

# OFC/NFOEC 2007 Archive

**Technical Conference: March 25-29, 2007**

**Exposition: March 27-29, 2007**

**Anaheim Convention Center, Anaheim, California, USA**

OFC/NFOEC 2007 was a true reflection of the thriving industry that is optical communications. This year's event showed promising new research achievements, innovative new products from the field's leading companies and a vibrant business environment.

With **144 sessions this year and more than 600 presentations**, the technical program remained the **premier scientific event for fiber optics**. This year's papers focused on everything from a new transceiver that transmits and receives record-breaking amounts of high-speed data in optical form to a fiber-based light source for food detection and a transmission method that increases high-speed data transmission at 40 Gb/s from 6 kilometers to more than 6,000 kilometers, along with many more significant technical achievements. Additionally, keynote presentations from industry luminaries CC Fan, Tsinghua University, Beijing and the Chinese Institute of Communications; Nicholas Negroponte, One Laptop Per Child; and Mark Wegleitner, Verizon, drove home the **importance of optical communications on an international scale**.

Attracting **13,000 attendees from all over the globe, including 600 participating companies**, the conference had a packed program that showcased the **exciting new commercial developments within optical communications**. News from exhibitors showed that companies are going public and new products are being rolled out on a regular basis. All of this development is certain to have an impact on the future of the field and OFC/NFOEC continues to **provide the inside track on up-to-the-minute developments in the business of optical communications**.

We can't wait to see what next year brings and are looking forward to **OFC/NFOEC 2008 from February 24 – 28 in San Diego, CA**.

## OFC and NFOEC Abstracts

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## Agenda of Sessions and Key to Authors and Presiders

[Agenda of Sessions](#)

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## Committees

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## **4. Switching Wavelength-Selective Filtering and Routing Devices**

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### **C. Service Provider Summit & Market Watch**

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## Invited Speakers

### 1. Fibers and Optical Propagation Effects

**Entanglement Generation with Fiber Nonlinearity for Quantum Communication in the Telecom Band**, Prem Kumar, *Northwestern Univ., USA*.

**Practical Considerations for the Application of Highly Nonlinear Fibers**, Toshiaki Okuno, *Sumitomo Electric Industries, Ltd., Japan*.

**Novel Fibers for Ultra-Short and High-Power Pulse Generation and Propagation**, Siddharth Ramachandran, *OFS Labs, USA*.

**Optical Materials for Fiber Applications: Past, Present and Future**, Kathleen Richardson, *Clemson Univ., USA*.

**Progress in Active Fibers**, Jayanta Sahu, *Optoelectronics Res. Ctr., UK*.

**Progress on Chalcogenide Glass Fibers**, Jasbinder Sanghera, *NRL, USA*.

### 2. Amplifiers and Lasers: Fiber or Waveguide

**Silicon Evanescent Laser in a Silicon-on-Insulator Waveguide**, John Bowers, *Univ. of California at Santa Barbara, USA*.

**Novel Dopants for Silica-Based Fiber Amplifiers**, Bernard Dussardier, *Univ. of Nice, France*.

**High Power Optical Amplifiers for Free-Space Communication Systems**, Douglas Holcomb, *Lucent Technologies, Bell Labs, USA*.

**High Power Mid-IR Fiber Lasers and Amplifiers**, Ravi Jain, *Univ. of New Mexico, USA*.

**Fiber Technologies for Terawatt Lasers**, John Marciante, *Univ. of Rochester, USA*.

**Advances in Femtosecond Fiber Lasers**, Jeff Nicholson, *OFS Labs, USA*.

**Tunable Lasers Based on Silica Waveguide Ring Resonators**, Morio Takahashi, *System Platforms Res. Labs, Japan*.

**Ultrafast Wavelength-Swept Lasers**, Seok-Hyun (Andy) Yun, *Harvard Medical School and Wellman Labs of Photomedicine, MGH, USA*.

### 3. Signal Measurement, Distortion Compensating Devices and Sensors

**High Resolution Optical Waveform and Eye Diagram Monitoring**, Peter Andrekson, *Chalmers Univ. of Technology, Sweden*.

**Chalcogenide Glass Waveguides and Grating Devices for All-Optical Signal Conditioning**, Benjamin Eggleton, *Univ. of Sydney, Australia*.

**Distributed Acoustic and Seismic Sensors**, Clay Kirkendall, *NRL, USA*.

**Outage Probabilities Revisited**, Herwig Kogelnik, *Lucent Technologies, USA*.

**Advances in 40G Electronic Equalizers**, Makoto Nakamura, *NTT Photonics Labs, Japan*.

**Recent Progress on FBG-Based Tunable Dispersion Compensators**, Yves Painchaud, *TeraXion, Canada*.

**Strategies for Fabricating Strong-Confinement Microring Filters and Circuits**, Henry

Smith, *MIT, USA.*

**Microfiber Photonics**, Misha Sumetsky, *OFS Labs, USA.*

#### **4. Switching, Wavelength-Selective Filtering and Routing Devices**

**SOI Photonic Wire Waveguides with Compact Grating Couplers**, Roel Baets, *Univ. of Ghent, IMEC, Belgium.*

**Different Aspects and Design Considerations of AWG in ROADM**, Ray Chen, *Univ. of Maryland, Baltimore County, USA.*

**High Performance WSS Technology Based on MEMS**, Thomas Ducellier, *Metconnex, USA.*

**LCoS Based Wavelength Selective Switch**, Steven Frisken, *Engana Pty Ltd., Australia.*

**Self-Organized Polymer Waveguides**, Manabu Kagami, *Toyota Central Labs, Japan.*

**Photonic Crystal Inside-Autocloned PhC's Enable Various Key Functions**, Shojiro Kawakami, *Touhoku Univ., Japan.*

**Telecommunication Application of Si-Based Photonic Crystals**, Masaya Notomi, *NTT Basic Res. Labs, Japan.*

**Highly Integrated PLC-Type Devices with Surface-Mounted Monitor PDs for ROADM**, Ikuo Ogawa, *NTT Photonics Labs, NTT Corp., Japan.*

#### **5. Optoelectronic Devices**

**Semiconductor: Based Optical Demultiplexing and Wavelength Conversion at 320 Gbit/s**, H. J. S. Dorren, *Eindhoven Univ. of Tech., Netherlands.*

**Do Quantum Dots or Quantum Wire Based Devices Offer a Practical Advantage in Producing Semiconductor Optical Amplifiers over Conventional 2-D Active Media?** Gadi Eisenstein, *Technion, Israel.*

**CMOS Based Photonic Integration For Optical Interconnects**, Cary Gunn, *Luxtera, USA.*

**80-Gb/s DQPSK Modulator**, Tetsuya Kawanishi, *Communications Res. Lab, Japan.*

**Ultra-High-Capacity WDM Photonic Integrated Circuits**, Fred Kish, *Infinera, USA.*

**THz Applications and Techniques**, Martin Koch, *TU Braunschweig, Germany.*

**PMD Compensation Using Electronic Equalizers**, Theodor Kupfer, *CoreOpticsGmbH, Germany.*

**InP-Based 1.3 and 1.55  $\mu\text{m}$  VCSELs for 10 Gbits/s Applications**, Nobuhiko Nishiyama, *Corning Inc., USA.*

**Recent Advances in AlInAs Avalanche Photodiodes**, Eiji Yagyu, *Mitsubishi Electric Corp., Japan.*



## 6. Digital Transmission Systems

**Network Upgrade from Telecom Operators View**, Dirk Breuer, *Deutsche Telekom T-Systems, Germany*.

**Dirrential-Phase-Shift Quantum Key Distribution Using Single-Photon Detectors**, Kyo Inoue, *Osaka Univ., Japan*.

**Compensating Multimode Fiber Dispersion Using Adaptive Optics**, Joseph Kahn, *Stanford Univ., USA*.

**Modulation/Demodulation Schemes for Optical Multi-Level Transmission**, Nobuhiko Kikuchi, *Central Res. Lab, Hitachi Ltd., Japan*.

**Challenges for 100Gbit/s ETDM Transmission and Implementation**, Eugen Lach, *Alcatel, Germany*.

**All-Channel PMD Mitigation Using Distributed Fast Polarization Scrambling in WDM Systems with FEC**, Xiang Liu, *Lucent Technologies, USA*.

**Coherent Detection for Optical Communications Using Digital Signal Processing**, Michael Taylor, *Univ. College London, UK*.

**Coherent Receivers for Phase-Shift Keyed Transmission**, Christoph Wree, *Discovery Semiconductors, Inc., USA*.

## 7. Transmission Subsystems and Network Elements

**Status of Optical Modules and Sub-Systems Standards**, Peter Anslow, *Nortel, UK*.

**Asynchronous Sampling for Optical Performance Monitoring**, Sarah Dods, *Natl. ICT Australia Ltd, Australia*.

**100GbE Transmission Techniques**, Gottfried Lehmann, *Siemens AG, Germany*.

**Coherent Detection with Digital Phase Locking**, Andreas Leven, *Lucent Technologies, USA*.

**OFDM for Dispersion Compensation**, Arthur Lowery, *Monash Univ., Australia*.

**Multi-Granularity OXC Architecture**, Atsushi Takada, *NTT Corp., Japan*.

**Monitors to Ensure the Performance of Photonic Networks**, Sheryl Woodward, *AT&T Labs-Res., USA*.

## 8. Optical Processing and Analog Subsystems

**Techniques for Optical Arbitrary Waveform Generation of Microwave Signals**, Wm. Randall Babbitt, *Montana State Univ., USA*.

**Technologies for Fiber Fed 60 GHz Wireless Systems**, Woo-Young Choi, *Yonsei Univ., Republic of Korea*.

**All Optical Tunable Wavelength Conversion at > 160 Gb/s**, Hideaki Furukawa, *Natl. Inst. of Information and Communications Technology, Japan*.

**RF-over-Fiber and Optical Processing for Navy Applications**, Everett Jacobs, *SSC San Diego, USA*.

**Optical Signal Processing Based on All-Optical Analog-to-Digital Conversion**, Akihiro

Maruta, *Osaka Univ., Japan.*

**Photonic Technologies in the NEDO Project**, Yoshiaki Nakano, *Univ. of Tokyo, Japan.*

**Optical Switching Technologies for Data Networking**, David Neilson, *Bell Lab, Lucent Technologies, USA.*

**Integrated Optics in Lithium Niobate: New Devices, Circuits and Applications**, Wolfgang Sohler, *Univ. of Paderborn, Germany.*

## 9. Networks

**Technologies for Building Fast Reconfigurable WDM Optical Networks**, Daniel Blumenthal, *Univ. of California at Santa Barbara, USA.*

**Has Optics Changed the Networking Paradigm?** Andreas Gladisch, *Deutsche Telekom, Germany.*

**Service Availability in Optical Network Design**, Monika Jaeger, *Deutsche Telekom, Germany.*

**Burst-Switched Metro and Access Networks**, Leonid Kazovsky, *Stanford Univ., USA.*

**Carrier-Grade Ethernet for Core Networks**, Andreas Kirstaedter, *Siemens AG, Germany.*

**Techno-Economic Issues in Future Telecom Networks**, Andrew Lord, *British Telecom, UK.*

**HOPI Testbed**, Rick Summerhill, *Internet 2, USA.*

**Impairment Aware Routing**, Ioannis Tomkos, *Athens Information Technology, Greece.*

## 10. Emerging Applications and Access Solutions

**Hybrid Optical-Wireless Networks**, Sudhir Dixit, *Nokia Res., USA.*

**Comparative Analysis of PON-Based Architectures PON: Lessons Learned**, Junichi Nakagawa, *Mitsubishi Electric Corp., Japan.*

**Recent Research Activities of WDM-PON in Korea**, Hyung-Jin Park, *Korea Telecom, Republic of Korea.*

**WDM-PON with Colorless ONUs**, Franck Payoux, *France Telecom, France.*

**Waveguides in PCB**, Petar Pepeljugoski, *IBM Res., USA.*

**GRID and Optical Networks: How to Bridge the Gap?** Nageswara, S. V. Rao, *Oak Ridge Natl. Lab, USA.*

**Optical VPN or Inter-Provider Optical VPN**, Tomonori Takeda, *NTT, Japan.*

**OCDMA Access Systems Using Ultra-Long Super-Structured En/Decoder**, Xu Wang, *Natl. Inst. of Information and Communications Technology, Japan.*

**Short Distance Optical Connections for Home Networks, Sensing and Mobile Systems**, Olaf Ziemann, *POF-AC Polymer Optical Fiber Application Ctr., Germany.*

## NFOEC A: Network Systems

**Optical/Wireless Access Architecture and Field Trials**, Peter Magill, *AT&T, USA*.  
**Optical Meshed Networks: From Concept to Deployment**, Hans-Juergen Schmidtke, *Siemens Communications, USA*.

## **NFOEC B: Network Technologies**

**ROADM Deployment, Challenges and Applications**, Ron Bernhey, *Verizon, USA*.  
**OA&M in Packet Transport Networks**, Leon Bruckman, *Corrigent Systems, USA*.  
**Falling Boundaries from Metro to ULH Optical Transport Equipment**, Michel Chbat, *Siemens Communications, Inc., USA*.  
**Applications of Liquid Crystal Technology to Telecommunication Devices**, Jack Kelly, *CoAdna Photonics, USA*.  
**Design and Implementation of an Optical Dynamic Core Network: Engineering Considerations**, Kim Papakos, *Tellabs, USA*.  
**Massively-Regenerator Based DWDM Systems**, David Welch, *Infinera Corp., USA*.

## **Tutorial Speakers**

### **1. Fibers and Optical Propagation Effects**

**Nonlinear Fibers and Applications**, Govind Agrawal; *Univ. of Rochester, USA*  
**Dispersion Compensating Fibers: Properties and Applications**, Lars Grüner-Nielsen; *OFS Denmark, Denmark*

### **2. Amplifiers and Lasers: Fiber or Waveguide**

**Fiber Parametric Amplifiers: Physics and Applications**, Stojan Radic; *Univ. of California at San Diego, USA*  
**Silicon Photonics**, Graham Reed; *UK*

### **3. Signal Measurement, Distortion Compensating Devices and Sensors**

**Coupled Resonator Optical Devices**, Amnon Yariv; *Caltech, USA*

### **4. Switching, Wavelength-Selective Filtering and Routing Devices**

**High Density Integration of Functional Optical Circuits with Higher Index Difference**, Brent Little; *Little Optics, USA*

### **5. Optoelectronic Devices**

**Recent Advances in Germanium Quantum Well Structures — A New Modulation Mechanism for Silicon-Compatible Optics**, David A. B. Miller; *Stanford Univ., USA*

### **6. Digital Transmission Systems**

**D(Q)PSK Transmission Technologies for ULH Systems**, Stuart Abbott; *Tyco*

*Telecommunications, USA*

**Introduction to Quantum Communications**, Yoshihisa Yamamoto; *Stanford Univ., USA*

## **7. Transmission Subsystems and Network Elements**

**Electronic Dispersion Compensation**, Henning Bülow; *Alcatel SEL AG, Germany*

**ROADM Network Elements**, Madhu Krishnaswamy; *JDSU, Canada*

## **8. Optical Processing and Analog Subsystems**

**SOA-Based All Optical Processing**, Alistair J. Poustie; *Ctr. for Integrated Photonics, UK*

## **9. Networks**

**Services from a Carrier's Perspective**, Stuart Elby; *Verizon Communications, USA*

## **10. Emerging Applications and Access Solutions**

**Service Oriented Architectures with User Controlled Light Paths**, Bill St. Arnaud; *Canarie Inc., Canada*

## **NFOEC B: Network Technologies**

**Electronic Dispersion Compensation**, Charles Laperle; *Nortel, Canada*

## **Workshops & Panels**

Workshops will be held on Sunday, March 25 from 3:30 p.m. - 7:30 p.m. and 4:30 p.m. - 7:30 p.m. and Monday, March 26 from 8:00 a.m. - 11:00 a.m. The workshops provide an interactive learning environment and are open to all conference registrants.

### **OSuA, Sunday, March 25, 3:30 p.m. – 7:30 p.m., Ballroom A**

**100 Gpbs Ethernet Systems, Applications and Enabling Technologies**, Heinz-Gunter Bach<sup>1</sup>, Bryan Robinson<sup>2</sup>, Marcus Duelk<sup>3</sup>, John D'Ambrosia<sup>4</sup>; <sup>1</sup>*Heinrich-Hertz Inst., Germany*, <sup>2</sup>*MIT Lincoln Labs, USA*, <sup>3</sup>*Lucent Technologies, USA*, <sup>4</sup>*Force10 Networks, Inc., USA*

Focus on 100 Gb/s Ethernet is growing. The applications and architectures driving the need for 100 GbE will be defined, and used to outline the challenges that will need to be overcome. High speed electrical and optical components and transmission technologies are being explored, and updates will be provided. The question of serial versus parallel transmission schemes will be considered. Finally, recent standards activity and challenges of implementing systems to address 100GbE will be explored. The last part of the workshop will include a panel session with the audience discussing the hurdles that must be overcome to develop 100 GbE.

### **OSuB, Sunday, March 25, 4:30 p.m. – 7:30 p.m., Ballroom B**

**Optical Amplifiers for Reconfigurable Dynamic Networks**, Martin Birk<sup>1</sup>, Atul Srivastava<sup>2</sup>;  
*<sup>1</sup>AT&T Labs - Res., USA, <sup>2</sup>OneTerabit, USA*

Optical amplifiers are vital components of reconfigurable dynamic networks using remotely reconfigurable optical add-drop multiplexers (ROADMs). Service providers can reduce per-wavelength cost by providing express channels through ROADM nodes, with longer reach between regeneration sites. Panelists address the critical challenges and potential solutions for application of EDFA's in dynamic networks. Topics include:

- Transients in reconfigurable networks,
- Tighter control requirements on power of channels due to limits posed by nonlinear effects and OSNR in longer-reach systems
- Static and dynamic spectral tilt compensation due to Raman effect
- Gain error due to spectral hole burning
- Polarization dependent gain/loss.

## **OSuC, Sunday, March 25, 3:30 p.m. – 7:30 p.m., Ballroom C**

**Future Optical Networks**, Chunming Qiao<sup>1</sup>, Mike O'Mahony<sup>2</sup>, Daniel Blumenthal<sup>3</sup>, Ken-ichi Kitayama<sup>4</sup>, Tanya Politi<sup>5</sup>; *<sup>1</sup>SUNY at Buffalo, USA, <sup>2</sup>Univ. of Essex, UK, <sup>3</sup>Univ. of California at Santa Barbara, USA, <sup>4</sup>Osaka Univ., Japan, <sup>5</sup>Natl. Technical Univ. of Athens, Greece*

Optical networking is of growing interest, but many challenges remain and debates over its applications are ongoing. This workshop will focus on visions of future optical networking architectures, technologies, and their roles and applications. It will feature invited talks from different regions to present views on (1) optical networking architectures 5-10 years from now, (2), how do we get there, i.e., what technological challenges lie ahead and (3) what are the major roles and applications of these future networks. The workshop will have a panel comprising people from government, industry, and academia to discuss and debate the above topic.

Invited Speakers include:

**Technologies, Architecture and Services for the Next-Generation Core Optical Networks**, Adel Saleh, *DARPA/ITO, USA*

**Optical Networks in GENI**, Paul Morton, *NSF, USA*

**Network Transformation and the Role of Optical Networks**, Andreas Gladisch, *T-Systems, Germany*

**Terabit LAN Challenges**, Osamu Ishida, *NTT Labs, Japan*

**Optical Networks for IT**, Dimitra Simeonidou, *Univ. of Essex, UK*

**A Regional Multicasting Testbed in China**, Weisheng Hu, *Shanghai Jiaotong Univ., China*

**Photonic Service Gateways in the Japan's Lambda Utility Project**, Soichiro Araki, *NEC Labs, Japan*

**Photonics in Converged Packet Networks**, Rod Alferness, *Alcatel-Lucent, USA*

**Photonics 21- Technology Platform**, Peter van Daele, *Univ. of Gent, Belgium*

**A National Project on Photonic Network Technologies: Development of an Optical Label Switching Node Prototype**, Yoshiaki Nakano, *Univ. of Tokyo, Japan*

**Silicon Photonics for Optical Buffers and Transmitters**, John Bowers, *Univ. of California at Santa Barbara, USA*

For more information about this workshop visit:  
<http://www.cse.buffalo.edu/~qiao/workshop/FON2>

## **OSuD, Sunday, March 25, 4:30 p.m. – 7:30 p.m., Ballroom D**

**Multi-Port WSS/ROADM Technologies: Performance Comparisons**, Ting Wang<sup>1</sup>, Paul Colbourne<sup>2</sup>; <sup>1</sup>*NEC Labs, USA*, <sup>2</sup>*JDS Uniphase, Canada*

Agile optical networks employing multi-port Wavelength Selective Switches are enabling unprecedented configuration and reconfiguration flexibility. There has been rapid development of WSS/ROADM technology in recent years, with numerous competing design approaches. This workshop outlines the needs of network suppliers and carriers, and compares these needs with cost and performance characteristics of various WSS/ROADM technologies. We discuss the most practical convergence point between wish lists of network suppliers and the capabilities of WSS/ROADM technologies, now and in the future. Presentations by carriers, network suppliers and WSS/ROADM suppliers are followed by a discussion period in which audience participation is encouraged.

## **OSuE, Sunday, March 25, 4:30 p.m. – 7:30 p.m.,**

### **Ballroom E**

**Future of Fiber Optic Sensors**, Joseph Friebele; *NRL, USA*

Fiber optic sensors have been developed over the past 30 years, and a number have been successfully commercialized and are in field applications today. New FO technologies based on silica and non-silica specialty fibers are under development, including chemical/biological sensors, sensors using microstructured fibers, nanoparticles, surface plasmons, and slow light. One issue is how to transition new sensors from the laboratory to commercial applications where they could be used to advantage. This workshop will address the present and future prospects for

FO sensors, including sensor development and commercialization with talks on sensing techniques and applications, as well as emerging technologies.

### **OMA, Monday, March 26, 8:00 a.m. – 11:00 a.m., Ballroom A**

**Slow Light**, Scott A. Hamilton<sup>1</sup>, Satoki Kawanishi<sup>2</sup>, Alan Willner<sup>3</sup> <sup>1</sup>*MIT Lincoln Lab, USA*, <sup>2</sup>*NTT Network Innovation Labs, Japan*, <sup>3</sup>*Univ. of Southern California, USA*

Researchers have worked for three decades to develop fiber networks capable of transmitting more than a million-billion data bits at light speed around the globe daily. Today, the focus has shifted to developing techniques for slowing, or even stopping, light to enable ground-breaking new capabilities in multi-terabit-per-second transparent packet routing, wideband computer interconnects, unbreakable quantum cryptography, massively-parallel quantum computing, and possibly even enabling the study of relativistic physics by creating an artificial black hole in the laboratory. In this workshop, we will discuss the physics of light control, material and structural engineering used for slowing light, and next-generation system applications.

### **OMC, Monday, March 26, 8:00 a.m. – 11:00 a.m., Ballroom D**

**Challenges in Meshed Optical Networks**, Kathy Tse; *AT&T Labs, USA*

This workshop will examine all aspects of planning and deploying a photonic mesh network and the enabling technologies and features that provide the value-added functionality. Participants range from Carriers that have deployed or are planning to deploy new metro/regional architectures or backbones, systems developers that provide the end-to-end solutions and critical component suppliers. Discussion will include challenges such as network planning and engineering trade-offs, timeframes for new technologies and value propositions.

### **OMD, Monday, March 26, 8:00 a.m. – 11:00 a.m., Ballroom E**

**Optical and Electronic Techniques for Signal Processing in Optical Fiber Communications**, John C. Cartledge<sup>1</sup>, José Capmany<sup>2</sup>, Henning Bülow<sup>3</sup>, Hideki Kamitsuna<sup>4</sup>; <sup>1</sup>*Queen's Univ., Canada*, <sup>2</sup>*Univ. Politecnica de Valencia, Spain*, <sup>3</sup>*Alcatel Res. & Innovation, Germany*, <sup>4</sup>*NTT Photonics Labs, Japan*

Recently, there has been considerable attention focused on signal processing for optical fiber communications in both the optical and electronic domains. This has led to innovative techniques that process signals within the same domain or convert signals to and from another domain for processing. The objective of the workshop is to explore the current status and future challenges of various aspects of optical fiber communications that can be implemented using optical or electronic techniques. These include, but are not limited to, time division multiplexing and demultiplexing, clock recovery, signal regeneration, compensation for transmission impairments, microwave filtering, and analog-to-digital conversion.

Invited speakers include:

Fred Buchali, *Alcatel-Lucent, Germany*  
Chris Doerr, *Alcatel-Lucent, USA*  
Ken-ichi Kitayama, *Osaka Univ., Japan*  
Sander Jansen, *KDDI Labs, Japan*  
Masataka Nakazawa, *Tohoku Univ., Japan*  
Jim Stimple, *Agilent, USA*  
Jean-Claude Simon, *CNRS-ENSSAT, France*

## **OMB, Monday, March 26, 8:00 a.m. – 11:00 a.m., Ballroom C**

### **Ultra-Short Reach Interconnects, Ashok Krishnamoorthy, *Sun Microsystems Inc., USA***

In recent years, we have witnessed the adoption of very-short reach fiber optic links (<300m) within central offices and data centers; the release of several multi-source agreements between vendors; the announcement of several single-channel and parallel fiber optic products with aggregate bandwidths ranging from 2Gbps to 40Gbps; the growing demand for Infiniband and Fiberchannel transceivers, and the emergence of a 10Gbps Ethernet standard. We have also witnessed the deployment of fiber optic data networks within automobiles. This workshop will review progress in very short reach interconnects and discuss potentials for ultra-short reach fiber optical interconnections between components within a system.

Invited Speakers include:

Marc A. Taubenblatt, *IBM T.J. Watson Res. Center, USA*  
Alex Dickenson, *Luxtera, USA*  
Ron Ho, *Sun Microsystems, USA*  
Dan Blumenthal, *Professor, Univ. of California at Santa Barbara, USA*  
Loukas Paraschis, *Technical Leaders, Service Provider Group, Cisco Systems, Inc., USA*  
Stan Swirhun, *Vice President and General Manager, Zarlink Semiconductor, USA*  
Mario Paniccia, *Director of Photonics, Intel Corp., USA*  
John Lambkin, *Chief Technology Officer, Firecomms, Ireland*  
Abhijit Shanbhag, *Chief Technology Officer, Scintera Networks, USA*

## **NFOEC WORKSHOP**

### **NMA, Monday, March 26, 8:00 a.m. – 11:00 a.m., Ballroom B**

#### **40 Gig Networks: The Actual World PMD (Polarization Mode Dispersion) Challenge, Sergio Barcelos, *FiberWork Optical Communications, Brazil***

With the current move towards 40Gb/s router interfaces, DWDM transmission shall have to follow swiftly. New major long distance fiber constructions are not expected soon, thus 40Gig transmission must tolerate PMD impairments as currently seen in the field rather than as idealized in laboratory demonstrations. However, the extent of the world PMD problem has not yet been recognized as most PMD-impaired networks are still operating at low channel rates and



few DWDM channels. This workshop will discuss the PMD levels of the world installed fiber plant to evaluate its compliance with 40Gig. Interested presenters should contact the organizer.

Invited Speakers include:

**PMD Measurements and Standards**, Richard Ednay, *Optical Technology Training Ltd., United Kingdom*

**Cost Impact of PMD on 40G Deployment**, Michel P. Belanger, Kim Roberts; *Nortel Networks, Canada*

**40G & PMD: Market at a Crossroads**, Karen Liu, Ian Redpath; *Ovum-RHK, United Kingdom and USA*

**Techno-economic Considerations for Managing Real World Installed Fiber Plant PMD**, Ross Saunders, *StrataLight Communications, USA*

**Review of Telcordia PMD Field Measurement Results**, John W. Peters, *Telcordia, USA*

**PMD as Bottleneck Problem for the Introduction of 40Gbit/s and Future 100Gbit/s Ethernet into German WDM Backbone**, Werner Weiershausen, *T-Systems, Germany*

**PMD Measurement Experiences – United Kingdom**, Richard Ednay, *Optical Technology Training Ltd., United Kingdom*

**PMD Measurement Experiences – Portugal**, Modesto de Moraes, Joaquim Anacleto; *Portuguese Electrotechnical Inst., Portugal*

**Sharing worldwide PMD tests results: are they all meeting international standards specifications?**, Andre Girard<sup>1</sup>, Dan Källgren<sup>2</sup>; <sup>1</sup>*Exfo, Canada*, <sup>2</sup>*Telia Sonera, Sweden*

**Nation-wide PMD audit of installed fiber networks**, Elso L. Rigon, *FiberWork Optical Communication, Brazil and USA*

## Market Watch

**Tuesday, March 27-Thursday, March 29, 2007**  
**OFC/NFOEC Exhibit Floor Theater**

This three-day series of panel sessions engage the applications and business communities in the field of optical communications. Presentations and panel discussions feature esteemed guest speakers from industry, research, and the investment community.

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.

## Tuesday, March 27

**12:00 p.m.- 2:00 p.m.**

### **Panel I: Business and Management Insights**

**Moderator:** Milton Chang, *Incubic, USA*

Resurgence in the core network opportunities, as well as the continuing growth of broadband access has stirred the optical value chain in the past year. This session will feature business leaders from several sectors, sharing insights that cover a spectrum of issues highly relevant to everyone in our industry.

#### **Speakers:**

#### **The Future of Optical Networking: Moving Toward an Ethernet-WDM Transport**

Michael Howard, *Principal Analyst & Co-Founder, Infonetics Research, Inc., USA*

#### **Transformation to the All-Packet Transport Network - Challenges, Solutions, Enablers, and Migration Strategies**

David P. Dixon, *Vice President, Optical Network Division, Alcatel-Lucent, USA*

#### **Title to Be Announced**

Tim Jenks, *Chairman, President & Chief Executive Officer, NeoPhotonics, USA*

## Wednesday, March 28

**2:00 p.m. – 4:00pm**

### **Panel II: Opaque vs. Transparent Optical Networks**



**Moderator:** Karen Liu, *Research Director, Ovum RHK, USA*

Much of the driving force in the past ten years behind network evolution has been the ideal of the all-optical network, with more optical regeneration, and less electronic regeneration. Recently, some in the vendor community have proposed just the opposite - that by embracing electronic switching as a core asset of the optical network, both operating and capital expenses can be lowered. This latest paradigm shift has stirred vigorous debate in both the vendor and carrier communities. The session will include leading representatives from each community to shed more light on this important and timely topic.

#### **Speakers:**

## **The Value Proposition of Electronic over Optical Switching in an Optical Network**

Dave Welch, *Founder, Infinera, USA*

## **The Evolution of Optical Networking Transparency beyond Further, Faster, and Cheaper**

Thomas A. Strasser, *Founder and Chief Technology Officer, Nistica, Inc., USA*

## **Optimizing the optical transport layer for packet traffic**

Loukas Paraschis, *Advanced Technology, Core Routing, Cisco Systems, USA*

## **Optical Networks in Today's Demand Environment**

Robert Feuerstein, *Senior Architect, Level 3 Communications, Inc., USA*

### **Thursday, March 29**

**8:30 a.m. – 10:30 a.m.**

#### **Panel III: ROADMs**

**Moderator:** Marc Stiller, *Director, Product Engineering, NeoPhotonics*

During the past 3 years, optical network deployments have gone from desire to require for ROADM functionality. The session explores the drivers behind this transition, including emerging technologies for ROADM, system architecture and changes in system traffic and growth patterns. Leaders from the components, systems and network deployment sectors will discuss their views on the drive for and future of ROADMs.

#### **Speakers:**

##### **ROADM Technology and Functionality: The Road Ahead**

Jy Bhardwa, *General Manager, Agile Optical Networks Business Unit, JDSU, USA*

##### **Title to Be Announced**

Jeffrey Maddox, *PLM, Optical Products, Cisco*

##### **Recent Advances on ROADM Technologies**

Yoshinori Hibino, *Executive Manager, NTT Network Labs, Japan*

**11:00 a.m. – 1:00 p.m.**

#### **Panel IV: A Wall Street Perspective**

**Moderator:** Phil Becker, *Senior Investment Director, Wasserstein Ventures*

There has been continued consolidation in the US service provider landscape, as well as consolidation on the equipment provider side in 2006. This has put more pressure on smaller companies with meaningful products to find the right partners to bring their products to market. The traditional telecom service providers have seen their business models continue to be threatened by triple play competition from the cable providers, and loss of market share as VoIP cannibalizes their traditional landline market. These disruptions have spurred a renaissance in

equipment deployment as providers need to step up the scope and quality of their services, especially for television and high speed Internet. FTTP deployment has started to hit its stride with the continued deployment of the Verizon FIOS service and its inroads on the cable providers. IPOs have been less than successful in 2006, and Wall St. has penalized a number of players for erosion in market share or a need for increased capital expenditures. It is not yet clear how the telecom market landscape will change and how Wall St. will choose to reward the winners.

**Speakers:**

**Optical Telecom is Blossoming Again**

John Dexheimer, *Partner, First Analysis Private Equity, USA*

**A Contrarian View of the Communications Market**

Russell A. Johnson, *Partner, Kalkhoven, Pettit, Levin & Johnson Ventures, USA*

**Value Creation and Monetization in Optical Modules**

Andrew Schmitt, *General Partner, Nyquist Capital, USA*

**Title To Be Announced**

Jeffrey Osborne, *Director, CIBC World Markets*

**1:30 p.m. – 3:30 p.m.**

**Panel V: Escalating Bandwidth Demands in Enterprise Networking**



**Moderator:** Dawn Hogh, *Vice President, Marketing, OpVista, Inc.*

Enterprises are currently evaluating alternative solutions, with some, like Google, garnering headlines by deploying their own network build-outs. This session discusses how operators and enterprises are responding to the challenges created by escalating bandwidth demands with applications such as storage, security, and video. The session features speakers from the enterprise, operator, equipment provider, and analyst community, providing their views on what is driving higher bandwidth requirements in the optical layer by enterprises.

**Speakers:**

**Optical Networking Equipment Forecast by Vertical Markets,**

Eve Griliches, *Program Manager, Telecommunications, IDC, USA*

**Enterprise communication fabric - The challenge of integrating applications and allocating network resources**

Thomas Scheibe, *Manager, Product Management, Internet Switching BU, Cisco Systems, USA*

**Optical Ethernet Methodologies in MSO Markets**

Bill Trubey, *Principal Network Architect, Time Warner Cable, USA*

## Panel Sessions

### ASON/GMPLS

Monica Lazer; *AT&T, USA*

Industry wide work is advancing standards and interoperability agreements in support of intelligent optical networks. Significant advances in standardization include:

- ITU-T has completed recommendations on the Automatically Switched Optical Networks (ASON) architecture and requirements for signaling, routing, and neighbor discovery.
- IETF has completed RFCs for GMPLS signaling covering SONET/SDH, Optical Transport Networks (OTN), and is working on routing protocols extensions.
- Optical Internetworking Forum (OIF) has completed work on Interoperability Agreements (IAs) for UNI and E-NNI signaling, it has staged several world-wide interoperability events, and is working on updates to IAs.
- TMF is completing work on extending the Multi-Technology Network Management (MTNM) interface for management of ASON networks.

This panel focuses on network applications for ASON/GMPLS from both vendor and carrier perspectives.

### FTTx: New Directions

Joseph M. Finn; *Verizon Technology Organization*

The last few years have seen increasing deployment of access technologies such as Fiber to the Premises (FTTP) and Fiber to the Node (FTTN). Millions of homes and businesses have already been passed with these robust fiber based networks. Large scale deployments will continue for the next several years making available to millions of new customers advanced triple play services: POTS, high speed Internet and video (IPTV and RF broadcast). The fiber access networks, requiring billions of dollars of investment, will need to provide decades of service and therefore must support technology evolution from BPON to GPON and beyond to meet the increasing bandwidth demands while simultaneously lowering the cost of providing services.

The panel presentations will provide an overview of the current state of technology and the various options under consideration by industry and standards organizations to evolve the technology. The panel will discuss the current state of FTTx technologies, architectures and deployments; near term technology advancements and deployment plans; and long term technology trends and standards activities targeting even greater service capabilities and reduced costs.

#### **Presentation Topics:**

##### **Verizon's FTTP BPON deployment & GPON transition**

- Architecture design & service capabilities

- Current status of BPON deployments & introduction of GPON

### **AT&T's FTTN U-verse IPTV architecture & deployment**

- End to end reference architecture
- Service capabilities, QoS management, scaling & routing
- Current and planned deployments

### **Status of new initiatives by standards groups (FSAN, ITU-T and IEEE 802.3) considering next generation PONs**

- Higher data rates (10 Gbps)
- Longer reach (up to 120 km)
- More wavelengths (WDM)
- Increased splitting (128 per PON)

### **Capability of the Optical Data Network (ODN) to support evolving technologies and reduce costs**

- ODN and OSP innovations to enable higher performance with lower first costs and lower lifecycle costs

### **Architecture transition strategies for assimilating new technologies**

- Considerations for efficiently evolving FTTx networks to increase capabilities while utilizing existing investment

### **Panelists:**

Dr. Frank Effenberger, *Director, FTTx Advanced Technologies, Huawei Technologies Co., Ltd.*

John George, *Director, FTTx Solutions, OFS*

Ron Heron, *Director, Network Strategy, Alcatel-Lucent*

Kuo-Hui Liu, *Executive Director, Lightspeed Network & Services Architecture  
AT&T Labs, Inc.*

Vincent O'Byrne, *Director, Access Network Design & Integration, Verizon Technology*

## Plenary Session

The OFC/NFOEC 2007 Plenary Session took place on Tuesday, March 27.



Mark A. Wegleitner  
*Senior Vice President - Technology and Network Planning,*  
*Chief Technology Officer*  
**Verizon Communications**

[Maximizing the Impact of Optical Technology](#) (603KB)

**Abstract:** The optical transport network is evolving based on the requirement to support higher bandwidth for business and residential services while reducing costs. Optical technology has matured to make an end-to-end all optical network both practical and economical. This network architecture will provide the flexibility to incrementally expand based on customer demand by providing key features such as integrated packet processing, mesh topology and restoration, optical broadcast, and an optical control plane. Multi-wavelength optical communication backbone networks and systems have evolved to support a dynamic mesh network with reduced regeneration requirements and improved reach characteristics while maintaining a high level of integration to keep cost and complexity manageable. Optical access technology (i.e., fiber to the premises) has proven a viable multi-service delivery vehicle. Component technology -- in particular wavelength switching -- has reached a level of maturity where it can be applied to support mesh topologies in DWDM systems -- both metropolitan and long-haul. The integration and price points of these switches and other optical components (such as amplifiers, filters and lasers) now allow a dynamic and flexible wavelength network to be extended much closer to the customer. Application of Raman amplification, electronic dispersion compensation, and advanced modulation techniques will also improve system reach and capacity.

**Biography:** Mark Wegleitner is Senior Vice President – Technology and Network Planning, and Chief Technology Officer (CTO) for Verizon Communications. His responsibilities include technology assessment, network architecture, platform development and laboratory testing for the local and long distance wireline communications businesses, as well as network planning for local wireline communications. In his current role, he and his organization support all business units in the management of technology and network matters.

Prior to his current assignment, Wegleitner served as Vice President, Technology & Engineering at Bell Atlantic Network Services, where he was responsible for all technology and engineering functions. And prior to that, he was CTO at Bell Atlantic Network Services.

Since joining Bell Atlantic, he has also held a variety of other management positions in strategic planning, network architecture, technology development, information systems, research and development, broadband implementation and new services technology.

Wegleitner began his career with Bell Telephone Laboratories in local switching systems development. He later joined the exchange switching systems design organization at AT&T General Departments, where he had responsibility for the introduction of new features and



services on local switching systems. He held another brief assignment with Bell Laboratories in local switching systems engineering before transferring to Bell Atlantic.

Wegleitner received a B.A. in mathematics from St. John's University, and an M.S. in electrical engineering and computer science from the University of California at Berkeley.



Chongcheng (CC) Fan  
*Retired Professor, Electronic Engineering Department*  
**Tsinghua University, Beijing**  
*Vice Director, Professional Group of Optical Communication*  
**Chinese Institute of Communications**

### [Optical Fiber Communications in Mainland China: Activities and Visions of Carriers, Equipment Vendors and Academia \(2MB\)](#)

**Abstract:** [Since 2004, the optical fiber communication industry has been under rational development in mainland China after the “telecom winter.”](#) As of June 2006, China has established the largest telephone network with 365.3 million (32% rural) fixed and 426.4 million mobile phone subscribers, while mobile communication occupies the biggest part (43.5%) of the total revenue. The capex/revenue ratio of the carriers is still as high as 35% in 2005, which is good news for system vendors. On the Internet side, the number of users reaches 123 million (penetration 9.4%; room for expansion), with 63% broadband (xDSL or cable modem) related. It is interesting to note that while the number of Internet users increased almost linearly during the past three years (20 million/year), the total international bandwidth of the Internet (214.7Gb/s in June 2006) increased exponentially during the same period of time (approx. 2 times/year). Internet users are bandwidth-hungry all the time. Accordingly, DWDM LH systems and large scale metro networks, less to say broadband access networks, are all under serious concern of carriers and equipment vendors. In fact, how to survive and generate more revenue and profit through improved and novel services becomes a serious challenge to service providers, especially traditional telcos. Visions and roadmaps of major carriers will be discussed. As for system vendors, achievements and strategies of leading companies will be introduced and analyzed. Finally, typical industrial and academic R&D projects with different targets and supported by various national programs, research institutes and universities will be briefly described.

**Biography:** CC Fan graduated from the Department of Radio Engineering, Tsinghua University, Beijing, China in 1958. He then joined the faculty there and was engaged in teaching and research activities in the field of microwave electronics. Since 1979, he switched to guided-wave optics and photonics, and is now a retired professor of the Electronic Engineering Department of Tsinghua University. His research interests include fiber transmission systems, optical amplifiers, optical nonlinearities, fiber Bragg gratings and photonic bandgap structures, etc. He was the principal investigator of numerous projects sponsored by the National Science Foundation of China, the State Commission of Science and Technology, and the Ministry of



Information Industry, and authored/co-authored more than 100 journal and conference papers and a graduate-level textbook titled *Guided-Wave Optics*. He is a fellow of the Optical Society of America and serves as the vice director of the Professional Group of Optical Communication of the Chinese Institute of Communications.



Nicholas Negroponte  
*Founder and Chairman*

**One Laptop per Child**  
[Networks without Operators \(3MB\)](#)

**Abstract:** Being digital is to be porous and blurring, turning previously crisp distinctions into more ambiguous and concurrent occasions. For example, home and work, consumption and creation, management and labor, teacher and student are no longer flip sides of a coin, but a single condition that can change state from one moment to the next. Telecommunications is no different. The Internet itself is living proof that man-made systems can emerge bottoms-up, more like the natural phenomena. What used to be a walled garden of voice service, that one either used or operated, is now morphing into a more peer-to-peer, data-centric structure. A “flower box” theory of telecommunications will be presented, including the specific example of the \$100 laptop being developed by the One Laptop per Child non-profit association.

**Biography:** Nicholas Negroponte is founder and chairman of the One Laptop per Child non-profit association. He is currently on leave from MIT, where he was co-founder and director of the MIT Media Laboratory, and the Jerome B. Wiesner Professor of Media Technology. A graduate of MIT, Nicholas was a pioneer in the field of computer-aided design, and has been a member of the MIT faculty since 1966. Conceived in 1980, the Media Laboratory opened its doors in 1985. He is also author of the 1995 best seller, *Being Digital*, which has been translated into more than 40 languages. In the private sector, Nicholas serves on the board of directors for Motorola, Inc. and as general partner in a venture capital firm specializing in digital technologies for information and entertainment. He has provided start-up funds for more than 40 companies, including *Wired* magazine.

## Service Provider Summit

**Wednesday, March 28, 2007**  
**OFC/NFOEC Exhibit Floor Theater**

**The Service Provider Summit is open to all Conference and Exhibit-only 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, keynote presentations, 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.

## Keynote Presentation

### **Business Models and Services with Managed Broadband Access**

**Speaker:** Sanghoon Lee, *Senior Executive Vice President, Korea Telecom, Korea*



**Abstract:** Dr. Lee will briefly introduce the transition of value chain flows in the recent ICT trend and mention the situation that Telco should be changed. As the competition grows rapidly, ISPs are difficult to generate additional revenue with traditional access services. They need to find distinctive differentiated services for customers, such as personalized services, contents based services, and converged communication services.

For enabling these differentiated and converged services on personal preference, we should upgrade the network into broadband, QoS guaranteed, and robust secured capability. For this purpose, Dr. Lee will show the current status of the advanced network that KT is deploying now. And, some key points derived from this experience will be taken into account.

**Biography:** Sanghoon Lee is Senior Executive Vice President of KT, where his organization, Business Group is responsible for KT's business planning and service launching. Prior to the current appointment, he had served in numerous positions including CTO, COO, and the head of Business Marketing Group. Before he joined to KT, he was with Bell Communications Research (Bellcore) from 1984 to 1991, where his research activities were in ATM Technology and broadband networks. He received his B.S. degree in electrical engineering from Seoul National University, Korea, in 1978, and M.S. and Ph.D. degrees in systems engineering from the University of Pennsylvania, Philadelphia, in 1982 and 1984 respectively. Dr. Lee has been contributing to setting up the deployment strategy of the national Broadband infrastructure in Korea. Currently, he served as a chairman of Korea Network Research Association. He is a member of National Academy of Engineering in Korea and the fellow of IEEE.

## Panel I: FTTx: We have Lift Off!



**Moderator:** Frank Effenberger, *Director, FTTx Advance Technology, Huawei Technologies America, USA*

In the U.S., fiber to the home networks have been an objective as tantalizing as the moon, and almost as unreachable. There have been numerous technology trials and tentative plans to deploy fiber access, but until recently none of these transitioned into a full mass deployment. But, in the past year or so significant deployments have begun in North America: millions of homes are passed by fiber and hundreds of thousands of active customers are online today. Japan is even further along in the deployment of fiber, with several millions of fiber customers online. Deep fiber with VDSL2 is also very

popular, and new markets are opening every day. Thus, it can be argued that we have finally overcome the initial hurdles, and are on the road to fiber access for everybody.

The network operators and their vendor partners have gained a wealth of important lessons through these deployments. These vary from the highly technical aspects of providing video over IP, to the prosaic matters of placing cables inside existing structures. All of these are important if the deployment is to be successful and scalable. At the same time, the services provided are changing and evolving to take advantage of the massive bandwidth available. Bandwidth tiers are increasing rapidly, and more intelligent services such as multimedia voice and video applications are becoming commonplace. To meet this ever-changing market of demands and issues, the technology of FTTx is also changing. The conversion of B-PON systems to E-PON and G-PON systems are well underway or completed, and the next step of WDM PON or 10G PON are beginning to gain traction in the standards committees.

Join us in this exciting session where executives from major service providers will present their views on the opportunities and challenges for FTTx around the world. The individual presentations will be followed by a panel discussion and open Q&A session.

#### **Speakers:**



#### **FTTH Evolution in Japan**

Motoyuki Ii, *General Manager, Plant Planning Dept., Network Business Headquarters, NTT EAST Corp., Japan*

Motoyuki Ii, General Manager, Network Business Headquarters, NTT East Corporation is responsible for the development and deployment of the FTTH plant at NTT East. After joining NTT in 1983, Mr. Ii was engaged in the development of outside telecom plants, facility investment planning, international procurement, global IP backbone network planning, and operations. In 2003, Mr. Ii served as a general manager of an NTT holding company and was responsible for NTT group management.

#### **Verizon's Broadband Strategy**

Vincent A. O'Byrne, *Director of Technology, Verizon, Technology Organization, USA*

Vincent O'Byrne received his B.SC. from Trinity College Dublin, Ireland, his PhD from the University of North Wales and his MBA from Babson College, USA. He has over 18 years experience in the Wireline and Wireless Telecommunications industry. Mr. O'Byrne is a Director of Technology within Verizon Technology Organization (VTO). His group focuses on the specification, design and integration of new Wireline access technologies within the Verizon Network for the residential and small business markets. This responsibility includes the leadership of wireline access RFPs and the vendor management through to the realization of

those technologies as stable platforms in the Network. Primary focus is on BPON and GPON, expansion of FTTP to the Multiple Dwelling Unit and overall Network Stability.



### **Scaling FTTx Networks for Video, Voice and Data Services**

Raj Savor, *General Manager, AT&T Labs, USA*

Raj Savor supports the Network Systems Engineering function for managing and optimizing Layer 1-3 networks and associated Broadband Applications.

Mr. Savor's group manages the AT&T broadband tool framework that supports service assurance, capacity management, performance management and provisioning optimization for the AT&T DSL, PON, ATM, Ethernet and IP networks.

### **Next Generation Optical Access Technology Alternatives**

Ronald C. Menendez, *Telcordia Technologies, USA*

## **Panel II: Emerging Networks**



**Moderator:** George Clapp, *Chief Scientist, Telcordia, USA*

There is a widely shared vision of a converged network in which many services are carried by a common IP/MPLS network over very high capacity optical transport networks. There is less consensus, however, about the allocation of functions between IP/MPLS and the optical network. For example, many carriers are deploying intelligent optical networks that can establish new circuit services rapidly and autonomously. Other carriers are deploying IP-centric networks in which routers perform more functions and the optical network provides simple transport services.

Join a panel of experts from carriers around the globe to explore the rationales for the different network architectures and compare their relative advantages and disadvantages. The individual presentations will be followed by a panel discussion and open Q&A session.

### **Speakers:**



### **Internet2 Hybrid Networking and the HOPI Project**

Rick Summerhill, *Director, Network Research, Architecture and Technologies, Internet2, USA*

As Director of Network Research, Architecture, and Technologies, Rick Summerhill has responsibility for the Abilene Observatory, the HOPI Project, and other projects related to network research and the development of next generation network architectures. Prior to joining Internet2 in December of 2002, Rick served as the executive director of the Great Plains Network, an Internet2 GigaPop centered at Kansas City, Missouri. He has been associated with network engineering at the campus, regional and national levels for the last twenty years. Prior to network engineering, he served on the research faculty in Mathematics at Kansas State University. Rick attended Monmouth College where he received a B.A. in Mathematics and Physics and The University of Iowa where he received a M.S. and Ph.D. in Mathematics.



### **Practical Aspects of Bandwidth on Demand in Optical Networks**

Robert Doverspike, *Director of Transport Network Evolution Research, AT&T Labs Res., USA*

Robert Doverspike received his undergraduate degree from the University of Colorado and Masters and Ph.D. degrees in Mathematics from Rensselaer Polytechnic Institute. Dr. Doverspike started with Bell Labs in 1979 and, upon divestiture of the Bell System, went to Bellcore (now Telcordia). In 1997 he went to AT&T Labs (Research) and is now Director of the Transport Network Evolution Research Department. Dr. Doverspike has made extensive contributions to the field of optimization in multi-layered transmission and switching networks and pioneered the concept of packet transport in metro and long distance networks. His work also includes advanced transport and IP network architectures, network restoration methods for optical cross-connects (for which he has numerous patents), and methods for IP over optical-layer integration. He has published broadly in journals on Telecommunications, Optical Networking, Mathematical Programming, IEEE CommSoc, Operations Research, Applied Probability, and Network Management. He is member of the Mathematical Programming Society, Optical Society of America (OSA), a Senior Member of IEEE Communications Society, and an INFORMS Fellow. He serves as associate editor of the Journals of Heuristics and Operations Research and has held key leadership positions of multiple international telecommunications societies and conferences, most prominently the INFORMS Technical Section on Telecommunications.



### **Optics in the Context of Network Convergence**

Andreas Gladisch, *Head, Network Architecture Dept., Deutsch Telecom, Germany*

Andreas Gladisch received the Dipl.Ing. Degree in Theoretical Electrotechnics from the Technical University of Ilmenau, and the PhD in Optical Communication from Humboldt University Berlin. He joined the Research Institute of Deutsche Telekom in 1991 where he was involved in projects on WDM networks, for example European Research Projects, like ACTS-Meton, ACTS-Demon, ACTS-Moon. He was involved in projects dealing with the short term development of Deutsche Telekom transport network especially the migration of SDH and WDM, including the development and assessment of different network scenarios. He has been responsible for a projects covering the mid term

strategy of the transport network and the harmonisation of the transport networks of Deutsche-Telekom-Group. Currently he is involved in projects dealing with the planning roll-out of NGN-architecture. Dr. Gladisch is member of ITG and IEEE and he has authored or co-authored more than 90 national and international technical conference- or journal-papers.



### **Integration of IP and DWDM: The Future is the Router**

David Ward, *Cisco, USA*

David Ward is a Cisco Fellow and is the architect of IOS-XR, Cisco's Service Provider operating system and co-architect of the 92 Terabit CRS-1. He is currently designing the next generation platforms for the Service Provider environment. David is known in the industry because of his knowledge and expertise in IP/MPLS routing, high availability, network design, and systems software. He is the WG chair of four IETF Working Groups: IS-IS, HIP, BFD and Softwires. He speaks frequently at the North American Network Operators Group (NANOG), IETF, IEEE and RIPE conferences and collaborates with several university and private research groups, including MIT and Tsinghua University.

## **Short Courses**

### **1. Fibers and Optical Propagation Effects**

**SOLD OUT** SC186, **Hands-on Specialty Fiber Splicing**, *Clyde J. Troutman; 3SAE Technologies, USA*

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

SC210, **Hands-on Polarization-Related Measurements Workshop**, *Danny Peterson<sup>1</sup>, Kent Rochford<sup>2</sup>, Ivan Lima<sup>3</sup>, Rance Fortenberry<sup>4</sup>; <sup>1</sup>Verizon Business, USA, <sup>2</sup>NIST, USA, <sup>3</sup>North Dakota State Univ., USA, <sup>4</sup>Bookham Technology PLC, USA*

**NEW!** SC288, **Fundamentals of Polarization, PMD and PDL in Lightwave Systems**, *Robert Jopson; Lucent Technologies/Bell Labs, USA.*

### **2. Amplifiers and Lasers: Fiber or Waveguide**

SC123, **Erbium-Doped Fiber Amplifiers and Raman Fiber Amplifiers**, *John Zyskind; JDSU, USA.*

**NEW!** SC290, **High Power Fiber Lasers and Amplifiers**, *Johan Nilsson; Univ. of Southampton, UK.*

### **3. Signal Measurement, Distortion Compensation Devices and Sensors**

SC259, **Electronic and Optical Impairment Mitigation**, *Chris Fludger; CoreOptics GmbH, Germany.*

SC265, **Passive Optical Components and Filtering Technologies**, *Bruce Nyman<sup>1</sup>, Christi*



Madsen<sup>2</sup>; <sup>1</sup>Princeton Lightwave, USA, <sup>2</sup>Texas A&M Univ., USA.

**NEW!** SC293, **Introduction to Fiber Sensors**, Michel Digonnet; Stanford Univ., USA.

#### 4. Switching Wavelength-Selective Filtering and Routing Devices

**NEW!** SC292, **Planar Integrated Optics**, Christopher R. Doerr; Bell Labs, Lucent Technologies, USA.

#### 5. Optoelectronic Devices

SC125, **Tunable Lasers**, Jens Buus; Gayton Photonics Ltd., UK.

SC175, **Packaging of Optoelectronic, Photonic and MEMS Components**, Paul Haugsjaa; Polycision, Inc., 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. LeCheminant; Agilent Technologies, USA.

SC215, **Nanofabricated Lasers, Waveguides and Dispersive Elements**, Axel Scherer; Caltech, USA.

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

#### 6. Digital Transmission Systems

SC102, **WDM in Long-Haul Transmission Systems**, Neal S. Bergano; Tyco Telecommunications, USA.

SC184, **Introduction to Modeling High Data Rate Optical Fiber Communications Systems**, Curtis R. Menyuk; Univ. of Maryland, Baltimore County, USA.

SC203, **40 Gb/s Transmission Systems, Design and Design Trade-offs**, Martin Birk<sup>1</sup>, Benny Mikkelsen<sup>2</sup>; <sup>1</sup>AT&T Labs - Res., USA, <sup>2</sup>Mintera, USA.

**NEW!** SC289, **Basics of Optical Communication Systems and WDM**, Gerd Keiser; PhotonicsComm Solutions, Inc, USA.

#### 7. Transmission Subsystems and Network Elements

SC103, **Fast Reconfigurable WDM Optical Networks**, Daniel Blumenthal; Univ. of California at Santa Barbara, USA.

SC105, **Modulation Formats and Receiver Concepts for Optical Transmission Systems**, Peter J. Winzer, S. Chandrasekhar; Bell Labs, Lucent Technologies, USA.

SC141, **Combating Degrading Effects in Non-Static and Reconfigurable WDM Systems**, Alan Willner; *Univ. of Southern California, USA.*

SC239, **Short-Reach Optical Interconnects**, Brian E. Lemoff; *Inst. for Scientific Res., USA.*

## 8. Optical Processing and Analog Subsystems

SC205, **Integrated Electronic Circuits for Fiber Optics**, Y. K. Chen; *Bell Labs, Lucent Technologies, USA.*

SC266, **Quantum Cryptography and Quantum, Information**, Matthew S. Goodman<sup>1</sup>, Richard Hughes<sup>2</sup>; <sup>1</sup>*Telcordia Technologies, USA*, <sup>2</sup>*Los Alamos Natl. Labs, USA.*

## 9. Networks

SC114, **Passive Optical Networks and FTTX**, Paul W. Shumate; *IEEE Lasers & Electro-Optics Society, USA.*

SC171, **Introduction to Optical Control Plane Standards and Technology: OIF UNI, GMPLS, G.ASON and All That!**, Greg Bernstein<sup>1</sup>, Bala Rajagopalan<sup>2</sup>; <sup>1</sup>*Grotto Networking, USA*, <sup>2</sup>*Intel Corp, USA.*

SC176, **Metro Network Architectures, Today and Tomorrow**, Joseph Berthold; *Ciena Corp., USA.*

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

SC243, **Next Generation Transport Networks: The Evolution from Circuits to Packets**, Ori Gerstel; *Cisco Systems, USA.*

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

SC264, **Optical Ethernet and Data Networking for Large Enterprises**, Jeffrey L. Cox; *JP Morgan Chase, USA.*

SC268, **Hands-on Workshop on Outside Plant Splicing, Testing and Troubleshooting for FTTx Networks**, Larry Johnson; *Light Brigade, Inc., USA.*

SC269, **Outside Plant Hands-on Testing and Troubleshooting**, Larry Johnson; *Light Brigade, Inc., USA.*

## 10. Emerging Applications and Access Solutions

SC101A, **Hands-on Workshop on Fiber Optic Measurements and Component Testing**, Lorenz Cartellieri<sup>1</sup>, Peter Schweiger<sup>2</sup>, John Kim<sup>1</sup>, Karl Merkel<sup>3</sup>, Michael Kelly<sup>4</sup>, Caroline Connolly<sup>5</sup>, Richard Buerli<sup>5</sup>; <sup>1</sup>*Experior Photonics, USA*, <sup>2</sup>*Agilent Technologies, Canada*, <sup>3</sup>*Agilent Technologies, USA*, <sup>4</sup>*Agilent Technologies GmbH, Germany*, <sup>5</sup>*OptoTest, USA.*



**SOLD OUT** SC101B, **Hands-on Workshop on Fiber Optic Measurements and Component Testing**, Lorenz Cartellieri<sup>1</sup>, Peter Schweiger<sup>2</sup>, John Kim<sup>1</sup>, Karl Merkel<sup>3</sup>, Michael Kelly<sup>4</sup>, Caroline Connolly<sup>5</sup>, Richard Buerli<sup>5</sup>; <sup>1</sup>Experior Photonics, USA, <sup>2</sup>Agilent Technologies, Canada, <sup>3</sup>Agilent Technologies, USA, <sup>4</sup>Agilent Technologies GmbH, Germany, <sup>5</sup>OptoTest, USA.

SC160, **Microwave Photonics**, Keith J. Williams; NRL, USA.

SC185, **Hands-on Polishing, Inspection and Testing of Connectors**, Phil Shoemaker<sup>1</sup>, Katsuhisa Taguchi<sup>2</sup>, Neal Wagman<sup>3</sup>; <sup>1</sup>Light Brigade, Inc., USA, <sup>2</sup>Seikoh Giken, USA, <sup>3</sup>Norland Products, USA.

**SOLD OUT** SC187, **Hands-on Basic Fiber Optics for the Absolute Beginner**, Dennis Horwitz; Micronor Inc., USA.

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

SC260, **Biomedical Diagnostic Applications of Communications Technologies**, Brett E. Bouma; Harvard Medical School and Massachusetts General Hospital, USA.

SC262, **Alternative Broadband Access: Wired and Wireless Technologies for the Last Mile**, Paul S. Henry; AT&T Labs -- Res., USA.

**SOLD OUT NEW!** SC291, **Hands-On Fiber Optics For Engineers Designing For Military, Aerospace, Shipboard and Industrial Harsh Environmental Applications**, Dennis Horwitz; Micronor Inc., USA.

### **Reliability and Qualifications**

SC133, **Reliability Methodologies for Fiber-Optic Components**, David Maack; JDSU, USA.

**NEW!** SC294, **Qualification Programs for Fiber Optic Components**, David Maack; JDSU, USA.