Computercom

Workshop: [Do Optics Need to Move to the Rack and the Backplane? When? Why?](#)

Organizer: Thelinh Nguyen, *Finisar, USA*; and Ali Ghiasi, *Ghiasi Quantum LLC, USA*

Workshop: [Quantum Cryptography: Is that cat dead or alive? Or is it looking for Godot?](#)

Organizer: Dr. Kristin Rauschenbach, Consultant-
GENI, BBN/Raytheon, USA; John Dexheimer,
LightWave Advisors, USA

Plenary Sessions

David D. Clark

Senior Research Scientist and Leader, Advanced Network Architecture Group, MIT Computer Science and Artificial Intelligence Laboratory, USA

Presentation: The Future(s) of Fiber Deployment

Abstract: The world is in the middle of a transformational investment to upgrade our telecommunications infrastructure with a new physical layer based on fiber and wireless. In the developed world, we are replacing copper pairs in the access network--in parts of the developing world there may not be much to replace. These are heady times, with lots of capital flowing into infrastructure. But at some point will we be "done"? Copper pairs served us for decades, and fiber has huge capacity if we spend the money to utilize it.

One the one hand, our apparently insatiable appetite for data capacity may argue that we will continue to invest in fiber for decades. On the other hand, there are a number of barriers to

continued growth, including economics, industry structure and regulatory concerns. Perhaps we will hit human limits on the ability to consume data, or perhaps computers will just talk to each other at ever-faster rates, leaving humans on the sidelines.

This talk will consider a number of the specific factors that will drive continued deployment of capacity, and contribute to the overall health of our telecommunications infrastructure.

Biography: David Clark is a Senior Research Scientist at the MIT Computer Science and Artificial Intelligence Laboratory, where he has worked since receiving his Ph.D. there in 1973. Since the mid 70s, Dr. Clark has been leading the development of the Internet; from 1981-1989 he acted as Chief Protocol Architect in this development, and chaired the Internet Activities Board. His current research looks at re-definition of the architectural underpinnings of the Internet, and the relation of technology and architecture to economic, societal and policy considerations. He is helping the U.S. National Science Foundation organize their Future Internet Design program. He has contributed to a number of studies on the societal and policy impact of computer communications. He is co-director of the MIT Communications Futures Program, a project for industry collaboration and coordination along the communications value chain.

Gary Smith

President and Chief Executive Officer, Ciena, USA

Presentation: Net Positive: Why the Network Matters Again

Abstract: With personalized content and applications more pervasive than ever, we must address an entirely new and dislocating consumption model – one that's transforming our industry structure, business models, and the network architecture itself. This puts the industry squarely at the beginning of a multi-year evolution to efficiently meet these new demands with converged architectures for greater bandwidth, services and performance.

The key to success will be virtualizing the network in much the same way as we witnessed with storage and computing, and that includes the ability to:

- run a variety of services and functions as applications in an open network ecosystem
- have that ecosystem adapt as user needs evolve
- use network resources as efficiently as possible

Underpinning that architecture will be the intelligent photonic layer, with its unique role as the bearer of all network services and ability to see and optimize network traffic. With a combination of ROADMs, coherent receivers, DSPs and software-enabled control at the optical layer, in addition to Ethernet and OTN traffic management, we can achieve the ideal packet-optical solution for software-defined networks.

Gary Smith, CEO of Ciena, will discuss the network ecosystem of tomorrow and how the industry playing field will produce new opportunities as we aim to deliver unprecedented levels

of convergence, programmability, openness, and software intelligence required to adapt to changing industry demands.

Biography: Gary B. Smith began serving as chief executive officer of Ciena in May 2001, in addition to his existing responsibilities as president and director, positions he has held since October 2000. Smith joined Ciena in November 1997, and previously served as the company's chief operating officer and senior vice president, worldwide sales.

From 1995 through 1997, Smith served as vice president of sales and marketing for INTELSAT. He also previously served as vice president of sales and marketing for Cray Communications, Inc.

Smith is a member of President Obama's National Security Telecommunications Advisory Committee. He also currently serves on the board of directors for Avaya Inc. and CommVault Systems, Inc., is a commissioner of the Global Information Infrastructure Commission, and participates in initiatives at the Center for Corporate Innovation. Smith also previously served as a Board member at the American Electronics Association (now TechAmerica). He received his M.B.A. from Ashridge Management College, United Kingdom.

Robert W. Tkach

Director, Advanced Photonics Research, Alcatel-Lucent Bell Labs, USA

Presentation: Optical Fiber Communications: The Next Generation

Abstract: Optical fiber communications has provided seemingly limitless capacity growth, increasing by more than a factor of ten thousand in the last 30 years. This has come through a series of generations of technology sometimes requiring dramatic changes in infrastructure. As we approach the limits of our current generation what will come next?

Biography: Robert W. Tkach is Director of the Advanced Photonics Research department at Bell Laboratories, Alcatel-Lucent, Crawford Hill Location. His research has involved dispersion management, optical amplification, optical networking, and high-speed DWDM transmission systems. Prior to rejoining Bell Laboratories in 2006, he has been: CTO of Celion Networks, Division Manager at AT&T Labs - Research, and a Distinguished Member of Technical Staff at AT&T Bell Laboratories. He has been General Co-Chair of OFC, Vice-President of OIF, Associate Editor of the Journal of Lightwave Technology, a member of the IEEE LEOS Board of Governors and currently serves as Vice-President for Publications of the IEEE Photonics Society. He received the Thomas Alva Edison Patent Award from the R&D Council of New Jersey and is a Fellow of the Optical Society of America, the IEEE, and AT&T. He received the 2008 John Tyndall Award and in 2009 he was elected to the U.S. National Academy of Engineering and was awarded the 2009 Marconi Prize and Fellowship and the 2013 Alexander Graham Bell Medal.

Market Watch Panel Sessions

This three-day series of panel discussions engages the latest application topics and business issues in the field of optical communications. Presentations and panel sessions feature esteemed guest speakers from industry, research and the investment community.

The program will be located on the exhibit floor (North, Exhibit Hall D), so ALL attendees can easily visit the sessions and tour the exhibit hall. Audience members are encouraged to participate in the question and answer segments that follow the presentations.

Market Watch Chair:

Steve Plote, *Director of Business Solutions, BTI Systems, USA*

Market Watch Organizer:

Frank Chang, *Principal Engineer - Optical, Inphi Corp., USA*

Market Watch Advisor:

Eve Griliches, *Director of Solutions Marketing, BTI Systems, USA*

Panel 1: State of the Industry

Tuesday, 11 March
12:00 - 14:00

Moderator:

Daryl Inniss, *Vice President & Practice Leader Components, Ovum, USA*

Panel Description:

A dedicated panel of industry experts will provide a deeper, more current understanding of the optical networks industry from the perspective of top tier analyst and finance community. Are we on track for recovery from the economic downturn? Are there more M&A in the optical component side once the Avago and Cyoptics merger is complete? Can optical integration keep up with the pace of electronics development? What are new opportunities and challenges? What make sense and what does not? Join us at another great destination for just the right mix of market analysis, insights and networking.

Speakers

Optical Communications Infrastructure, Investment and Emerging Market
Badri Gomatam; *CTO Telecom, Sterlite Technologies Ltd, India*

In this talk we discuss the current status and future trends of wired optical fiber communications infrastructure as seen from an emerging markets view. The optical sector has grown rapidly in terms of transmission speeds and capacity in developed economies. In emerging economies however, the interplay between bandwidth demand, transmission capacity, regulatory environment and infrastructure investment is distinctly different. We discuss our perspectives and experience in this sector and conclude with an overview of our efforts in advancing global broadband access.

State of the Optical Communications Market

Vladimir Kozlov; *CEO and Founder, Lightcounting Market Research, USA*

The majority of vendors across the global communication industry continue to search for a sustainable economic model. Network operators have not yet found a solution for improving returns on increasingly expensive investments into networking infrastructure required to support Internet traffic growth. Average profitability of communication equipment manufacturers and suppliers of components remains volatile. There are exceptions. Large companies like Cisco continue to be highly profitable and many midsize suppliers of communication semiconductors substantially improved their profitability in 2010–2013. Is there hope for the rest of the supply chain?

Defining Virtualised Networks by Software – What Impact for Optical?

Mark Lum; *Layer123, UK*

At the CTO and network strategy level, carriers, datacentres – and even large enterprises – are highly energised by the potential benefits from new Software-Defined Networking and Network Virtualisation approaches and architectures. Hype is high and transformational paradigms are promised, sometimes daily! But this evolution seems real and well-grounded – investment in innovation is tangible, huge corporations are adapting their strategies and deployments are starting in earnest.

Expectations are high that SDN and NFV (Network Functions Virtualisation) will be effective vehicles for improving network ROI and application/service innovation agility. What impact is already foreseen for the optical networking industry? Mark will bring insight and observations from the SDN & OpenFlow World Congress to inform the debate here.

The Competitive Landscape

Jeff Ogle; *Principal Analyst Optical, ACG Research, USA*

Jeff Ogle, principal optical analyst for ACG Research, will provide a competitive overview summary of the major optical infrastructure vendors. Jeff will discuss vendors' ranking within Long-Haul DWDM, POTS, Metro WDM, and MSPP product segments as well as their overall market momentum relative to their competition. Using ACG Research's five-year forecast (2014–2019), Jeff will highlight global revenues, regional segmentations and vendor ranking for the APAC, EMEA, and NA regions. Leading market drivers such as the shift to all IP/Ethernet access and the use of optical for data center interconnect and mobile back-haul will be examined

for sustainability. Jeff will spotlight technology trends such as SDN and discuss vendors' progress and uptake of new technology.

100G Coherent and the Metro Opportunity

Andrew Schmitt; *Principal Analyst, Optical, Infonetics, USA*

A discussion of the state of the overall 100G market as well as carrier timelines and requirements for 100G in the metro.

Optical Investment Cycle – Is It Different This Time?

Nikos Theodosopoulos; *Consultant, NT Advisors, LLC, USA*

Over the past three decades, the optical sector has experienced many investment cycles that typically have shown the pattern of significant stock price appreciation during periods of strong fundamentals and significant stock price declines during periods of weakening fundamentals. The optical sector began a new positive cycle in mid-to-late 2012, likely reflective of the positive investment cycle related to 100G upgrades, much needed industry consolidation and other factors. Will this investment cycle be just another cyclical cycle measured in quarters or is the optical sector poised for a much longer lasting secular growth phase? This presentation will discuss why the optical sector has been so volatile over the years and whether the sector is likely to maintain its historical cyclical nature or become more of a secular growth sector.

Biography

Daryl Inness leads Ovum's Components research stream, focusing on optical components and physical media-dependent integrated circuits used in telecoms and datacoms networks. This research provides a comprehensive view of the products, their suppliers, and the associated technologies used. It identifies and tracks emerging opportunities, analyzes technology trends, and monitors the financial health of suppliers. Daryl's syndicated research includes market forecasts, market share reports, and technology analyses. His research currently focuses on reconfigurable optical add/drop multiplexers (ROADMs), the technologies needed to support both 40Gbps and 100Gbps line and client transmission, and supplier strategies to build sustainable businesses. Prior to joining Ovum, Daryl was a technical manager at JDS Uniphase, and prior to that a technical manager at Lucent Technologies, Bell Laboratories. He has published more than 25 technical papers, presented invited papers at ECOC, OFC, FOE, and Gordon Research Conferences, and has been awarded 15 patents. Daryl was awarded a PhD in Chemistry from UCLA and an AB from Princeton University.

Badri joined Sterlite Technologies Ltd in 2011 as the CTO in the Telecom Business unit. He has over 20 years of product development, marketing and business development experience in high speed Integrated Circuits and Optical Communications. At Sterlite he leads the newly established Center of Excellence focused on product development and research in optical fiber communication. He received his Ph.D. in 1993 from the University of Massachusetts, Amherst, in Electrical Engineering. Prior to Sterlite he was based in the United States, most recently with ClariPhy Communications.

Vladimir Kozlov is the founder and CEO of LightCounting an optical communications market research company. LightCounting was established in 2004 with an objective of providing in-depth coverage of market and technologies for high speed optoelectronic interfaces employed in communications. By now, the company employs a team of industry experts and offers comprehensive coverage of optical communications supply chain. He has more than 25 years of experience in optoelectronics, optical communications and market research. He also co-founded several other companies, including Fianium, LX Medical and Microtech Instruments, developing laser systems for medical applications. Vladimir held market analyst, product development and research staff positions at RHK Inc., Lucent Technologies and Princeton University. Dr. Kozlov holds several US patents and has numerous publications in the area of optoelectronics. He received M. Sc. at Moscow State University in Russia and Ph. D in Physics at Brown University in the United States.

Mark Lum MA MSc is Co-Founder and Market Lead at Layer123, and has worked in telecoms networks since graduating from Cambridge University. He joined ITT-STL where he worked on the world's very first 140Mbit/s, 565Mbit/s and multi-Gbit/s optical systems, and earned his MSc studying statistics of modal noise in multimode systems.

In his career, he has contributed to the first SDH, WDM and ATM networks, done time at ITU and ETSI standards as Rapporteur, and worked on early Metro WDM and Carrier Ethernet services at Nortel. As a consulting analyst, he continues to stay on top of fundamental trends and disruptions, and examines new developments with a careful and hype-free eye.

Since first finding out about OpenFlow and SDN over 3 years ago, Mark now recalls learning to program in 1973 using punched cards on an ICL mainframe (and front panel register toggles on a PDP-8). So he finds his interests turned full circle in the new world of Software-Defined Networking and Network Virtualisation, where he now spends his time.

Jeff Ogle is a senior telecommunications professional with 10+ years' experience working as an analyst and 25 years in the key phases of product development (hardware & software), product management & marketing and production. The experienced was gained at a number of both private and public telecom companies and covered all phases of both the product and company lifecycle, including Initial Public Offerings (IPO). As an optical analyst for ACG Research, Jeff covers a broad spectrum of technology, products and services offered within the telecom industry as well as partnership and M&A initiatives of the vendors. Specific areas of expertise included switching and routing, optical, IMS, VoIP, professional and managed services and the mobile environment. Jeff has been frequently published and quoted in TechTarget, Fierce Telecom and other industry media. He holds a B.S.E.E. from Virginia Tech and has completed additional professional development work at Wharton and the University of Michigan.

Andrew Schmitt is an analyst focused on the optical network industry, leveraging over 20 years in the networking and communications industry including tenures at Vitesse Semiconductor, where he ran the carrier chipset unit, and Nyquist Capital, where he was a general partner at the investment consulting firm focused on the optical sector.

Nikos Theodosopoulos is the founding Member of NT Advisors LLC, a consulting and advisory firm for the technology, venture capital and private equity industries. Prior to founding NT Advisors LLC in September of 2012, Nikos was a Wall Street Equity Research Analyst for 18 years covering the technology sector primarily at UBS Investment Bank. During his 18 year Wall Street career, Nikos was voted to the All-American Team by Institutional Investor Magazine 17 times. Nikos was also the Global Technology Strategist and the Head of U.S. Technology Sector Research at UBS Investment Bank. Prior to his career on Wall Street, Nikos spent 10 years at AT&T Network Systems and Bell Laboratories. He holds an MBA from New York University, an MS from Stanford University and a BS from Columbia University.

Panel 2: What's Happening for 100G and Beyond Ecosystems?

Tuesday, 11 March
15:00 - 17:00

Moderator:

Tiejun Xia, *System Architect/DMTS, Verizon, USA*

Panel Description:

The panel will address the needs, applications, adoption, and deployment of commercially available next-gen 100G, and beyond solutions for the metro, regional and long-haul backbone networks. Discussion topics will focus on the available technologies, solutions, and deployment issues associated with modulation schemes: 4x25G and DP-QPSK, new advances in 16-QAM, coherent detection, advanced electronic DSP techniques, enhanced FEC and OTN, plus the critical IC and/or PIC implementations. Can also discuss current 400G Ethernet and transport standards process. How about configurable modulation format, configurable FEC overhead, configurable client bandwidth, select your solution based upon capacity/distance requirements, OSNR and other parameters? A wide range of industry experts will deliver different perspectives and answer questions.

Speakers

Recent Advances and Trends for Digital Coherent 100Gb/s and Beyond Technologies in Submarine Optical Cable Systems

Yasuhiro Aoki; *Executive Manager, NEC Submarine Division, Japan*

Advanced 100Gb/s digital coherent technologies have enabled transmission of beyond 10 Tb/s per fiber pair across trans-Pacific distances for new-build systems, while also supporting transmission capacity upgrades that far exceed original design targets of installed systems. We introduce and discuss such advances and trends brought by high-speed digital coherent technologies, based on NEC's recent transmission records and activities.

100G - What Comes Next?

Jörg-Peter Elbers, *VP Advanced Technology, ADVA Optical Networking, Germany*

100G transmission has found rapid adoption in core and metro networks. The need to balance equipment density, power consumption and cost with fiber capacity and reach led to the emergence of coherent and direct detect 100G transport solutions. Leveraging established eco-systems and economies of scale has been a crucial success factor for deployments in service provider and enterprise networks. The move to higher capacities offers new opportunities and will impose new challenges. This talk will discuss coherent and direct detect approaches for beyond 100G transmission. It will address the question how emerging eco-systems can be exploited to deliver next-generation solutions fitting diverse network and market requirements.

New requirements for Switched-Transport Systems to enable multi-layers convergence in Packet-Optical integration

Domenico Di Mola; *VP of Engineering, Optics RBU Juniper Networks, USA*

Packet Optical integration is driving a new integrated approach across multi network domains (Switched and Transport) and inter-operability through multilayer convergence for best TCO (CAPEX, OPEX). It will drive broader, than today, orchestration of physical, management and signaling layers with an evolutionary path towards enabling SDN architectures. The market adoption will happen at different speeds to meet different customer requirements as organizations and new service evolve.

100G Current Status, Views of Beyond 100G and Transport SDN

Yiran Ma, *China Telecom Beijing Research Institute, China*

The content of the talk will generally cover three aspects: 100G current status, views of beyond 100G and transport SDN. Dr. Ma's idea is that the key technology of beyond 100G are multi-carrier for high capacity and transport SDN for easier management.

Evolution of Coherent Optical Hardware Solutions for 100G and Beyond

Doug McGhan; *Director, Electro-Optics Development, Ciena, Canada*

DSP enabled coherent optical transport solutions have proven to be both cost effective and very powerful for overcoming optical line system impairments. As deployment of this technology accelerates, it is beneficial for the industry to improve the framework for a robust supply of the critical components. Electro-optics and RF components based on a range of key technologies should be allowed to evolve and compete on the merits of performance, cost, and size. Coherent digital signal processing and forward error correction devices also continue to improve enabling higher capacity and longer optical reach along with reduced power consumption and size. These key building blocks together with photonic line system improvements and increasing software defined networking capabilities will define the more powerful optical transport networks of the near future.

NTT Communications' Perspective on Next GEN Optical Transport Network

Hisayoshi Yoshida; *Vice President, Network Facilities, Service Infrastructure, NTT Communications Corporation, Japan*

Global total ICT outsourcing enables customers to focus their resources on their management innovation. Cloud based ICT system is the key for ICT reform. Cloud enables to build low-cost ICT environments to respond to business challenges/changes and to optimize safe/secure ICT environments on a global scale. NTT Com contributes customers' management innovation through a carrier-class Cloud service. The carrier-class Cloud is realized based on strong network infrastructure and Data Center facilities as well as managed and flexible operations. NTT Com has already deployed 100G multi-degree ROADM systems with CDC capability on a nationwide scale. NTT Com also deploys PTN for network simplicity and SDN for operation excellence. An advanced virtualized network is realized by orchestrating seamlessly the controllers between Cloud to WAN including optical transport layer. NTT Com expects the emerging technologies for beyond 100G such as flexible grid and multi-channel to realize further flexible and efficient operation.

Biography

Tiejun J. Xia is an expert of photonic technologies and optical communications in research, development, and technology innovations. He is Distinguished Member of Technical Staff with Verizon where his responsibility is optical network architecture and technology development. He is also an adjunct professor at Miami University, Ohio. He has served as Director for Network Technology Development at Chorum Technologies and worked for MCI for next generation optical transmission technologies. He has also been a research faculty member in the Department of Electrical Engineering at the University of Michigan and an adjunct professor at University of Texas at Dallas. He is co-founder and current president of the Advanced Fiber Connectivity & Switching Forum. He has served on Technical Program Committees of OFC/NFOEC, APOC, ACP, and OECC. He is a senior member of IEEE and serves the executive board of IEEE Dallas Section. Dr. Xia holds his Ph.D. degree in Physics from CREOL at the University of Central Florida, M.S. degree from Zhejiang University, China, and B.S. degree from University of Science and Technology of China. He has published more than 100 technical papers, given numerous invited talks, and holds more than 60 granted or pending U.S. patents. In 2011, he was featured as "Verizon Innovator" on YouTube. In 2012, he was elected a Fellow of The Optical Society.

Yasuhiro Aoki has been with NEC Corporation since 1981 and has contributed to the development of optical fiber amplifier submarine systems and relevant advanced products, covering 5Gb/s, 10Gb/s and 40/100 Gb/s WDM systems. He holds B.S., M.S. and Ph.D degrees, all in Electrical Engineering, from the Faculty of Engineering Science, Osaka University, Japan, and is an author of more than 80 technical papers and conference contributions.

Domenico Di Mola, holds a "Laurea degree" in Electronic Engineering and a post-doc in Thermodynamic, from Italy Polytechnic of Turin. He holds several fundamental patents in the field of technology, components and system design in Fiber-Optics field. He has several publications in IEEE issues and made multiple speech at major fiber-optics conferences and shows. Today, he serves as VP of Engineering in Juniper Routing Business Unit, in charge of Packet-Optical development and strategy.

Previously he has hold a Chief Technology and Chief Commercial Officer positions in Oplink driving development of next generation ROADM architecture based on Flex-Grid approach and Multi-Cast Switch architecture. He has driven the strategy for the first integrated 100G CFP product based on DSP-MLSE and OOK modulation scheme integration. Today this product is shipped to largest Tier 1 NEM's as one of the unique 100G DWDM low cost solution for Metro and Datacenter market. Since 2008 until 2012, he has been global leader of Alcatel-Lucent Optics Technology R&D team, spanning from ASIC and FPGA design, to Coherent board and Photonics integration. He succeed first in time to market to ship 100G Coherent single carrier PD-QPSK to several Tier 1 and CSP customers. In his 20 years career, He has worked for the major System and Opto-Component firms in various senior positions, among JDSU, Agilent and Italtel.

Jörg-Peter Elbers is Vice President Advanced Technology in the CTO Office at ADVA Optical Networking and responsible for technology strategy, new product concepts, standards, and research. Prior to joining ADVA in 2007, he was Director of Technology in the Optical Product Unit of Marconi (now Ericsson). From 1999 to 2001, he worked at Siemens AG, last as Director of Network Architecture in Siemens Optical Networks. He holds a Dr.-Ing. and Dipl.-Ing. degree in electrical engineering from the Technical University of Dortmund, Germany.

Yiran Ma received the Ph.D. degree from National ICT of Australia, the University of Melbourne, Melbourne, Australia. In 2010, he joined China Telecom Beijing Research Institute and is responsible for transport and access networks. His current research interests include long haul high capacity transmission systems, next generation PON systems, SDN enabled transport and access networks.

Doug McGhan received a B.Sc. in electrical engineering from the University of Alberta in 1993. He has since been based in Ottawa, Canada, employed in the development of electro-optic hardware component and system solutions at Ciena (formerly Nortel and Bell Northern Research). Doug has over 20 years of experience designing and leading a team in the development of ground breaking solutions for metro, regional, long-haul and ultra-long-haul optical networks.

Mr. Hisayoshi Yoshida joined Nippon Telegraph and Telephone Corporation in 1988. After the reorganization of NTT in 1999, he designed the architecture of the Transport Network for NTT Communications Corporation (NTT Com) and introduced new technology to the network. Since June 2010, he has been in charge of engineering, construction, and operation of the L1, L2 and IP backbone networks for the NTT Com. At present, he is in charge of the entire network facilities of NTT Com

Panel 3: Data Center Architecture and Content Delivery Strategies

Wednesday, 12 March
13:00 - 15:00

Moderator:

Siddharth Sheth, *Vice President Marketing, Inphi Corp, USA*

Panel Description:

This panel will provide insights on market transition in strategy, architecture, and solutions to enhance cloud computing, including internal DC architecture concentrating on East-West paths versus North-South paths. Where are emerging bottlenecks to enable cloud? What are the fundamental traits? How to impact OpEx and CapEx? Where are the optical trends for high-speed interconnectivity such as 400G? How about green data center and latency requirements? Any energy trade-offs among content delivery architectures?

Speakers

100G Optics for Cloud Datacenters

Andreas Bechtolsheim, *Arista Networks, USA*

Andreas will discuss the technologies and market outlook for 100G optics in the data center.

Data Center Virtualization and the Expansion of the Cloud

Paul Crann; *Senior Vice President of Product Management and Business Development, BTI Systems, Canada*

As both consumer and business applications continue to migrate to the cloud it drives a tremendous need for additional data center capacity close to access networks. Traffic has migrated and increased dramatically between data centers, driving a compelling model to collapse the optical and IP layers to derive significant economic and operational benefits. How the layers are collapsed to integrate key functions will be discussed, as will the importance of adding analytics in order to automate and optimize services and key applications.

Vijay Gill; *Microsoft, USA*

Scaling the WAN for Data Center Interconnect

Tad Hofmeister; *Network Architect, Google, USA*

Mega data centers continue to scale in the numbers of processor cores they house and their interconnect bandwidth needs to meet the growing demands for myriad cloud services. This talk will summarize several approaches to scale inter-data center network capacity to meet this demand while minimizing the network equipment and operational costs. Specific technologies that can enable the approaches will also be included.

Data Center Bandwidth Scenarios

Scott Kipp; *Senior Technologist, Brocade, USA*

As servers move to 10GbE and 40GbE, the bandwidth demands of racks and pods of servers grows into terabit levels. This presentation will investigate how bandwidth aggregates from the server to the rack to the pod to the core and to the Internet. When mega-data centers have over

10,000 servers, the network bandwidth has various bottlenecks that will be explored in this presentation. While having lots of bandwidth is a great solution in theory, the cost of the bandwidth limits the size of the deployment. This presentation will compare the cost of competing 10GbE, 40GbE and 100GbE technologies to show the best 50,000 server data center topology from a cost perspective.

Optics Technology Trends in Data Centers

Marc Taubenblatt; *Sr. Mgr, Optical Communications and High Speed Test , IBM T.J. Watson Res Ctr, USA*

Optical trends for high-speed interconnectivity such as 400GE will be reviewed in the context of data center needs. While optical links are not the major contributors to data center power and costs today, their impact is of increasing concern. A number of factors are contributing to this concern: 1) Ever rising BW requirements, 2) Larger data centers with increased link counts and distance requirements, 3) Higher per lane data rates (e.g. 25G going to 50G), which may be less power efficient and require closer integration of optics to router and processor chips. These represent both technological and business challenges for the optics industry.

Biography

Siddharth Sheth joined Inphi as VP of Marketing for its High-speed Connectivity Products in 2011. He brings with him more than 17 years of marketing, engineering and general management experience in the networking and server infrastructure industry. At Inphi, Mr. Sheth heads up the network connectivity business leading the company's efforts in the cloud infrastructure and metro service provider segments. Prior to Inphi he was at NetLogic Microsystems (now Broadcom Corp.), where he held worldwide marketing responsibility for NetLogic's networking interconnect chips. While at NetLogic, he pioneered the company's 40G/100G product line and led NetLogic's entry into the mobile and cloud infrastructure markets. In 2001, Mr. Sheth was a founding team member of Aeluros, a mixed-signal networking IC company, where he held global marketing responsibility, helping make Aeluros a market leader until its successful acquisition by NetLogic in 2007. Mr. Sheth also spent many years at Intel Corp, where he held engineering design and management positions in the Pentium III microprocessor and network processor groups. Mr. Sheth is a regularly featured speaker at industry tradeshow and conferences, is a published author at ISSCC and other technical conferences and has an M.S.E.E from Purdue University.

Andreas Bechtolsheim is a Co-Founder and Chief Development Officer of Arista Networks, a high-speed datacenter and cloud networking company. Previously, Andy was a Co-Founder and Chief System Architect at Sun Microsystems, responsible for next generation server, storage, and network architectures. From 1995 to 1996, Andy was CEO and President of Granite Systems, a Gigabit Ethernet Switching startup company he founded that Cisco acquired in September of 1996. From 1996 to 2003 Andy was General Manager for the Gigabit Systems Business Unit at Cisco System that developed the Catalyst 4000 switch family, which became the highest volume modular switching platform in the industry. As a private venture investor, Andy has been involved in the funding of numerous companies including Google, VMware, Mellanox, Brocade, and Magma Design. He has served on the Board of Directors of over 25

companies, the majority of which went public or were acquired. Andy earned a M.S. in Computer Engineering from Carnegie Mellon University in 1976. He was a doctoral student in Computer Science and Electrical Engineering at Stanford University from 1977 to 1982. He has been honored with a Fulbright scholarship, a German National Merit Foundation scholarship, the Stanford Entrepreneur Company of the year award, the Smithsonian Leadership Award for Innovation, and he is a member of the National Academy of Engineering.

Paul Crann is a senior business leader with 25+ years of operational experience, having served in a variety of management roles delivering data networking, wireless and video solutions. Paul has worked extensively with service providers throughout his career in both start-ups and F500 companies. Prior to BTI, he was focused on service provider video solutions as Senior Vice President of Product Management with BigBand Networks. Paul previously served as Senior Vice President of Marketing and Business Development at Avici Systems, a core IP/ MPLS routing provider. He has also held senior product management and market development positions with Lucent Technologies and Ascend Communications. His earlier experience includes Omnipoint, an early PCS wireless service provider, PRTM as a management consultant, and the U.S. Navy where he served as a Submarine Officer. Paul holds a master's in Business Administration from the Harvard Business School and a Bachelor's degree in Engineering from Villanova University.

Tad Hofmeister has been a Network Architect at Google since 2011, with a focus in metro and long-haul DWDM networking. Prior to Google, Tad was an architect, system engineer, and hardware designer for several optical transport and packet processing companies including: Ciena, Matisse Networks, OpVista, and Applied Signal Technology. Dr. Hofmeister earned MS and Ph.D. degrees in EE from Stanford University and BS degrees from Columbia University and Bates College.

Scott Kipp represents Brocade in multiple standards organizations and industry associations and has written several books on storage networking, fiber optics and digital entertainment. Scott contributes to multiple standards organizations including ANSI T11, IEEE 802.3, OIF, IEEE 1619, SNIA, OASIS, IETF and Multi Sourcing Agreements. He specializes in high-speed fiber optic technology. Kipp is the President of the Ethernet Alliance and has written three books for the Fibre Channel Industry Association (FCIA), another entitled Broadband Entertainment and co-authored the Handbook on Fiber Optic Data Communications. He has a Bachelors and a Masters degree in Electrical Engineering from Cal Poly in San Luis Obispo, California.

Marc Taubenblatt is currently Senior Manager, Optical Communications and High Speed Test, at IBM's T.J. Watson Research Center, focusing on optical interconnects and high speed electrical packaging for computer systems, and test and innovative diagnostic techniques for high performance computer chips. Marc has had responsibility for IBM Research optical interconnect strategy for the past 13 years. He also manages a research program on advanced computing technology. He received a BS degree in Electrical Engineering from Princeton University and MS and PhD degrees in Electrical Engineering from Stanford University. Marc has been at IBM Research for over 28 years and is a member of the IBM Academy of Technology.

Panel 4: 100/400G Pluggable Optics and its Enabling Technologies

Thursday, 13 March
10:30 - 12:30

Moderator:

Beck Mason, *Vice President Research and Development, JDSU Corp., USA*

Panel Description:

Various high-speed pluggable optics, such as CPAK, CFP2, CFP4, QSFP28, CXP etc., are in high demand for the 100G-400G era. This panel will address its latest industry status and discuss key enabling technologies and building blocks. This panel will bring together world-leading experts from industry and academia to address the following example of questions: Which form factor will dominate? Are we meeting our cost and power target? Can coherent 100G pluggable? What is the impact of the leading technologies? How are 400G modules going to be build?

Speakers

Indium phosphide enabled coherent pluggable modules for 100G and 200G

Robert Blum; *Director, Product Management, Oclaro, USA*

Coherent pluggable interfaces are now becoming reality thanks to a combination of recent progress in digital signal processing, photonic integration, and innovative packaging technologies. In this talk we will focus on how advances in narrow linewidth tunable lasers and InP-based modulators are enabling new pluggable form factors with low power dissipation and cost/performance metrics that are ideal for metro and regional applications. We will review current and future market trends, discuss the various form factors under consideration and the performance trade-offs for 100G and 200G. We will also look at options for scaling these new building blocks to 400G and beyond.

What's Next for 100G and 400G Optical Modules?

Julie Eng, *Senior Vice President, Transceiver Engineering, Finisar Corporation, USA*

This talk will review the state-of-the-art in 100G optical modules, with a focus on datacom and client interfaces. In particular, parallel multi-mode and multi-channel single-mode optical modules will be reviewed. Technology advances required to support ever-higher bandwidth density at 100G as well as to demonstrate commercial 400G multi-mode and single-mode optical modules will also be reviewed.

How Much Functionality Can We Pack into a Pluggable Module?

Mitch Fields; *Director of Product Strategy, FOPD, Avago Technologies, USA*

As bandwidth and reach requirements increase for pluggable media, we begin to approach a limit dominated by the thermal envelope of the module. This presentation explores electronic and

optical technologies that can address the needs of next-generation interconnects with particular focus on data center networks.

Optical Integration and the Role of DSP in Coherent Optics Modules

Atul Srivastava; *CTO, NTT Electronics America, USA*

The DSP LSI with reduced power and cost is suitable for signal impairment compensation and achieve higher performance in smaller size CFP, CFP2... modules for applications in both shorter reach metro links and longer reach networks . Next generation DSP operating in conjunction with highly integrated optical components will enable new applications for the 100G and 400G coherent transmission systems and drive even larger scale deployment.

This talk will focus on the novel integrated devices and low power DSP for the next generation pluggable optics and highlight the recent industry activity driving standards for smaller and cheaper modules and related integrated opto-electronic components.

Programmable Integrated Circuits for Next Generation Coherent Optical Transport

Norm Swenson; *Chief Technology Officer, ClariPhy Communications, USA*

As data rates expand to 400 Gbps and coherent optical transport migrates down to the cost-sensitive metro market, a new generation of integrated circuits is required to enable this wide array of applications. We describe a highly flexible programmable chip architecture that addresses power and cost sensitive 100 Gbps applications as well as the most demanding long haul and 400Gbps transport requirements. Coupled with new pluggable transceiver optics, this single architecture is a key enabling building block for high spectral efficiency, long reach, and low power, low cost deployments.

Cost Efficient 100G/400G Optical Transceiver Solutions

Rang-Chen Yu; *Vice President, Business Development, Oplink Communications, Inc., USA*

For every generation of data rate upgrade, high volume adoption of new data rate occurs when cost of new data rate solution become lower on the per bps basis. For 100G applications, the inflection point is when cost of 100G solutions becoming comparable or lower vs. 10 times of 10G. We present 100G technology options with proper choice of combination of low cost optics, transmission modulation format, receiver detection techniques, and high speed digital signal processing to achieve best cost efficiency for various reach 100G/400G client optical interface and metro DWDM applications.

Biography

Beck Mason is the Vice President of R&D for Transmission Products within the Communications and Commercial Optical Products Business Segment at JDSU. Prior to joining JDSU in 2007 he served as Vice President of R&D at Collinear Corporation a company developing leading edge nonlinear optics technology. Before joining Collinear he was Director of Transceiver R&D at Finisar Corporation from 2002 to 2005 and a Technical Manager in the

Photonics Research group at Agere Systems from 1999 to 2002. Before joining Agere systems he was a Member of Technical Staff at Lucent Technologies Bell Laboratories. Beck holds a Ph.D. in Electrical and Computer Engineering from the University of California at Santa Barbara, a Masters in Aerospace Engineering from the University of Toronto and a Bachelors in Mechanical Engineering from the University of Waterloo. He holds more than 20 US patents and numerous publications.

Robert Blum is currently director of product management for Oclaro's 40G and 100G line-side product portfolio. Prior to joining Oclaro in 2010, he was product line manager for optical transmission components at JDS Uniphase, and held various engineering and marketing management roles at Gemfire Corporation, all in California. Robert holds doctorate and masters degrees in Physics from Hamburg-Harburg University of Technology and Darmstadt University of Technology, respectively. He has studied and done research at Ecole Polytechnique Fédérale in Lausanne, Switzerland, Deutsche Telekom's Research and Technology Labs in Darmstadt, Germany, and Stanford University, California.

Julie Sheridan Eng is Senior Vice President of Transceiver Engineering for Finisar Corporation. She has held senior management positions within the Finisar engineering organization since 2003. From 1995 to 2003, Dr. Eng was part of AT&T/Lucent/Agere, primarily leading Agere's optoelectronic transmitter, receiver, and transceiver design for datacom markets. She holds a B.A. degree (summa cum laude) in Physics from Bryn Mawr College and a BSEE degree with honors from the California Institute of Technology. She earned an MSEE and PhD in Electrical Engineering from Stanford University. She has published over a dozen papers and holds 7 patents.

Mitchell Fields is presently the Director of Product Strategy, Fiber Optics Products Division, at Avago Technologies. His team is responsible for driving the technology and product roadmap at Avago to address next-generation interconnect challenges.

Atul Srivastava, Chief Technology Officer of NTT Electronics America, has over 30 years of experience in the optical communications R&D starting from AT&T Bell Laboratories and as the director of Optical Amplifier research department. He worked at Bookham (now Oclaro) as the VP of Product Technology after the acquisition of the Optical Amplifier startup Onetta. He is credited with over 100 publications, and over 12 United States patents. He is editor of a book on "Optically Amplified WDM Networks". He was co-chair of the Technical Program Committee of Optical Fiber Communications Conference (OFC) 2009 and general co-chair of OFC 2011, and currently serving on the OFC Steering Committee. He is a chair of the SPIE's Photonics West 2014 Technical Program Committee. Dr. Srivastava currently serves as US Technical Advisor for standards activity of International Electro-technical Commission (IEC) SC86C – Fiber Optic Systems and Active Devices, and convener of the Optical Amplifiers and Modules working group. He is a member of Optical Internetworking Forum (OIF) and is leading the Gen2 100G Long-Haul Module MSA. He has been honored with several awards including Bell Laboratories President's Gold Award, and the Trophée du Téléphone in Paris. He was elected Fellow of Optical Society of America in 2003. He received the 1905 Award of the IEC in 2009.

Norman Swenson is co-founder and Chief Technology Officer of ClariPhy Communications, a leading supplier of integrated circuits for high performance networking. Dr. Swenson previously served as CTO and VP Engineering at Kestrel Solutions, a manufacturer of optical networking systems for local exchange carriers. Prior to Kestrel, he was Chief Engineer and Program Manager for Advanced Communications at Lockheed Martin, where he directed research in multi-gigabit communication systems. Dr. Swenson received his Ph.D. in Electrical Engineering from Stanford University, where he developed novel applications of signal processing for fiber optic communication channels. He received an M.S. in Electrical Engineering from the University of Southern California and a B.A. in Physics and Computer Science from UC Berkeley.

Rang-Chen Yu is the Vice President of Business Development at Oplink Communications, Inc. Prior to joining Oplink in 2009, he was Global Vice President of Product Development at Source Photonics, after Fiberxon was acquired by MRV, and subsequently merged with LumimentOIC. At Fiberxon, he was the Vice President of Datacom and Telecom. Before joining Fiberxon in 2004, he was Sr. Director of System Engineering at Agility Communications, Inc. Rang-Chen holds a Ph. D. in Solid State Physics from University of Pennsylvania, and B. S. in Physics from Peking University.

Panel 5: PIC vs. Si Photonics: Hype or Reality?

Thursday, 13 March
13:00 - 15:00

Moderator:

Adam Carter, *General Manager - Transceiver Module Group, Cisco, USA*

Panel Description:

Photonic integrated circuits (PIC) and silicon photonics have attracted a lot of attention for highly integrated modules and devices and it has been one of the hottest topics at OFC over the past few years. What is the latest industry status for reality check? Where are we doing well and where are we not? How close to the commercial deployment? Any critical aspects that are not receiving enough attention? Component Analysts and Service Providers would give their opinions on the values of each and status in the workplace. The goal is to set the right level of expectations with reality to move this potentially important technology forward.

Speakers

Silicon Photonics, Real Products: Past, Present and Future

Mehdi Asghari; *Mellanox, USA*

In this presentation we will look at the Hype vs Reality of Si Photonics from a real product perspective, not research. We will also review what Mellanox is doing in this area and what challenges remain ahead to utilize the full potential that the technology has to offer.

Feeding the Broadband Monster: The Transformational Impact of DWDM Super-Channels

Geoff Bennett; *Director of Solutions & Technology, Infenera, USA*

Internet capacity is said to be growing at 30% to 50% per year; so, looking at a five year timescale, service providers not only have to plan to grow capacity by a factor of five over that time, but they also need to deal with operational scale. Coherent DWDM super-channels address both of these issues – with coherent technology delivering the capacity, and super-channels making that capacity operationally scalable. Super-channels consists of multiple, coherent optical carries implemented on a single line card, so large scale (ie. multi-wavelength) photonic integrated circuits are an ideal implementation approach.

To make this capacity efficient, and allow advanced protection scenarios, non-blocking OTN switching is needed everywhere in the network. The combination of the service-ready capacity offered by super-channels, and the deterministic switching offered by OTN means that control plane technology – both distributed (eg. GMPLS) and centralized (eg. SDN) reach their full potential.

Next Generation Intelligent and Programmable PICs and Optical Subassemblies

Daniel Blumenthall; *CTO/Co-Founder Packet Photonics, Inc., and Professor/Director Terabit Optical Ethernet Center UCSB, USA*

In this talk we will describe a new generation of optical transceiver that by design merges the worlds of Photonic Integration through PICs with Intelligence and Programmability. Our technology, called Software Programmable Optical Technology (SPOT™) is a software programmable technology that is adaptive and compatible with both the legacy/standardized infrastructure and the new Software Defined Network (SDN) architectures being deployed. We are incorporating our own monolithically integrated InP PICs and other solutions including optics, electronics, interconnects and mechanical structures. These solutions lead to highly integrated modules and subassemblies with intelligence and programmability to realize PIC based transceivers for high density, low power, high-capacity and cost efficiencies.

Metro Silicon Photonics

Chris Doerr; *Director of Integrated Photonics, Acacia, USA*

Silicon photonics is touted as a low-cost solution for short reach optical interconnects. However, the performance is also good enough for metro applications. Silicon photonic's high yield for complex integration and compact footprint bring tremendous advantages to metro transceivers. We discuss the performance and applications of silicon photonics in metro optical networks.

Review Light Sources for PIC and Si-Photonics

Norman Kwong; *Executive VP Business Development, BinOptics, USA*

The latest light source technologies that enable PIC and Si-Photonics commercialization will be reviewed. Low cost and low power consumption are key factors in choosing the light

source. Light sources that can reliably work in non-hermetic environments provide substantial savings in packaging costs. Components that can be passively aligned within the module reduce costs. Efficient coupling to the PIC and Si-Photonics chips reduces the power consumption of the module. Uncooled light sources that can work over a wide temperature range eliminate the need for a thermal electric cooler. Methods to shape the laser beam to increase coupling efficiency are critical in lowering power consumption. Integrated devices and array light sources will also be reviewed.

Silicon Photonics as A Photonic Integration Platform

Ferris Lipscomb; *Vice President of Marketing, Neophotonics, USA*

Photonic Integrated Circuits (PICs) are widely deployed in optical communications networks today and are manufactured using high volume wafer based photolithography and processing tools originally developed for the semiconductor industry. PIC developers have long desired to follow the lead of electronics where extremely complex devices are made using one nearly ubiquitous materials system (Silicon), one basic device element (the gate) and one dominant manufacturing process (CMOS). However, this goal has proven elusive for optics due to the multitude of applications required, including reaches from meters to thousands of kilometers, different wavelength bands, and the different functions required, such as lasers, amplifiers, filters, switches, detectors, splitters, etc. This talk will explore whether Silicon Photonics, as it is now emerging, will become a unifying material and process, or whether Silicon Photonics will be an additional integration platform that exists along-side existing platforms such as PLC, GaAs and InP.

Biography

Adam Carter has over 20 years experience in the optical communication market and is currently the Senior Director and General Manager of the Transceiver Module Group (TMG) at Cisco, a position he has held for the last five years. In March 2012 Cisco announced the acquisition of Lightwire, a privately held company developing Silicon Photonics for high bandwidth, low power, high density transceiver applications which now reports into TMG. Prior to joining Cisco, Adam was Director of Marketing for the Fiber Optic Product Division at Avago Technologies, and before that held positions in Strategic Marketing, Product Management, Operations and Product Development for Agilent Technologies, Hewlett Packard and British Telecom & Dupont (BT&D). Adam holds a BSc (Hons.) in Applied Physics from Portsmouth University and received a PhD from the University of Wales, Cardiff for his research on plasma etching of III-V semiconductor materials.

Dr. Mehdi Asghari has around 20 years of research and product development experience within the silicon photonics industry. Currently, Dr. Asghari is the VP of Silicon Photonics R&D at Mellanox. Prior to that he was the CTO at Kotura Inc. Previously Dr. Asghari served as VP of Research and Development at Bookham Inc. in the UK. Bookham was the first company commercializing Silicon photonics.

Dr. Asghari holds a Ph.D. degree in Optoelectronics from the University of Bath, a M.Sc. degree in Optoelectronics and Laser Devices from the Heriot-Watt and St. Andrews Universities, and a MA degree in Engineering from Cambridge University. He has authored or co-authored over 150

Journal and Conference publications and holds more than 15 active patents within the fields of silicon photonics and optoelectronics

Geoff Bennett is the Director of Solutions & Technology for Infinera, a leading manufacturer of Intelligent Transport Network solutions. He has over 20 years of experience in the data communications industry, including IP routing with Proteon and Wellfleet; ATM and MPLS experience with FORE Systems; and optical transmission and switching experience with Marconi, where he held the position of Distinguished Engineer in the CTO Office. Geoff is a frequent conference speaker, and is the author of “Designing TCP/IP Internetworks”, published by VNR.

Daniel J. Blumenthal received the B.S.E.E. degree from the University of Rochester, M.S.E.E. degree from Columbia University and Ph.D. degree from the University of Colorado, at Boulder. He was Assistant Professor in the School of ECE, Georgia Institute of Technology from 1993 to 1997. He is currently a Professor in the Department of ECE at the UCSB and Director of the Terabit Optical Ethernet Center (TOEC). Dr. Blumenthal is currently CTO and Co-Founder of Packet Photonics, Inc. and co-founded Calient Networks. He has published over 380 papers in the areas of optical communications and networks and InP and Ultra Low Loss Waveguide Photonic Integrated Circuits (PIC) and silicon photonic and nanophotonic device technologies. He holds 8 patents and is co-author of *Tunable Laser Diodes and Related Optical Sources* (New York: IEEE–Wiley, 2005). Dr. Blumenthal is a Fellow of the IEEE the Optical Society of America. He is recipient of a Presidential Early Career Award for Scientists and Engineers (PECASE), a National Science Foundation Young Investigator Award and a Office of Naval Research Young Investigator Program (YIP) Award.

Christopher R. Doerr earned a B.S. in aeronautical engineering and a B.S., M.S., and Ph.D. in electrical engineering from the Massachusetts Institute of Technology (MIT). He attended MIT on an Air Force scholarship and earned pilot wings in 1991. Since coming to Bell Labs in 1995, Doerr’s research has focused on integrated devices for optical communication. He was promoted to Distinguished Member of Technical Staff in 2000, received the OSA Engineering Excellence Award in 2002, and became an IEEE Fellow in 2006, an OSA Fellow in 2009, and a Bell Labs Fellow in 2011. Doerr was Editor-in-Chief of IEEE Photonics Technology Letters from 2007-2009. He was awarded the William Streifer Scientific Achievement Award in 2009. He was promoted to Technical Manager in 2010. In 2011 he joined Acacia Communications as Director of Integrated Photonics. He is currently a Program Chair for OFC and an Associate Editor for IEEE Photonics Technology Letters. He is married to Neriko Musha and has two children.

Norman Kwong is current the Executive VP of Business Development at BinOptics. He is a well-respected contributor to the photonics industry and has been working on laser light sources over 30 years. He was a co-founder of Archcom Technology Inc. (later acquired by Hisense), where he was the chief technology officer. During his time at Archcom, he performed a wide range of senior management functions. Previously, Dr. Kwong was the Director of Advance Technology at JDS Uniphase, where he was involved in corporate technology strategy and due diligence, and chairman of the corporate reliability council. He was also VP and General Manager of the Telecom business unit at Ortel Corporation (later acquired by Lucent, Agere and

Emcore). Dr. Kwong earned his Ph.D in Physics at the California Institute of Technology.

G. Ferris Lipscomb has served as NeoPhotonics' Vice President of Marketing since November 2002. From January 1999 until October 2002, Dr. Lipscomb served as Vice President of Marketing of Lightwave Microsystems Corporation, which was acquired by NeoPhotonics. From January 1993 until December 1998, Dr. Lipscomb served in various positions including as General Manager and Executive Vice President at Akzo Nobel Electronic Products, Inc., a division of a multinational materials company. From September 1983 until December 1993, Dr. Lipscomb served in various positions including Chief Scientist for Photonics and Lightwave Technology in the Research and Development Division of Lockheed Missiles & Space Company. From September 1981 until August 1983, Dr. Lipscomb served on the Technical Staff of the TRW Technology Research Center. Dr. Lipscomb holds a doctorate degree in solid state physics from the University of Pennsylvania and a bachelor of science degree from the University of North Carolina, Chapel Hill.

Service Provider Summit

The Service Provider Summit is open to all Conference Attendees and Exhibit Pass Plus Attendees! Join your colleagues for this dynamic program with topics and speakers of interest to CTOs, network architects, network designers and technologists within the service provider and carrier sector. The program includes panel discussions, a keynote presentation, exhibit time and networking time.

The program will be located on the exhibit floor, so attendees can easily attend the sessions and tour the exhibit hall. Audience members are encouraged to participate in the question and answer segments that follow the presentations.

Service Provider Summit Chair:

Steve Plote, *Director of Business Solutions, BTI Systems, USA*

Service Provider Summit Organizer:

Samuel Liu, *Senior Product Line Manager, Juniper Networks, USA*

A Division of Labor: The Evolving Roles of Packet Optical and OTN Technologies at Windstream

Wednesday, 12 March
08:30 - 09:00

Keynote Speaker

Randy Nicklas, *Executive Vice President – Engineering & Chief Technology Officer, Windstream, USA*

Windstream Communications is a US service provider providing advanced telecom services to enterprise, carrier and consumer customers on a national basis. As a facilities based provider, Windstream owns and operates extensive access, regional, metropolitan and intercity networks that are fiber-based and increasingly geared to support large-scale and cost-effective packet transport. Windstream uses an evolving combination of both Packet Optical and OTN based platforms to deliver its services to all types of customers, and sees these technologies as complementary rather than mutually exclusive in our network architectures. This presentation will give specific examples of how Windstream today uses both Packet Optical and OTN capabilities in various portions of its network, describe the relative advantages of both technical approaches, and relate some of the challenges we have experienced to date. The presentation concludes with some predictions on the future role of Packet Optical and OTN technologies in service provider networks.

Biography

Randy Nicklas is executive vice president – engineering and chief technology officer for Windstream. Nicklas is responsible for network planning and engineering, outside plant, records and capital management.

Prior to joining Windstream in May 2013, Nicklas was senior vice president of engineering and chief technology officer for XO Communications. He had previously held engineering and technical management positions at Intelst, Cisco, and MCI. He has also worked in the areas of software development and systems engineering on a variety of aerospace programs for NASA, Los Alamos National Laboratory and Computer Sciences Corporation.

Nicklas holds bachelor's and master's degrees in applied mathematics and a master's degree in physics, all from the Georgia Institute of Technology.

Panel I: Packet Optical Convergence

Wednesday, 12 March
09:00 - 10:30

Description:

Packet optical is here with 100G using both metro 4x25 and coherent solutions. Router companies are adding integrated optics on routers while transport companies are adding MPLS/packet features on transport equipment. Is there a clear statement on which strategy will win in the market? Is there a hybrid approach that will be more successful.

Moderator:

Dana A. Cooperson, *VP Network Infrastructure, Ovum, USA*

Speakers:

Should Transport Providers Be Early Adopters of Packet Optical?"

Sam Hartley, *Manager, Network Engineering, Fibertech Networks, USA*

Should tier 2 transport providers be early adopters of packet optical or are the problems addressed with packet optical convergence not yet compelling enough to adopt a new transport architecture.

There is no question that packet optical convergence will be widely adopted and implemented. Large tier 1 providers with complex services and networks will likely be the first but, what does packet optical have to offer smaller tier 2 providers with networks containing less complexity. Do they need to begin rolling out this infrastructure now to remain competitive or wait for real problems and cost savings opportunities to arise as their networks grow in size and complexity.

Service Providers and Packet Optical Convergence

Lisa Paradis, *Manager, Transport Network Development, Sprint, USA*

As data services become part of the overall fabric of society and commoditized, Service Providers must continue to drive down network costs and simplify to continue to provide services in a rapidly growing and competitive environment. Compressing layers of equipment and applications to create a simpler, efficient, and flexible network is key. Software can provide that convergence to stitch the layers together.

A View on Packet Optical

Tom Schlatter; *VP Packet Architecture/Engineering, XO Communications, USA*

As 100G Packet Optical platforms mature in the marketplace, how will packet capabilities in transport equipment and optical capabilities in packet equipment make their way into existing networks? What makes sense today and what is still missing?

When Routers are Masters of Colored Light

Christopher Tracy, Network Engineer, ESNET, USA

Practical experiments with deploying Routers with integrated DWDM optics over an existing third-party lit production metro ring.

Biography:

Dana manages Ovum's network infrastructure advisory and consulting services, which comprise fixed access; mobile; IP services; optical transport; optical components; and carrier/vendor financials analysis. Her 30+ years of telecoms experience include 15 years as an industry analyst and consultant, bolstered by 16 years in product management and network operations.

Dana's custom research projects have spanned strategic analysis of big data analytics and video optimization; carrier opex; the future of telecom; green telecom; and market entry opportunity analyses including GPON, Ethernet services, and non-carrier buyers of ON products. Prior to joining Ovum, Dana was a marketing manager for Tektronix and a product manager at Telco Systems. She began her career as a network engineer at NYNEX (now Verizon

Communications). Her background provides a solid base for understanding her clients' challenges and opportunities. Dana holds an M.S. in Management from MIT and a B.S. in Engineering from Cornell University.

Samuel Hartley has worked in telecom since 1987 primarily in the service provider side of the industry. He has held senior engineering and planning positions in many segments of the industry such as local, long distance, cellular and transport/backhaul. Since joining Fibertech in 2006, he has served as their principal optical transport engineer and manager of the network engineering team.

Prior to joining Fibertech, Samuel worked as a senior network engineer at Rochester Telephone, Frontier Cellular and Global Crossing and as a network planner at Lucent Technologies.

Lisa Paradis has over 25 years of experience in technology fields ranging from software development, IT systems, IP networking and optical engineering. Since joining Sprint in 1996, she worked in a variety of Engineering and Development positions and is currently responsible for Development for the Transport Networks, including optical applications and synchronization.

Tom Schlatter leads the Packet Engineering team at XO Communications. The team's responsibilities include the architecture, design, engineering, implementation, planning and security of XO's IP, MPLS and Ethernet platforms and products. Previously, Schlatter led the Data Architecture and Technology team at XO, focusing on the design and evolution of XO's IP and MPLS networks, data products, and integration of VoIP applications and products with the network. Before XO, Schlatter was an IP Network Engineering manager with BBN which was subsequently acquired by GTE to become GTE Internetworking. Schlatter has 20 years experience in the Internet infrastructure and Telecommunications industry and holds a bachelors degree in Systems Engineering from Boston University.

Chris Tracy has worked in computing and networking since 1997. Prior to joining ESnet, he was a Co-PI on the GENI MANFRED proposal and was one of the systems/optical network engineers for the NSF DRAGON project, a \$6.5M research program to deploy "experimental" optical networks utilizing novel technologies and services to provide real and measurable advantage to advanced e-science applications. The program was a collaborative project between the Mid-Atlantic Crossroads, the USC Information Sciences Institute East, George Mason University, and the University of Maryland College Park. Tracy has also directly contributed to Internet2's HOPI/DCN project since April 2004. He was also responsible for the deployment and operational management of the DRAGON network - a lambda-switched network which includes over 100 miles of fiber in the Washington DC/Baltimore metro area connecting 7+ POPs with ROADMs, OADMs, L2 switches, routers, etc. Tracy has helped with strategic planning and providing engineering support for the DRAGON, HOPI, and DCN networks. Prior to MAX, Tracy was a Senior Network Engineer for seven years at a regional ISP in the Pittsburgh, Pennsylvania area. He has presented at LISA 2002, and was also involved with the Pittsburgh SAGE organization. Tracy has been actively involved with the SCinet planning committee between 2002-2006, primarily working with the IT and WAN groups. Tracy received a Bachelor of Science degree in Computer Engineering from the University of Pittsburgh in 2001, and is

currently pursuing a master's degree in telecommunications management at University of Maryland University College (UMUC).

Panel II: Network Evolution

Wednesday, 12 March
11:00 - 12:30

Description:

Implementation costs as well as technology will determine what wins. What's next for OTN switch, 400G, CDC ROADM.

Moderator:

Sterling Perrin, Senior Analyst, Heavy Reading, USA

Speakers:

Shamim Akhtar; *Sr. Director, Network Architecture & Technology Strategy, Comcast, USA*

Will Carrier OSS do Everything SDN is Promising?

Andrew Lord; *Head of Optical Research, BT, UK*

The huge hype surrounding SDN disguises the fact that all it does is offer dynamic control of networks – something traditional OSS is also capable of. So is SDN short-lived and will OSS ultimately offer the same functionality more robustly, or are there Uses Cases which are impossible or very difficult for conventional OSS? The talk will look at Use Cases from a network carrier perspective, addressing potential such as rapid circuit provisioning, multi-layer and multi-vendor operation, bandwidth on demand, virtualisation and orchestration with data center resources.

Glenn Wellbrock; *Director Network Architecture, Verizon, USA*

A Challenge of High Capacity Mobile Optical Networks for Future Radio Access

Naoto Yoshimoto; *Senior R&D Manager, NTT Access Network Service Systems Laboratories, Japan*

Fixed optical access networks based on PON technologies contribute to provide broadband services, such as video distributions and real-time network games and so on. On the other side, mobile traffic is growing more and more in recent years, due to attractive wireless services using various smart phones and portable tablet devices. To meet such a bandwidth requirement and taking a current customer's preference into consideration, future radio access networks beyond 4G are eagerly discussed. Assuming the 5G mobile network based on a centralized-controlled small cell configuration will be realized, high capacity optical networks is necessary both mobile

backhaul and fronthaul by using 100G-class transmission and WDM access technologies, for example. I will introduce enabling technologies to realize high capacity mobile optical networks for future radio access by effectively reusing PON technologies, and fixed-mobile convergence access network architecture for constructing a new social infrastructure toward “internet of everything era”.

Biography:

Sterling Perrin has more than 15 years' experience in telecommunications as an industry analyst and journalist. His coverage area at *Heavy Reading* is optical networking, including packet-optical transport. His past reports for *Heavy Reading* include:

- [SDN & NFV: A Revolution in the Making](#) (August 2013)
- [Metro Packet-Optical Transport 2.0: A *Heavy Reading* Survey Analysis](#) (March 2013)
- [SDN & the Future of the Telecom Ecosystem](#) (August 2012)
- [Photonic Integration, Super Channels & the March to Terabit Networks](#) (July 2012)
- [The Next-Gen ROADM Opportunity: Forecast & Analysis](#) (January 2012)
- [100Gbit/s Transport: Forecast & Analysis](#) (March 2011)
- [The Future of Packet-Optical Transport for Mobile Backhaul](#) (May 2010)
- [The Core Packet-Optical Transport Evolution](#) (December 2009)
- [The Optical Switching Revival: Rebuilding Optical Networks for Packets](#) (March 2009)
- [Optical Networking for Tier 2/3 Operators in North America](#) (November 2008)
- [Photonic Integration & the Future of Optical Networking](#) (March 2008)
- [The Future of Optical Transport Networks: 40G & the Road to 100G](#) (November 2007)

Perrin also authors *Heavy Reading's Packet-Enabled Optical Networking Quarterly Market Tracker*, a special quarterly research service, and the *Next-Gen Core Packet-Optical Semi-Annual Market Tracker*. Perrin is a frequent speaker at telecommunications industry events and is a highly sought-after source among the business and trade press. He chairs *Light Reading's* annual Packet-Optical Transport Evolution conference and *Light Reading's* Next Generation Packet Transport Networks – India conference. His opinions have appeared in *The Financial Times*, *The New York Times*, *Investor's Business Daily*, *Lightwave*, *Telephony*, *CNET News*, *Information Week* and *CIO Magazine*, among many others. Perrin joined *Heavy Reading* after five years at IDC, where he served as lead optical networks analyst, responsible for the firm's optical networking subscription research and custom consulting activities. Prior to joining IDC, Perrin worked for Standard & Poor's, where he delivered global industry analysis on a range of IT segments. He is a former journalist and editor at *Telecommunications Magazine*, and has also done consulting work for the research firm Current Analysis. Perrin graduated *cum laude* with a B.A. in English from Dartmouth College. He can be reached at perrin@heavyreading.com.

Shamim Akhtar, Sr. Director & Distinguished Architect, Network Strategy at Comcast is responsible for driving the network technology platform and architecture roadmap for Comcast's truly converged national IP/Optical backbone, Metro, Edge and Access network. His technology innovation & operations leadership, both inside and outside Comcast has brought tremendous momentum in the area of vendor agnostic network scaling to support Triple play residential, Distributed Elastic Cloud, MEF2.0 based business services and Mobile backhaul services over

one of the largest converged IP/Optical network in the world. Shamim is a frequent speaker in packet optical converged core and access space. He is instrumental in aligning system level thought process in scaling speeds beyond 100G to 1Tbps in North America by collaborating with carriers, technology partners and research organizations. Shamim has been involved in critical technology acquisition and investment decisions in IP/Optical industry with help of his experience and insight on the length and breadth of network technologies and their operational models across core, edge and access network. Shamim is an IIT Graduate with working knowledge of MSO/Carrier network in North America, Europe and APAC through his current & prior experiences in Philips, VPI Systems and Internet Photonics/Ciena.

Andrew joined BT in 1985 after a degree in Physics from Oxford University. He has worked on a wide range of optical network systems and technologies, including long haul subsea and terrestrial DWDM networks. He currently heads BT's optical core and access research. He has had many years of European project coordination and currently helps lead the Idealist FP7 project. He publishes more than 10 papers per year, regularly speaks at conferences and is Technical Program Chair for OFC 2015. He is an associate Editor of Journal of Optical Communications and Networking (JOCN) and also Visiting Professor at Essex University.

Naoto Yoshimoto is an executive R&D manager at NTT access network service systems Laboratories. He received B.S., M.S., and Ph.D. degrees in electronics and information engineering from Hokkaido University, Japan, in 1986, 1988, and 2003, respectively. He joined NTT Laboratories in 1988, and engaged in the research and development of optical transmission systems and related devices for broadband access systems. He is currently engaged in the planning of next-generation optical access networks and architectures. In particular, he has recently been devoting effort to advanced research for optical-wireless convergence network technologies and resilient access networks. Dr. Yoshimoto is a member of the IEEE Communication Society and a senior member of the Institute of Electronics, and he has served the chair of technical sub-committee "Access Network" in OFC2012 and OECC2013, and served the technical program member of many international conferences. He is also the visiting professor of Hokkaido University since 2010.

Other Show Floor Programming

Business:

- The Art and Science of NPI Operations in the Fiber Optic and Telecommunications Industry - Strategy, Planning and Execution
- The Buzz - A Real-time Look at the News and Trends Happening at OFC
- OIDA Review of Roadmaps for the Optical Communications Market and NPI Overview
- Product Showcases
- Workshop on Photonic Startups and Entrepreneurship

Data Center and SDN:

- Advancing Optical Solutions in Cloud Computing, Communications and Networking
- Enhanced Use Cases for an SDN-based Control Architecture for Optical Networks

- Harnessing Optical Layer Flexibility with SDN Intelligence
- How Software Defined Networking Will Alter Optical Transport
- OIF Networking & Operation Session "Carrier SDN Drivers and Evolution"
- SDN 2.0 is Here - What Have We Learned?

FTTx:

- 100G Single Lambda Optics
- Network Components in FTTx Systems
- Passive Optical LAN
- POF Symposium
- Splitter Placement in FTTB Installations

Networks:

- Advances in Photonics for Optical Transmission Networks
- New Standards for Ethernet Access Networks
- The Future of the Metro Core: A New and Innovative Approach to Delivering a Scalable, Yet Simplified, Metro Core Network
- OIF Physical & Link Layer Session "56 Gbps Serial - Why, What, When"
- Snapshot on 400GE Standardization

OFC Press Releases

See below for official news and announcements from OFC 2014. Should you have any questions, please email media@ofcconference.org.

Title	Date
Day 5: Thursday, March 13 - Final Day of OFC Includes Market Watch Program, Poster and Tech Sessions, Post-Deadline Papers and More	14 March 2014
OFC Closes in San Francisco with Increased Attendance, Larger Show Floor and a Week of World-Class Optical Networking and Communications Programming	14 March 2014
Day 4: Wednesday, March 12 - OFC Show Floor Programming in Full Swing	13 March 2014
Day 3: Tuesday, March 11 - OFC Show Floor Opens to Flurry of Activity	12 March 2014
2014 Corning Outstanding Student Paper Competition Winner Announced at OFC	11 March 2014
Day 2: Monday, March 10 Technical Sessions Begin as the Optical Communications Community Descends upon San Francisco	11 March 2014
Day 1: Sunday, March 9 - OFC 2014 Kicks off in San Francisco	10 March 2014

When Disaster Strikes: Safeguarding Networks	5 March 2014
OFC 2014 to Feature Breakthrough Research, Technology-focused Programming at the World's Leading Optical Communications Event	4 March 2014
Novel Quantum Dot Laser Paves the Way for Lower-cost Photonics	3 March 2014
OFC 2014 to Host Premier Optical Communications Exposition Featuring 550 Companies, Industry and Business Programming on Show Floor	26 February 2014
New Record Set for Data-Transfer Speeds	25 February 2014
A Step Closer to a Photonic Future	19 February 2014
Kazuro Kikuchi Wins 2014 John Tyndall Award	9 December 2013
Trailblazers in Optical Networking Set to Deliver Keynote Talks at OFC 2014	2 October 2013
OFC/NFOEC Announces Name Change to OFC	24 June 2013

Exhibitor Press Releases

Many prominent industry corporations unveil innovative new products and research at OFC. OFC 2014 exhibitor announcements are below.

Company	Title	Date
Lightip Technologies	Lightip Technologies announces the simplest and smallest tunable laser TOSA	13 March 2014
OptoTest Corporation	OptoTest's New OP940 Insertion Loss and Return Loss Meter	13 March 2014
Teledyne LeCroy	Teledyne LeCroy Showcases 100 GHz Oscilloscope Bandwidth and Optical Test Technology at OFC 2014	12 March 2014
Pactech/Willsym	PacketLight Networks announces release of enhanced encrypted DWDM transponder on the PL-1000TE platform for high security links.	12 March 2014
PacketLight Networks	PacketLight Networks announces release of enhanced encrypted DWDM transponder on the PL-1000TE platform for high security links.	12 March 2014
Sumitomo Electric Device Innovations U.S.A., Inc	Sumitomo Electric Launches Advanced Coherent Solutions	11 March 2014

Sumitomo Electric Device Innovations U.S.A., Inc	Sumitomo Electric Launches Advanced Coherent Solutions	11 March 2014
Sumitomo Electric Device Innovations U.S.A., Inc	Sumitomo Electric Showcases the World's First Public Demonstration of 100G EDR Active Optical Cable at OFC 2014	11 March 2014
MRV Communications	MRV Delivers Bold Software-Based Approach for Managing	11 March 2014
SmarTest LLC	SmarTest LLC Announces 14.5 Gb/s Programmable Pattern Generators and Bit Error Rate Test instruments for Fastest Time-to-Test Results	11 March 2014
ClariPhy Communications	ClariPhy Samples Single-Carrier 200G Coherent SoC	11 March 2014
Anritsu Company	Anritsu, Teledyne LeCroy to Demonstrate Innovative Test Solution for PAM4 Designs at OFC 2014	11 March 2014
Anritsu Company	Anritsu to Showcase Optical Test Solutions that Stretch from Lab to the Field During OFC 2014	11 March 2014
ClariPhy Communications	ClariPhy Announces SoC for 100G Coherent CFP Modules	11 March 2014
Anritsu Company	Anritsu MP1800A BERT Part of 100G Active Optical Cable Demonstration by Mellanox at OFC 2014	11 March 2014
Maxim Integrated Products	Achieve High Performance and Low Power with Highly Integrated 11.3Gbps Ethernet Optical Transceiver IC for Data Centers	11 March 2014
Tektronix, Inc.	Tektronix Unveils 40 Gb/s High-Performance BERT for Datacom & Long Haul Testing	11 March 2014
Sumitomo Electric Device Innovations U.S.A., Inc	Sumitomo Electric Demonstrates Continued Leadership of CFP4 Optical Transceivers at OFC 2014	11 March 2014
OE Solutions	OE Solutions and AimValley introduce TWAMP Smart SFP™ for layer 3 Service Assurance	11 March 2014
NeoPhotonics	NeoPhotonics Introduces Modular Multicast Switch (MCS) Configurations for Next Generation ROADMs in 100G Coherent Networks	11 March 2014
Fujitsu Network Communications, Inc.	Fujitsu and Bright House Networks Trial 400G Super Channel Technology in Real World Network Environment	11 March 2014
Sumitomo Electric Device Innovations U.S.A., Inc	Sumitomo Electric Reinforces 40/100G Leadership at OFC 2014	11 March 2014

OE Solutions	OE Solutions Announces Successful Initial Public Offering	10 March 2014
RANOVUS	Industry Leaders Introduce OpenOptics Multi-Source Agreement	10 March 2014
CoAdna Photonics, Inc.	Software Takes Center Stage as Vello Systems Leads Industry's First Open Source Optical (OSO) Effort	10 March 2014
NeoPhotonics	NeoPhotonics Samples Dual Rate 100G LR4 CFP2 Transceivers for Datacom and Telecom Applications	10 March 2014
NeoPhotonics	NeoPhotonics Adds Integrated Coherent Transmitter (ICT) To Its Suite of Next Generation PIC-Based Optical Components for 100G Coherent Transport	10 March 2014
Sanmina	SANMINA TO SHOWCASE ADVANCED OPTICAL AND RF PRODUCTS AT OFC	10 March 2014
Go!Foton	Go!Foton Unveils Ultra-High Density Universal Cassette Chassis based on its PEACOC™ Technology Platform	9 March 2014
Acacia Communications, Inc.	Acacia Communications Ships Industry's First Pluggable Coherent 100G CFP Module	9 March 2014
APEX Technologies	APEX Technologies announce new 'Long Pattern and PRBS pattern analysis' Optical Complex Spectrum Analyzer	6 March 2014
Pharad, LLC	Pharad Introduces 50 GHz RF Photonic Transmitter and Receiver	6 March 2014
Fujitsu Network Communications, Inc.	MAX-Fujitsu Field Trial Successfully Records 400 Gbps and 800 Gbps Networking Speed, Reveals Bright Future for Terabit Networking Capabilities	6 March 2014
OE Solutions	OE Solutions and AimValley introduce Chronos Smart SFP™ TS (Transparent SyncE)	6 March 2014
Fibercore Limited	Outstanding PM Performance in Fibercore's Latest Specialty Fibers For Telecommunication being released at OFC 2014	5 March 2014
APEX Technologies	APEX Technologies announce new 'Long Pattern and PRBS pattern analysis' Optical Complex Spectrum Analyzer	5 March 2014
MultiPhy, Inc.	MultiPhy to Introduce 400Gb/s Technology at OFC 2014	5 March 2014
Fraunhofer IPMS	Light path controller in fiber optic networks	5 March 2014
VI Systems	VI Systems enters European optical transceiver project for up to 56 Gbit/s	5 March 2014

Fraunhofer Institute for Photonic Microsystems	At the speed of light on the data highway	4 March 2014
Fischer Connectors, Inc.	Fischer Connectors launches revolutionary FiberOptic Hybrid Connector	4 March 2014
Source Photonics	Source Photonics introduces industry-first 100G LR4 transceiver in QSFP28 form factor for datacenter application	4 March 2014
VITEX LLC	Vitex Exhibiting at OFC	4 March 2014
Fujitsu Optical Components	Fujitsu to Exhibit World's First 100Gps Multi-Mode QSFP28 Active Optical Cable	4 March 2014
PhoeniX Software	OpSIS and PhoeniX Software Collaborate on Providing Access to Silicon Photonics	3 March 2014
PacketLight Networks, Ltd.	100G Live demo at OFC 2014 San Francisco, Booth 308	1 March 2014
ID Photonics GmbH	ID Photonics Extends its Popular Cobrite Tunable Laser Portfolio by Ultra-Narrow Line Width Tunable Laser Source	27 February 2014
Souriau	UTS LC: Fiber Optic Connector for Fast & Reliable Rollout	26 February 2014
Optical Internetworking Forum	OIF Product Showcase at OFC Features Cutting-Edge Products	25 February 2014
LEONI Fiber Optics, Inc.	Leoni Presents New Singlemode Switch at OFC 2014 In San Francisco	25 February 2014
CAILabs SAS	CAILabs, a French optics start-up, unveils its spatial multiplexer / demultiplexer at OFC 2014 in San Francisco	25 February 2014
MRV Communications	MRV Delivers New High-Performance OptiDriver™ Solution to Optimize 100G Networks	18 February 2014
EXFO	EXFO Launches First Pol-Mux Optical Spectrum Analyzer for Coherent 40G/100G DWDM Systems	23 January 2014
CIVCOM	Civcom Makes Successful Entry to High Growth Transport Networks for Telecommunications Market in India	18 December 2013
Krell Technologies, Inc.	KrellTech Releases FLeX™ System	15 November 2013

Short Courses

Short Courses cover a broad range of topic areas at a variety of educational levels. The courses are taught by highly regarded industry experts on a number of subjects.

Short Courses are an excellent opportunity to learn about new products, cutting-edge technology and vital information at the forefront of communications. Whether you choose a course designed for beginners or for more advanced instruction, the small size of each class gives you an excellent opportunity for personalized instruction.

SC101A: Hands-on Workshop on Fiber Optic Measurements and Component Testing

Caroline Connolly¹, Chris Heisler¹, Joseph Bos², Tony Nicholson³; ¹*OptoTest Corp., USA*, ²*Luna Technologies, USA*, ³*Connected Fibers, USA*

SC101B: Hands-on Workshop on Fiber Optic Measurements and Component Testing

Caroline Connolly¹, Chris Heisler¹, Joseph Bos², Tony Nicholson³; ¹*OptoTest Corp., USA*, ²*Luna Technologies, USA*, ³*Connected Fibers, USA*

SC102: WDM in Long-Haul Transmission Systems

Neal S. Bergano; *TE Subcom, USA*

SC105: Modulation Formats and Receiver Concepts for Optical Transmission Systems

Peter Winzer, Chandrasekhar Sethumadhavan, Xiang Liu; *Bell Labs, Alcatel-Lucent, USA*

SC114: Passive Optical Networks (PONs) Technologies

Frank J. Effenberger; *Futurewei Technologies, USA*

SC160: Microwave Photonics

Keith Williams, Vince Urick; *NRL, USA*

SC171: Introduction to Optical Control Plane Concepts, Technologies and Practices

Greg Bernstein; *Grotto Networking, USA*

SC176: Metro Network: The Transition to Ethernet

Loudon Blair; *Ciena Corp., USA*

SC177: High-Speed Semiconductor Lasers and Modulators

John Bowers; *Univ. of California at Santa Barbara, USA*

SC178: Test and Measurement of High-Speed Communications Signals

Greg D. Le Cheminant; *Agilent Technologies, USA*

SC185: Hands-on Polishing, Inspection and Testing of Connectors

Phil Shoemaker¹, Steve Baldo², Neal Wagman³; ¹*Light Brigade Inc., USA*, ²*Seikoh Giken Co. Ltd., USA*, ³*Norland Products, USA*

SC187: Hands-on Basic Fiber Optics for the Absolute Beginner

Dennis Horwitz; *Micronor Inc., USA*

SC203: 100 Gb/s and Beyond Transmission Systems, Design and Design Trade-offs
Martin Birk¹, Benny Mikkelsen²; ¹*AT&T Labs, Res., USA*, ²*Acacia Communications, USA*

SC205: Integrated Electronic Circuits and Signal Processing for Fiber Optics
Y. K. Chen, Noriaki Kaneda; *Bell Labs, Alcatel Lucent, USA*

SC208: Optical Fiber Design for Telecommunications and Specialty Applications
David J. DiGiovanni; *OFS Labs, USA*

SC210: Hands-on Polarization-Related Measurements
Danny Peterson¹, Tasshi Dennis², Brian Teipen³, Christine Tremblay⁴; ¹*Verizon Business, USA*, ²*NIST, USA*, ³*ADVA Optical Networking, USA*, ⁴*Ecole de Technologie Supérieure, Univ. du Quebec, Canada*

SC216: An Introduction to Optical Network Design and Planning
Jane M. Simmons; *Monarch Network Architects, USA*

SC217: Hybrid Fiber Radio: The Application of Photonic Links in Wireless Communications
Dalma Novak; *Pharad, LLC., USA*

SC239: Short-Reach Optical Interconnects
Steve Joiner; *Finisar, USA*

SC259: Electronic and Optical Impairment Mitigation
Chris Fludger; *Cisco Optical GmbH, Germany*

SC261: ROADM Technologies and Network Applications
Thomas Strasser; *Nistica Inc., USA*

SC265: Passive Optical Components and Filtering Technologies
Bruce Nyman¹, Christi Madsen²; ¹*TE SubCom, USA*, ²*Texas A&M Univ., USA*

SC266: Quantum Cryptography and Quantum Information
Richard Hughes¹, Thomas Chapuran²; ¹*Los Alamos Natl. Lab, USA*, ²*Applied Communication Sciences, USA*

SC267: Silicon Microphotronics: Technology Elements and the Roadmap to Implementation
Lionel Kimerling; *MIT, USA*

SC288: Fundamentals of Polarization, PDL, and PMD
Nick Frigo; *US Naval Academy, USA*

SC291: Hands-On Fiber Optics For Engineers Designing For Military, Aerospace, Shipboard and Industrial Harsh Environmental Applications

Dennis Horwitz; *Micronor Inc., USA*

SC312: Parametric Optical Processing and Systems

Stojan Radic; *UCSD, USA*

SC314: Hands-on Fiber Characterization for the Engineering of Long Haul and Metro Deployments

Daniel Peterson¹, Christine Tremblay²; ¹*Verizon, USA*, ²*École de Technologie Supérieure, Univ. du Québec, Canada*

SC325: Highly Integrated Monolithic Photonic Integrated Circuits

Chris Doerr; *Acacia Communications, USA*

SC327: Modeling and Design of Fiber-Optic Communication Systems

Rene-Jean Essiambre; *Bell Labs, Alcatel-Lucent, USA*

SC328: New Developments in Optical Transport Networking (OTN)

Stephen Trowbridge; *Alcatel-Lucent, USA*

SC341: OFDM for Optical Communications

Sander L. Jansen¹, Dirk van den Borne²; ¹*ADVA Optical Networking, USA* ²*Juniper Networks, Germany*

SC347: Reliability and Qualification of Fiber-Optic Components

David Maack; *Corning, USA*

SC356: 40G/100G Ethernet Technologies and Applications

Osamu Ishida; *NTT Electronics, Japan*

SC357: Circuits and Equalization Methods for Short Reach Optical Links

Alexander Rylyakov; *IBM T.J. Watson Res. Ctr., USA*

SC358: Data Center Cabling: Transitioning from Copper to Fiber

Lisa Huff; *DataCenterStocks.com, USA*, *Discerning Analytics, LLC., USA*

SC359: Datacenter Networking 101

Cedric Lam, Hong Liu; *Google, USA*

SC369: Test and Measurement of Complex Modulated Optical Signals

Bernd Nebendahl, Oliver Funke; *Agilent Technologies, Germany*

SC372: Energy-Efficiency Networking

Rod S. Tucker, Kerry Hinton; *Univ. Melbourne, Australia*

SC373: Specialty Fiber Splicing and Interconnection

Andrew Yablon; *Interfiber Analysis, USA*

SC374: Cloud Computing and Dynamic Networks

George Clapp¹, Douglas Freimuth²; ¹*AT&T Labs, USA*, ²*IBM, USA*

SC384: Background Concepts of Optical Communication Systems

Alan Willner; *Univ. of Southern California, USA*

SC385: Fundamentals of Super Computing

Horst Simon; *National Energy Research, Scientific Computing (NERSC) Center, Lawrence Berkeley National Laboratory, USA*

SC386: The Evolution of Network Architecture Towards Cloud-centric Applications

Loukas Paraschis; *Cisco Systems, Inc., USA*

SC388: Wireless Backhaul

Stu Benington; *Tellabs, Inc., USA*

SC389: Network Optimization

Dominic Schupke; *Nokia Siemens Network, Germany*

SC390: Introduction to Forward Error Correction

Frank Kschischang; *Univ. of Toronto, Canada*

SC391: FEC Technology and Applications in Optical Communications

Takashi Mizuoichi, Yoshikuni Miyata, Takashi Sugihara; *Mitsubishi Electric Corporation, Japan*

SC392: Coherent Optical Systems 1

Maurice O'Sullivan; *Ciena, Canada*

SC393: Coherent Optical Systems 2

Mark D. Feuer; CUNY College of Staten Island, New York, USA;

SC395: Hands On: Basic Modeling and Design of Coherent Fiber-Optic Communication Systems

Erich Gottwald, Harald Rohde; *Coriant, Germany*

SC401: Software Defined Networking and OpenFlow

Saurav Das; *Consultant (formerly with Big Switch Networks, USA)*

SC408: Space Division Multiplexing

Roland Ryf; *Bell Labs, Alcate-Lucent*

SC409 : Safety in Fiber Optics: From Components to Systems

Larry Johnson¹, Ken Barat²; *The Light Brigade*¹, USA, Consultant², USA

SC411: Multi-layer Interaction in the Age of Agile Optical Networking

Ori A. Gerstel; *Cisco Systems, USA*