**OFC/NFOEC 2006 Archive**

**Technical Conference: March 5-10, 2006**

**Exposition: March 7-9, 2006**

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

OFC/NFOEC 2006 was a resounding success and confirmed its role as **the premier international event** for both the science and business of optical communications. More than **700 technical talks** emphasized the innovative technologies emerging within the field and reiterated the conference's position as **the preeminent event for optical communications**. Business sessions, like Market Watch and the Service Provider Summit, spotlighted hot industry topics including IPTV, FTTx developments and network evolutions to standing-room only audiences. On-floor demonstrations showcased products at the forefront of our industry, and our **exhibiting and sponsoring companies unveiled a host of new product and corporate announcements**, including those from Bookham, Corning, JDSU, Opnext and others.

The conference is truly **the must-attend global event** for optical communications. Approximately **40% of the more than 600 participating companies came from outside the United States**, with more than 80 companies attending from the hot Pacific Rim region. Additionally, **60% of technical talks were presented by engineers and scientists from outside the U.S.** International attendance continues to grow for this event as well, with more than 55 countries represented and the field's leading minds from around the world in attendance.

Overall attendance for the conference was also quite strong, reaching **13,000 registrants**. OFC/NFOEC realized **technical registrations at nearly 3,000** and excellent floor traffic. In fact, on-site rebook was one of the strongest to date.

There was a real sense of an industry upswing this year and leading analyst reports were **optimistic about what 2006 has in store for optical communications**. Every indicator is showing that innovation is alive and well in the industry again.

**OFC/NFOEC 2007** will certainly address these developments, new topics and more when it convenes in **Anaheim March 25 - 29, 2007**. We'll see you there!

# OFC and NFOEC Abstracts

[Tuesday, March 7, 2006](http://www.ofcconference.org/library/images/ofc/PDF/2006/06AbstractsTuesday.pdf)

[Wednesday, March 8, 2006](http://www.ofcconference.org/library/images/ofc/PDF/2006/06AbstractsWednesday.pdf)

[Thursday, March 9, 2006](http://www.ofcconference.org/library/images/ofc/PDF/2006/06AbstractsThursday.pdf)

[Friday, March 10, 2006](http://www.ofcconference.org/library/images/ofc/PDF/2006/06AbstractsFriday.pdf)

# Agenda of Sessions and Key to Authors and Presiders

[Agenda of Sessions](http://www.ofcconference.org/library/images/ofc/PDF/2006/06Agenda.pdf)

[Key to Authors and Presiders](http://www.ofcconference.org/library/images/ofc/PDF/2006/06Key.pdf)

**Postdeadline Papers**

[Postdeadline Abstracts](http://www.ofcconference.org/library/images/ofc/PDF/2006/PostdeadlineAbstracts2006.pdf)

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Itsuro Morita, *KDDI R&D Labs, Japan* Torben Nielsen, *Mahi Networks, Inc., USA* Harshad Sardesai, *Ciena Corp., USA*

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**Category G – Subsystems, Network Elements and Analog Systems**

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# Invited Speakers

## A. Fibers and Optical Propagation Effects

OTuA4, **Fiber Designs for Reducing Stimulated Brillouin Scattering,** Ming-Jun Li;

*Corning Inc., USA.*

OTuH5, **High Nonlinearity Bismuth Fibers and Their Applications,** Tomohara Hasegawa;

*Asahi Glass, Japan, Japan.*

OWA1, **Single Polarization Fibers and Applications,** Daniel Nolan; *Corning Inc., USA.* OWA6, **Polarization Properties of Photonic Crystal Fibers,** Jes Broeng; *Crystal Fiber, Denmark.*

OWJ7, **Propagation Effects at High Bit Rates,** Alexei Pilipetskii; *Tyco Telecommunications , USA.*

OThH1, **Towards Transmission Applications with Microstructured Fibers,** Katsusuke

Tajima; *NTT, Japan.*

OFC7, **Reducing Losses in Photonic Crystal Fibres,** Timothy Birks; *Univ. of Bath, UK.* OFK3, **Microstructured and Multicore Fibers and Fiber Lasers,** Nasser Peyghambarian; *Univ. of Arizona , USA.*

## B. Amplifiers and Lasers: Fiber or Waveguide

OTuD1, **Waveguide Amplifier Design and Integration,** Sergey Frolov; *Inplane Photonics , USA.*

OTuD6, **Recent Progress of Self-Assembled Quantum Dot Optical Devices for Optical**

**Telecommunication: Temperature-Insensitive 10 Gb/s Directly Modulated Lasers and 40**

**Gb/s Signal-Regenerative Amplifiers,** Misturu Sugawara¹ ²; *¹Fujitsu Ltd., ² OITDA, Japan.*

OWD7, **Silicon Based Lasers and Amplifiers via Stimulated Raman Scattering,** Haisheng

Rong; *Intel Corp., USA.*

OWM1, **High-Power Amplification of Ultrashort Pulses,** Martin Ferman; *IMRA America, USA.*

OThC1, **High-Coherency Fiber Lasers,** Christine Spiegelberg; *NP Photonics, USA.*

OThJ7, **High Power Single-Frequency Yb Doped Fiber Amplifiers,** Yoonchan Jeong; *Univ. of Southampton , UK.*

OThQ1, **Nonlinear Optical Devices Based on Carbon Nanotubes,** Youichi Sakakibara; *Natl. Inst. of Advanced Industrial Science & Technology, Japan.*

OThQ2, **Ultrashort-Cavity Passively Mode-Locked Fiber Lasers Using Carbon**

**Nanotubes,** Shinji Yamashita; *Univ. of Tokyo, Japan.*

OFH7, **All-Optical Phase and Amplitude Regeneration of DPSK Signals Based on Phase- Sensitive Amplification,** Guifang Li; *CREOL, USA.*

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

OTuE1, **Advances in SiGe ICs for 40G Signal Equalization,** Hong Jiang; *StrataLight*

*Communications, USA.*

OTuE5, **Application of Digital Equalization in Optical Transmission Systems,** Andreas

Färbert; *ADVA AG Optical Networking , Germany.*

OTuL7, **Distributed Strain Sensors Based on Brillouin Scattering for Structural Health**

**Monitoring,** Xiaoyi Bao; *Physics Dept, Univ. of Ottawa, Canada.*

OWE1, **Optical Parallel Processing Approach to All-Order PMD Compensation,** Andrew

Weiner; *Purdue Univ., USA.*

OWE4, **Effect of Nonlinearities on PMD System Degradations,** Magnus Karlsson;

*Photonics Lab., Chalmers Univ. of Technology, Sweden.*

OWN5, **Monitoring Requirements for Optical Transparent Networks,** Wolfgang Grupp;

*Acterna Germany, Germany.*

OThE3, **High Index Contrast Photonics Components for Optical Data Communication,**

Alfred Driessen; *Univ. of Twente, The Netherlands.*

OFF3, **Fiber Bragg Grating Technologies and Applications in Sensors,** Ian Bennion; *Univ. of Aston, UK.*

## D. Switching, Wavelength-Selective Filtering and Routing Devices

OTuF3, **Four-Degree Hub Switch Module Using Multi-Chip Planar Lightwave Circuit Integration Technology for Transparent ROADM Ring Interconnection,** Takashi Goh; *NTT Corp., Japan.*

OTuM3, **SOI Technology for Microring Tunable Filters,** Fabrizio Giacometti; *Pirelli Labs, Italy.*

OThO3, **Photonic Crystals for Communications: Stopping Light and Miniaturized Non- Reciprocal Devices,** Shanhui Fan; *Stanford Univ., USA.*

OWF4, **Replicated Polymer Waveguides for Optical Access Applications,** Hayami

Hosokawa; *Omron Corp., Japan.*

OWO3, **Optical Waveguide Filters Using Nanophotonics,** Thomas Mossberg; *LightSmyth*

*Technologies Inc, USA.*

OWO5, **Need-Oriented Waveguide Design Based on Wavefront Matching Method,**

Hiroshi Takahashi; *NTT Photonics Labs, Japan.*

OWV1, **Recent Advances on Laser Processing in Silica-Based PLCs,** Masaki Kohtoku; *NTT Photonics Labs, Japan.*

OThO4, **Nanotechnology for Optical Networks,** Edward Sargent; *Univ. of Toronto, Canada.* OFP3, **High Resolution Control of the Optical Phase for Code Empowered Networking,** Shahab Etemad; *Telcordia Technologies, USA.*

## E. Optoelectronic Devices

OWC1, **High Performance InP-Based Optical Modulators,** Takayuki Yamanaka; *NTT Photonics Labs., Japan.*

OWC6, **Chirp Managed Laser (CML): A Compact Transmitter for Dispersion Tolerant**

**10Gb/s Networking Applications,** Daniel Mahgerefteh; *AZNA Corp., USA.*

OWH3, **Recent Advances in Si Photonics,** Tom Koch; *Lehigh Univ. , USA.*

OWH6, **Components for Quantum Cryptography,** Hugo Zbinden; *Univ. of Geneva, Switzerland.*

OWL5, **Hybrid Integration of Access Modules Using Surface Mount Photonics,** A. Benzoni; *Xponent Photonics Inc, USA.*

OThN1, **The Physics Controlling the Sensitivity of Semiconductor Lasers to High**

**Temperatures,** Alfred Adams; *Univ. of Surrey, UK.*

OThN5, **Dilute Nitride Lasers and Photodetectors,** James Harris; *Stanford Univ., USA.* OFA3, **Chip-to-Chip Optical Interconnects,** Jeffrey Kash; *IBM, T. J. Watson Res. Ctr., USA.* OFI1, **PIN Photodiode Modules for 80 Gb/s and Beyond,** Andreas Beling; *Fraunhofer Inst. for Telecommunications, Heinrich-Hertz-Inst., Germany.*

## F. Digital Transmission Systems

OTuK3, **Phase Conjugation for Increased System Robustness,** Sander Jansen; *TU Eindhoven, The Netherlands.*

OWB3, **Electronic Dispersion Compensation by Signal Predistortion,** Robert Killey; *Univ. College London, UK.*

OThD2, **Low-Density Parity-Check Codes for 40 Gb/s Transmission,** Bane Vasic; *Arizona*

*Univ., USA.*

OThR1, **Performance of Advanced Modulation Formats in Optically-Routed Networks,**

Gregory Raybon; *Bell Labs, Lucent Technologies, USA.*

OThR4, **Coherent WDM: The Achievement of High Information Spectral Density through Phase Control within the Transmitter,** Andrew Ellis; *Univ. College Cork, Ireland.* OFD1, **Dispersion Tolerant Alternative 10Gb/s Transmitters and Implications for WDM Optical Networking,** Sethumadhavan Chandrasekhar; *Bell Labs, Lucent Technologies, USA.* OFD4, **The Power of Dispersion Management for 10Gbit/s and 40Gbit/s Systems,** Diego Grosz; *Inst. Tecnologico de Buenos Aires (ITBA), Argentina.*

OFL1, **Quantum Key Distribution for Reconfigurable Optical Networks,** Robert Runser;

*Telcordia Technologies, USA.*

OFL4, **Design Trade-Offs for High PMD Routes in Installed Transmission Systems,** Andre

Hamel; *France Telecom, France.*

## G. Subsystems, Network Elements and Analog Systems

OTuB3, **80+ Gbit/s ETDM Systems Implementation: An Overview of Current**

**Technology,** Thomas Lee; *SHF Communication Technologies AG, Germany.*

OTuI1, **High-Rate Photon-Efficient Laser Communications with Near Single Photon/Bit**

**Receiver Sensitivities,** David Caplan; *MIT, Lincoln Lab, USA.*

OTuI4, **Coherent Detection of Phase-Shift Keying Signals Using Digital Carrier-Phase**

**Estimation ,** Kazuro Kikuchi; *Univ. of Tokyo , Japan.*

OWG3, **Subcarrier Multiplexed Signals: A Tool for Optical Fiber System Characterization,** Mary Phillips; *Northwestern Univ., USA.* OWR5, **Electronic Dispersion Compensation for Enhanced Optical Transmission,** Fred Buchali; *Alcatel, Germany.* OWW1, **Transmitter Enabling Ultra-High Speed Transmission of Phase Modulated Data Signals up to 640 Gbit/s,** Marcel Kroh; *Fraunhofer Institute for Telecommunications, Germany.*

OThI3, **Optimum Modulation Format for High Density and/or Ultra Long Haul Transmission at 40Gbit/s,** Gabriel Charlet; *Alcatel Res. and Innovation, France.* OThP3, **Polarization-Nulling Method for Monitoring OSNR in WDM Network,** Yun Chung; *KAIST, Republic of Korea.*

OFB3, **Photonic Signal Processing of High-Speed Signals,** Robert Minasian; *Univ. of*

*Sydney, Australia.*

OFJ3, **Petabit-per-Second Routers: Optical vs. Electronic Implementations,** Rodney

Tucker; *Univ. of Melbourne, Australia.*

## H. Networks

OTuG1, **Design of Multi-Tier Networks to Support Data-Intensive Applications,** Scott

Davidow; *Northrop Grunman, USA.*

OTuN3, **Open Optical Networks,** Vik Saxena; *Comcast , USA.*

OWP1, **IRIS: Optical Switching Technologies for Scalable Data Networks,** Martin

Zirngibl; *Lucent Bell-Labs, USA.*

OWU1, **Optical Networking Testbeds in Europe,** Bernhard Fabianek; *European*

*Commission, Belgium.*

OWU2, **Optical Networking Testbeds in China,** Jintong Lin; *Beijing Univ. of Posts and*

*Telecoms, China.*

OWU3, **Today's Optical Network Research Infrastructures for E-Science Applications,**

Gigi Karmous-Edwards; *MCNC, USA.*

OWU4, **Network Design for Large Data Flow,** Kees Neggers; *SURFnet, The Netherlands.* OThM7, **Optical Networking in Non-Telecommunications Applications,** David Levy; *General Dynamics, Advanced Information Systems, USA.*

OFO3, **The European Network of Excellence e-Photon/ONe on Optical Networks,** Fabio

Neri; *Dept. di Elettronica, Politecnico di Torino , Italy.*

## I. Emerging Applications and Access Solutions

OTuC3, **Broadband Access Technology and Asia Market for FTTH and IP-DSLAM,**

James Mao; *UTStarcom, USA.*

OTuJ1, **10G-Enabled Optical Network Architecture Directions for Video, Voice and**

**Data: An MSO Perspective,** Robert Harris; *Time Warner Cable, USA.*

OWQ1, **High-Bandwidth Biomedical, Telemedicine, and E-Earth Science Applications and Their Requirements on Optical Transport Networks,** Albert Yee; *Calit2, Irvine Division, USA.*

OFE5, **Field Trials with Channel Bit Rates of 160 Gbit/s,** Ralph Leppla; *T-Systems, Germany.*

**NFOEC Subcommittee 1: Network Systems**

NThE1, **Interoperability and Optical Network Performance,** Vishnu Shukla; *Verizon, USA.* NThG5, **Modern HFC Networks -- More F, Less C,** David Piehler; *Harmonic, Inc., USA.* NThH1, **Broadwing's Experience with Optical Network Planning and Deployment,** Michael Bortz; *Broadwing, USA.*

**NFOEC Subcommittee 2: Network Technologies**

NTuC1, **Transmission of 40 Gbps Signals through Metropolitan Networks Engineered for**

**10 Gbps Signals,** Jim Grzyb; *Tellabs, Inc., USA.*

NTuC3, **Field Measurement of PMD Using Four Common Measurement Techniques,**

Osman Gebizlioglu; *Telcordia Technologies, USA.*

NTuD3, **Optical Network Architecture Choice for Ethernet Services: A CLEC's View,**

Steve Plote; *Looking Glass Networks Inc, USA.*

NTuF4, **Engineering and Planning Tool for an Ultra-Long-Haul Optical Mesh Transport**

**System,** Sydney Taegar; *Bell Labs, Lucent Technologies, USA.*

NTuF1, **Progress in DWDM Deployment in MCI's North American Network,** Daniel

Peterson; *MCI, USA.*

NThC5, **Systems Integration and Testing Challenges for Next-Generation Optical**

**Transport Networks (NGOTNs),** Muzaffer Kanaan; *Verizon Labs, USA.*

NThF5, **New Optical Patch Panels and Optical Switches,** T. J. Xia; *MCI, USA.*

# Tutorial Speakers

**A. Fibers and Optical Propagation Effects**

OTuA1, **Slow Light in Bulk Materials and Optical Fibers,** Robert Boyd, *Univ. of Rochester,*

*USA*

**B. Amplifiers and Lasers: Fiber or Waveguide**

OWT1, **Fiber Parametric Amplifiers,** Robert Jopson, Bell Labs, *Lucent Technologies, USA*

**C. Signal Measurement, Distortion Compensating Devices and Sensors**

OThL1, **Optical Compensation of System Impairments,** Christopher Doerr, *Lucent*

*Technologies, USA*

**D. Switching, Wavelength-Selective Filtering and Routing Devices**

OWF1, **Polymer Waveguides: The Future is Now,** Garo Khanarian, *Rohm & Haas, USA*

**E. Optoelectronic Devices**

OFI4, **R ecent Advances in Avalanche Photodiodes,** Joe Campbell, *Univ. of Texas at Austin ,*

*USA*

**F. Digital Transmission Systems**

OThD1, **Modelling of WDM Terrestrial and Submarine Links for the Design of WDM**

**Networks,** Sebastien Bigo, *Alcatel, France*

**G. Subsystems, Network Elements and Analog Systems**

OWK1, **Electronic Dispersion Compensation,** Doug McGhan, *Nortel, Canada*

H. Networks

OThT1, **OCDMA,** Jonathan Heritage, *Univ. of California at Davis, USA*

**I. Emerging Applications and Access Solutions**

OThU5, **Free Space Optical Networking,** Charmain Gilbreath, *U.S. Naval Research Lab, USA*

**NFOEC Subcommittee 2: Network Technologies**

NWA1, **Optical Transceivers for Passive Optical Networks (PON),** Weiping Huang,

*McMaster Univ., Canada*

# Workshops

OFC/NFOEC workshops provide opportunities to discuss and debate the latest technologies. Many workshops will be highly interactive, among 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, contributed presentations (5 to 10 minutes) from people involved in the field followed by a panel discussion driven by questions from the audience.

The 2006 conference featured workshops in current areas of interest in OFC and NFOEC

categories alike. Details on all workshops are listed below.

## A. Fibers and Optical Propagation Effects

**OMD - Comparing Conventional and Microstructured Optical Fibers**

**Organizers:***John Fini, OFS Labs, USA*

*Tanya Monro, Univ. of Adelaide, Australia*

Microstructured optical fibers have captured the interest of the optics community because of their unique properties and their potential use in a wide variety of applications. This field is rapidly maturing and it is now timely to consider the following important questions for each application:

 How do the unique properties of microstructure fibers address the relevant requirements or performance tradeoffs of the application?

 Are conventional fibers or waveguides able to provide equivalent function to the proposed microstructure designs?

 Do microstructured waveguides provide qualitatively new functionality or advantages in the detailed system performance?

This workshop will explore the role that unique microstructure fiber capabilities can play in three the key application areas:

|  |  |
| --- | --- |
| 1. | Transmission and laser power delivery |
| 2. | Nonlinear fibre devices |
| 3. | Amplifiers and lasers |

Three invited speakers and a panel of 3 experts have been selected for each application area. The role of the panel is to engage in and stimulate discussion of the questions listed above with the

speakers and the audience. Both the invited speakers and panellists are leaders in their field chosen to provide good coverage of the application area.

## B. Amplifiers and Lasers: Fiber or Waveguide

**OMB - The Future of SOAs**

**Organizers:** *Juerg Leuthold, Univ. of Karlsruhe, Germany*

*Niloy K. Dutta, Univ. of Connecticut, USA*

Semiconductor Optical Amplifiers (SOAs) have been a topic of intense research for over twenty years. Although SOAs have lower saturation powers than fiber amplifiers, they are most unique because they cover the whole spectral range from 1300 to 1600 nm with sufficient gain for most access and medium-haul applications. A recent router introduced by startup Infinera clearly exploits SOAs not only to boost signal power but also demonstrates the benefit from the monolithic integration of SOAs with other InP based devices. The high nonlinearity of SOA is most unique among all known optical materials – it has led to the development of a new class of commercially available nonlinear all-optical products.

This includes wavelength converters and optical clock recoveries and soon might include optical high-speed demultiplexers and many other all-optical processing applications in view of label swapping, optical header recognition and optical switching applications. Recently, SOAs have found new applications for FTTx and non-telecommunications fields, which has triggered a new interest in the technology.

After a short introduction on the theory and concepts behind SOAs including new materials such as Quantum Dots, we will discuss recent trends in industries and highlight new applications not only in the field of telecommunications but also in the field of medicine and related fields.

**Invited Speakers include:**

K. Morito, *Fujitsu Labs Ltd., Japan*

B. Sartorius, *HHI, Germany*

D. Bimberg, *Tech. Univ. of Berlin, Germany*

L. Zhang, *Lucent Tech., USA*

L. Tongnin LI, *INPHENIX, USA*

S. Tsdaka, *Kailight Israel*

B. Stefanov, *Alphion Corp., Director of Product Development, USA*

T. A. Fujitsu, *Optical Semiconductor Device Res. Lab, Fujitsu Labs Ltd., Japan*

J. Zyskind, *Optovia, USA*

P. Heim, *Vice President of Advanced Technology, COVEGA Corp., USA*

A. Poustie, *CIP, UK*

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

**OMA - Optical vs. Electrical Approaches to Compensation of Signal Degradations in High**

**Speed Optical Networks**

**Organizers:** *Kim Roberts, Nortel Networks, Canada*

*Paul Westbrook, OFS Labs, USA*

Optical signal compensation, most importantly dispersion compensating fiber, has enabled today’s high speed 10Gbit/s networks. Much research has also been devoted to 40Gbit/s optical compensation technologies, such as tunable dispersion compensators, PMD compensators and even optical equalizers. However, at lower bit rates, particularly in wireless communication, electrical compensation of signal degradations is well established. With advances in high speed electronics, these methods are now being tested in 10G and even 40G optical communication systems and recent laboratory demonstrations have shown that electrical precompensation may enable even long haul 10G transmission without any optical dispersion compensation.

How far can electronic approaches go in high speed optical networks to replace or coexist with optical technologies? Our workshop will examine this issue with participation from electrical and optical component vendors and system designers.

**Invited Speakers include:**

Martin Birk, *AT&T Res. Labs, USA*

M. Bohn, *Siemens, Germany*

Hans Damsgaard, *OFS Fitel Denmark I/S, Denmark*

Rene-Jean Essiambre and Peter Winzer, *Lucent Technologies, Bell Labs, USA*

Chris Fludger, *CoreOptics, UK*

Martin Guy, *TeraXion, Inc., Canada*

Kim Roberts, *Nortel Networks Ltd., Canada*

Ross Saunders, *Stratalight, USA*

Dave Weidman, *Avanex Corp., USA*

## D. Switching, Wavelength-Selective Filtering and Routing Devices

**OMC - Low-Cost ROADM: Wavelength Switching vs Tunable Filters**

**Organizers:** *Haifeng Li, Tyco Telecommunications, USA*

*Dan Marom, The Hebrew Univ. of Jerusalem, Israel*

Reconfigurable optical add/drop multiplexer (ROADM) technology enables remote traffic provisioning at the wavelength level in network nodes. This capability allows the network operator to increase system efficiency and reduce operating expenses. However ROADM deployment is limited due to its initial costs, hence the drive to reduce cost for ROADM implementations. Under the scope of this workshop, we focus on two general technology categories: 1) The simple, but functionally limited, single-channel ROADM, based on tunable filters; and 2) the more expansive and expensive, wavelength-selective switches. At the

workshop, users of the ROADM modules like system integrators and equipment vendors will first present their requirements and willingness of performance and economic trade-offs. Subsequently, the technology developers and innovators will demonstrate and fit their unique product against different applications, followed by Q&A session to the panelists from the audience. The goal of the workshop is not to find the best all-around technology for ROADM, but rather to explore the full potential of each technology to different applications in terms of performance and cost.

## E. Optoelectronic Devices

**OMH - Integrated Optics in InP: Technology and Economics**

**Organizers:** *Yoshiaki Nakano, The Univ. of Tokyo, Japan*

*Rajeev Ram, MIT, USA*

Integrated Photonics based on InP materials has been a promising technology for more than a decade, with impressive demonstrations of multifunctional components on a single chip. The ability to integrate active and passive optical components on a single substrate for the optical window suitable for data- and telecommunications has opened a variety of applications. In the recent past one challenge was the design of high performance subcomponents such as low loss waveguides with optical filters, efficient and high speed optical sources and detectors, with all of these components having polarisation- and wavelength control. A further challenge was the realisation of uniform and high yield processes that would ensure the required cost reduction of integrated optical devices. With the development of proven software models for both passive and active subcomponents, and the recent establishment of focussed InP foundries with controlled process capabilities, Integrated Photonics has taken a giant step from the research playground towards industrialization. At the same time, the FTTx mass market is emerging to provide a

boost in the economics of Integrated Photonics products by stimulating the same combination of high volume, high performance and low cost that drove the early days of electronic integrated circuits.

This workshop will address the technology and economics of Integrated Photonics Products for the optical telecom- and data communication and sensor markets. Companies and research institutes are invited to share their views. In addition, companies that have adopted a business model based on fabless operation are solicited to share their experiences. New concepts for integration will be discussed as well as recent trends in applications that are viable candidates for integration technology that have been applied successfully.

## F. Digital Transmission Systems

**OMG - Design and Planning Tools for WDM Systems and Networks**

**Organizers:** *Michael Frankel, Ciena Corp., USA*

*Ekaterina Golovchenko, Tyco Telecommunications, USA Stephen Gringeri, Verizon, USA*

Carriers are continuing to experience pressure to reduce both capital and operating costs of fiber- optic communication networks. Design and Planning tools have a critical role to play

in optimizing configurations for providing low start up cost, scalability and efficient maintenance and operation, as well as the exploration of the upgrade potential of the legacy systems and networks. The workshop plans to cover issues related to the development and applications of

such tools. Areas of focus may include tradeoffs in adaptability to either new network deployments or extensions of existing networks, computational accuracy vs. memory and run times, beneficial levels of coupling among service demands, wavelength provisioning, physical transport layers and protection mechanisms. The other subject of interest is integrated planning approach across WDM and TDM domains, as well as integrating planning around across multiple equipment vendors. The workshop format will consist of several contributed and invited presentations, followed by a panel discussion.

**Invited Speakers include:**

Roman Egorov, *Verizon, USA*

Ralph Leppa and Andreas Gladisch, *T-Nova Deutsche Telekom Innovationsgesellschaft, Germany*

Matthew Ma, *VSNL International, USA*

Dmitriy Kovsh, *Tyco Telecommunications, USA* Loukas Paraschis, *Cisco Systems, Inc., USA* Enrico Ghillino, *RSoft Design Group, USA*

Yun Feng Shen and Harshad Sardesai, *Ciena Corp., USA*

Jan Spaeth, *Ericsson, Germany*

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

## H. Networks

**OMF - Next Generation Optical Networking Applications, Architecture and Technologies**

**Organizer:** *Adel Saleh, DARPA/ATO, USA*

As the telecom industry turns around, it is an opportune time to explore the applications, architectures and technologies of next-generation optical networks. In this workshop, experts and decision makers from the commercial, academic, and government sectors will present their visions for the evolution of the network. The panel will discuss evolving advanced optical networking applications and the associated network requirements. They will address the benefits and limitations of today's networks, and examine what new architectures and technologies are needed to enable the next-generation network. An open discussion session will follow the panel presentations, where audience participation is greatly encouraged.

**Panelists:**

Dr. Henry Dardy, *DoD Senior Technologist and Navy Chief Scientist for Advanced Computation*

*and Communications at the Naval Res. Lab*

Dr. Larry Smarr, *Professor of Computer Science and Engineering, and Founding Director of*

*CalIT2, Univ. of California, San Diego*

Dr. Stuart Elby, *Vice President, Network Architecture and Enterprise Technologies, Verizon*

*Technology Organization*

Dr. Rodney Alferness, *Research Senior Vice President, Bell Labs, Lucent Technologies*

Dr. Joseph Berthold, *Vice President, Network Architecture, Office of the CTO, Ciena Corp.*

Dr. David Welch, *Chief Strategy Officer and Co-Founder, Infinera Corp.*

## I. Emerging Applications and Access Solutions

**OME - X-PONs, Global Perspectives, Drivers and Tradeoffs that Drive the Technology**

**Choice of the Future**

**Organizers:** *Cedric Lam, OpVista, USA*

*Yun C. Chung; KAIST, Republic of Korea*

Deployments of broadband access infrastructures have been speeded up by applications such as video on demand, Internet gaming, peer-to-peer downloading etc. To avoid being left out in the fast-growing video, voice and broadband data triple play, RBOCs in the US are rolling out ATM-PON (APON) based FTTP systems to compete with MSOs who are leveraging their existing HFC infrastructure. At the same time, the Japanese seems to be charging forward with Ethernet PONs (EPON) and the Koreans are experimenting with WDM-PONs.

Since it was first captured in the Full Service Access Network (FSAN) standard, different flavors of PON technologies have been proposed. APONs based on the ITU-T G.983 and G.984 guidelines give them the advantage of available well-defined ATM QoS support. At the same time, EPON adopters are betting on Ethernet cost efficiency, ubiquity and proven compatibility. Some carriers also make use of the huge bandwidth in optical fibers by overlaying services such as legacy analog video on their PON fibers with coarse WDM.

The following bullets give a non-exhaustive list of interplaying factors that will affect a network

service provider’s choice of a particular PON technology:

 Capital cost

 Capacity limit

 SLA and QoS support

 Compatibility and integration with legacy local and backbone infrastructure

 Technical staff know-how

 Ease of deployment, operation and management

 Technology trend and growth potential

 Regualtions, government policies and strategic considerations

In this workshop, we will invite industry experts from different parts of the world to review and discuss the drivers and trade-off considerations in the choice of PON technologies for their territory.

# NFOEC WORKSHOPS

## 1. Network Systems

**NMB - Optical Performance Monitoring: What Are the Possibilities and What Do Carriers**

**Need?**

**Organizer:** *Ron Skoog, Telcordia, USA*

Optical Performance Monitoring (OPM) is essential for the operation of all-optical portions of transport networks. Today we have ultra-long-haul systems forming significant all-optical network segments; looking to the future, networks will utilize all-optical switching to form more expansive all-optical sub-networks. With these developments there will be an increasing need for economic optical monitoring that can identify and isolate degradations and failures in all-optical sub-networks. This workshop will provide perspectives from carriers, equipment vendors and researchers on today’s OPM capabilities, what carriers will need and what the possibilities are

for tomorrow. The planned format will consist of contributed presentations, followed by a panel session. Interested presenters should contact the organizer.

**Invited Speakers include:** Vishnu Shukla, *Verizon, USA* Martin Birk, *AT&T Labs Res., USA*

Dan Kilper, *Bell Labs, Lucent Technologies, USA*

Yun Chung, *Dept. of Elect. Engineering, KAIST, Korea*

Bengt-Erik Olsson, *Chalmers Univ. of Technology, Sweden*

**Vendor Contributions:**

Mark Lourie, *Aegis Semiconductor, Inc., USA*

David Menashe, *RedC Optical Networking Ltd., USA*

## 2. Network Technologies

**NMA - OC-768: When/How/Where? Drivers and Challenges in Deploying a Network to**

**Support OC-768**

**Organizer:** *Gary Nicholl, Cisco, Canada*

With the introduction last year of 40 Gb/s interfaces on the next generation of core routers, the industry has seen a steady uptake in interest on 40 Gb/s networking technology. Several service providers have announced both 40 Gb/s field trials and limited deployment over the past year. Advances in component technology have allowed not only improvements in reliability and performance, but also extremely aggressive cost points, however, there are still some challenges ahead. The desire to support seamless transitions from 10 Gb/s transport solutions to 40 Gb/s adds some issues, such as OSNR performance, tolerance to chromatic and polarization-mode dispersion, which must be overcome before 40Gb/s is ready for wide scale deployment.

In this workshop a panel of industry experts, from both service providers and equipment manufacturers, will review the current state of 40 Gb/s technology, the technical and business

challenges, and discuss what it will take for 40 Gb/s to become a widely deployed networking technology.

**Invited Speakers include:**

Ross Saunders, *Stratalight, USA*

Steve Penticost, *Mintera, USA*

Joerg-Peter Elbers, *Ericsson, Germany*

Michel P. Belanger, *Nortel, Canada*

Ralph Leppla, *Deutsch Telecom, Germany*

Li Xing, CERNET, *China* Vik Saxena, *Comcast, USA* Daniel L. Peterson, *Verizon, USA* Joseph Stewart, *Cisco, USA*

# Market Watch

This three-day series of panel sessions engages 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. A special session featured on Thursday highlighted Video over IP.

## Tuesday, March 7, 2006

**Business and Management Insights**

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

Moderator: Milton Chang, *Managing Director, Incubic, LLC, USA*

New broadband opportunities will see competition from both cable and telecom service providers, while systems providers and IT businesses in general must pay attention to globalization and international markets. This session features leaders from the global private equity, cable systems, and telecommunication technology sectors, sharing insights that cover a spectrum of issues highly relevant to everyone presently in our industry.

Dr. Henry Kressel, Partner and Senior Managing Director of Warburg Pincus, a global private equity investment firm that participated in the recent purchase of Telcordia, will address IT and communications business opportunities both in the United States and overseas from an investor viewpoint. Karl May, President and CEO of OpVista, a optical transport company presently supplying the major cable companies, will discuss the business environment and opportunities for serving the cable industry and CLECs, and will also share his insights on business development. Dr. Rod Alferness, Senior Vice President, Optical Networking and Photonics Research of Lucent, Bell Laboratories, recipient of the 2005 IEEE Photonics Award, will describe trends in optical network technologies.

**Speakers**

**Innovation - the Engine of Global Broadband Networks**

Rod Alferness, *Senior Vice President, Bell Labs Res., Lucent Technologies, USA*

**Global Communications Services**

Henry Kressel, *Partner and Senior Managing Director, Warburg Pincus LLC, USA*

**Building the Broadband Connected Community**

Karl May, *President and Chief Executive Officer, OpVista, USA*

**Drivers for an Optical Re-Emergence**

3:00 p.m.-5:00 p.m.

Moderator: Serge Melle, *Vice President, Network Architecture, Infinera Corp., USA*

The past year has seen the announcement and implementation of several major network overbuild initiatives geared towards wide-spread roll-out of broadband services, migration to IP- based networking, and wireless and wireless network and service convergence. In many cases these initiatives are having a significant impact on the underlying optical network infrastructure, or in the case of FTTX/PON initiatives, are an inherent part of it. This session will feature speakers providing a macro view of key initiatives, service drivers, resulting investment in new optical network infrastructures, and the resulting impact on the technology and vendor landscape.

**Speakers**

**Network rEvolution in North America: The Expanding Role of Optics**

Ronald J. Kline, *Research Director, Optical Networks: North America, Ovum, USA*

**Wireline Resurrection: The New Optical Networking Agenda**

Stéphane Téral, *Directing Analyst, Service Provider Next Gen Voice and Mobile Core, Infonetics*

*Research, Inc.*

**Beyond the Internet: Emerging Bandwidth Drivers**

Stuart Elby, *Vice President, Network Architecture, Verizon Network Services Group, USA*

**Optical Networking: A View from Wall Street**

Paul Silverstein, *Director, Equity Research, Credit Suisse, USA*

## Wednesday, March 8, 2006

**Collapsing Layers and Technologies: How New Service Offerings Are Driving the**

**Evolution of the Optical Communication Networks**

2:00 p.m.-4:00 p.m.

Moderator: Alan Gibbemeyer, *General Manager, Siemens Communications, Inc., USA*

In recent years there has been a clear trend to collapse different optical network layers. The core, regional, metro, and access layers are being consolidated in one optical multi-haul platform, while an approach integrating the physical, SONET, switching, and routing layers is desired in

the market place. These are disruptive approaches with long lasting impact on how we view the market and its segments, and how we build the network. This session will explore the commercial and technical benefits and challenges of such integrated technologies for the carrier, system supplier and component maker.

**Speakers**

**Network Layer Convergence from the Residential to the Core**

Hans-Juergen Schmidtke, *Vice President of Product Management Access and Transport,*

*Siemens Communications Inc., USA*

**Migrating to a Packet Over DWDM Network**

Thomas Scheibe, *Manager Product Management, TMG, Cisco Systems, USA*

**How Paths Collide: Network Layer and Technology Collapse Create New Opportunities and Threats**

Dana Cooperson, *Vice President, Optical Networks, Ovum-RHK, USA*

**The Role of SONET in an Ethernet-Centric World**

Andre Fuetsch, *Vice President Enterprise Product and Platform Integration, AT&T Inc., USA*

**Automation and Integration Are Key To Building Next Generation Networks!**

Glenn Wellbrock, *Director of Network Technology Development, MCI Communications, USA*

## Thursday, March 9, 2006

**Special Session: IP Video and Its Many Implications**

9:00 a.m.-10:00 a.m.

Featuring: Tony Werner, *Senior Vice President and Chief Technology Officer, Liberty Global, Inc., USA*

Just like most communications, video is also finding its way to IP networks. This transition creates opportunities and threats to every element of the value chain. This talk will highlight some of the early challenges as well as the long term implications of Video over IP. The discussion will include the impact of exponential increases in storage density, computational capacity and access bandwidth. The speaker will also provide his thoughts on evolving business models, portable media and the topic of disintermediation.

**State of the Industry: A Wall Street / Investor Perspective**

11:00 a.m.-1:00 p.m.

Moderator: Paul Bonenfant, *Associate Vice President, Equity Research, Morgan Keegan & Co., USA*

After years of decline, telco capex spending is predicted to approach double-digit year-over-year growth in 2005, with spending into 2006 focused on broadband access/FTTx, wireless, and carrier-grade Ethernet initiatives. This session will provide Wall Street and Investor perspectives

on potential beneficiaries, from established players to emerging start-ups, with a view toward what the future might hold for the telecommunications industry.

**Speakers**

**Arms Merchants to the Civil War**

Simon Leopold, *Senior Vice President, Equity Analyst, Morgan Keegan & Co., USA*

**An Investment Banking Perspective - IPOs, Financings and M&A**

Gary Kirkham, *Managing Director, Global Co-Head of Communications Equipment Group,*

*Merrill Lynch & Co., USA*

**Venture Capital Trends In The Communications and Optical Sectors**

Chris Rust, *Managing Member, U.S.Venture Partners, USA*

**Voice as an Afterthought**

Cliff Higgerson, *Venture Capital Advisor, CHVentures, USA*

# Panel Discussions

Panel Sessions provide interactive discussions focused on topics of interest to the industry. Thursday, March 09,

2006 8:00 am - 10:00 am

Room 303 C

## JThA - Reconfigurable Networks: Challenges and Opportunities

Steve Frisken; *Engana Pty, Ltd., Australia*

This combined OFC/NFOEC workshop brings together key players who are enabling the next generation of agile or reconfigurable optical networks. This "vertically integrated" session examines the issues and opportunities from the perspective of the Telecom providers, Network Equipment Manufacturers, Subsystems and Technology developers. Presentations and panel discussions define the focus of current developments and deployments and give a view on the potential evolution of this very dynamic area of telecommunications. The panel discusses the commercial drivers of reconfigurability and look at what functionalities and network topologies are being developed to meet the requirements. Specific themes will include monitoring, protection, cascadability, level of transparency and technologies of choice.

## NWE - Riding the Wave of Silicon Economics: Is the Wave Reaching Shore?

*Altera, USA; LSI, USA; Turin Networks, USA; Netgear, USA*

In the past, smaller geometries, larger wafers and integration into silicon all drove the performance and cost of network components and systems. These same traits continue to drive Silicon Economics for very high volume consumer and networking applications. However, foundry costs and the cost of EDA tools may severely limit future generations of merchant silicon and ASICs, except for the highest volume applications. The panelists will discuss their visions and solutions to these issues.

Speakers Include:

*Mathew Steinberg, Ample Communications, USA Jim Jungjohann, CIBC World Markets Corp., USA Denny Scharf, LSI Logic, USA*

*Steve West, Packet Switch Networks, USA Anthony Torza, Xilinx, USA*

Tuesday, March 07, 2006 2:00 pm - 4:00 pm

Room 303 C

## NTuB - Ethernet's Real Deal: A Discussion of Service Providers' Real-World Experiences Developing, Managing, and Delivering Ethernet Services

Umesh Kukreja; *Atrica Inc., USA*

Service providers of all types are developing creative Ethernet service strategies, and they are having to address a host of issues from the business strategy, technical, competitive, and financial perspectives. Issues such as service definition, competitive positioning, target marketing, infrastructure choices, and service management must be considered, as well as

customizing offerings to best fit their customers. This panel will deliver 'Real World' case studies from service providers that have rolled out Ethernet service offerings, highlighting the issues, challenges, and rewards they have experienced. Attendees will leave with a clearer

understanding of their options for pursuing and deploying successful Ethernet services offerings.

**Session Chair:** Umesh Kukreja, *Director of Product Marketing, Atrica Inc., USA*

Panelist 1: Michael Howard, *Principal Analyst and Co-Founder, USA*

Panelist 2: Gary George, *President, IP Networks, USA*

Panelist 3: Andy Redman, *Senior Network Engineer, Cox Communications, USA*

Panelist 4: John Galgay, *OmniTech Advisors, Inc., USA*

## NWB - Control of Optical Systems and Networks: Vendor, Carrier, and Application Perspectives

John Strand; *AT&T, USA*

Angela Chiu; *AT&T Labs, USA*

Much progress has been made in the effective control of optical systems and networks, and applications such as grid computing are developing architectures and middleware needing reconfigurable gigabit reconfigurability. However there are "seam" issues between the players that need to be solved if reconfigurable optical networking is to take off. This panel discussion will bring together architects from equipment manufacturers, carriers, standards groups, and applications to discuss the status and prognosis for solving these "seam" issues.

Speakers Include:

**Physical Layer Control in Optical Transport Systems,** *Michael Eiselt, ADVA AG Optical*

*Networking, USA*

**Optical Network Control for Multi-Layer Transport,** *Lyndon Ong\* and Rajender Razdan, Ciena Corp., USA*

**Multi-Layer Restoration Architecture in IP Over Optical,** *Angela Chiu\* and John Strand, AT&T, USA*

**Integration and Control of IP and Intelligent Optical Backbone Network,** *Yong Xue\* and*

*David Mihelcic, DISA , USA*

**Rethinking Intelligent Optical Control Planes for Grid Computing,** *Gigi Karmous-Edwards, MCNC , USA*

**Grid Optical Network Service Architecture for Data Intensive Applications,** *Tal Lavian\*, Nortel, Canada, Randy Katz, Univ. of California, USA and John Strand, AT&T, USA*

Thursday, March 09,

2006 10:30 am - 12:30 pm

Room 303 C

## NThD - Emerging Networks

Shahab Etemad¹, Mehran Esfandiari², Roberta Rentko¹ ; *¹Telcordia Technologies, USA , ² SBC,*

*USA*

This panel discussion on "Emerging Networks" addresses the following:

 FTTx networks that carry video, data and voice to the end customer: the traditional carriers which provide voice and data to the end customer are building networks in the last access miles to provide video services to compete with the cable companies;

 Video backbone networks (both metro and long-distance) that provide broadcast, VoD (Video on Demand), and other video services to the local markets, to connect to FTTx and other access architectures;

 Converged backbone networks that combine layer 1, 2, and 3 network elements and applications which will enable new video services, a multitude of new data services, and IP services (VoIP, etc.) to be carried on same network; and

 Reconfigurable scaleable networks that support ultrahigh aggregate bandwidth for dual government-commercial use.

Speakers include:

*Andreas Gladisch, Telcordia Technologies, USA Deutsche Telekom, Telcordia Technologies, USA Germany Ken Kerpez, Telcordia Technologies, USA John Ryan, Adventis, USA*

*Glenn Wellbrock, Verizon, USA*

Tuesday, March 07, 2006 4:30 pm - 6:30 pm

Room 303 C

## NTuE - Fiber-to-the-X Deployment Issues

Vincent O'Byrne; *Verizon, USA*

Over the last several years various Telecommunication and Cable Television companies across the world have deployed fiber further and further into the network in order to offer the customer a triple-play solution (POTS, Data and Video). Companies have chosen different technologies to deploy from FTTP, FTTN and others to meet these demands. This Panel will discuss the various options that the companies chose, their rationale, lessons learned and where they see their

Network going over the coming years to meet the ever increasing customer need and competition from other broadband companies.

Speakers Include:

*Hiromichi Shinohara, Director of NTT's Access Network Service Systems Labs, Japan*

*Glenn Mahony, MTS, BellSouth Telecommunications, USA Gene Edmon, Executive Director, AT&T Labs, USA Vincent O'Byrne, Director of Technology, Verizon, USA*

# Plenary Session

The OFC/NFOEC 2006 Plenary Session was held on Tuesday, March 7 in the Marquis Ballroom of the Anaheim Marriott Hotel.

Bran Ferren



***Chief Creative Officer***

Applied Minds, Inc., USA

## Optical Fiber Communications - *What's Next?*

**Abstract:** In 1997, Bran Ferren addressed OFC, providing a series of industry predictions resulting in one of the most refreshing, realistic and accurate Plenary Sessions in OFC’s history. In this year’s OFC/NFOEC Plenary Session, Ferren provides a fresh look at our industry, including drivers for applications as well as the globalization and commodization of the communications industry.

Bran Ferren speaks from unique experience on the art and science of the imagination, and how to organize for innovation. He is a dynamic and inspiring speaker with unparalleled knowledge and insight into the ways invention and innovation, creativity and technology interact for business success. Ferren fills his presentations with ideas gleaned from his vision of design and technology's future, and he offers concrete ways to redesign innovation processes that come from his experience as one of our finest innovation practitioners.

Equal parts artist/ designer and scientist/engineer, he has a distinguished career of contribution to business and product development, film and entertainment, aerospace and other sciences,

winning many awards, including three Academy Awards for technical achievement. He is the co- founder, Co-Chairman and Chief Creative Officer of Applied Minds, a company that provides advanced technology, creative design, and consulting services to a variety of clients, including The Walt Disney Company, NASA and GM. Before founding Applied Minds, Ferren held

various leadership positions, including president, at Walt Disney Imagineering, a resource for new technology invention and creative input for the entire company.

**Henry J. Kafka**



***Chief Architect***

BellSouth Corporation, USA

## [Drivers for Next Generation Networks](http://www.ofcconference.org/library/images/ofc/PDF/2006/2006KafkaPlenary.pdf)

**Abstract:** Hurricane Katrina presented BellSouth with an unprecedented challenge in New Orleans as the levee system failed and approximately 80% of the city flooded. Restoration of the metro network provided new perspectives on opportunities for advanced technologies.

Upcoming changes in video communications and entertainment services may provide an unprecedented challenge for existing networks, as consumer demands shift from linear programs to an explosion of content delivered wherever and whenever the customer wants it. Meeting

these challenges will require advances in the costs, capabilities, and management of metro access and core networks.

Henry J. "Hank" Kafka has over 20 years of experience in telecommunications. He started his career in the equipment provider part of the industry, working for Bell Labs on projects

involving voice, data, and multimedia communications systems and applications. He then moved to become a large business customer of communications services and products, working for Johnson Controls in the IT organization, Having been both a supplier to BellSouth and a

customer of BellSouth, Kafka joined BellSouth's Science and Technology organization in 1997. He has been working towards the transformation of BellSouth's network to a converged data- centric architecture, setting directions for the introduction of hardware, software, and service technologies such as xDSL, fiber to the premises, optical networking, metro ethernet, MPLS, network-based VPNs, wireless broadband access, packet voice, video, wireless/wireline integrated services, and home networking.

Kafka has a Bachelor of Science degree in Electrical Engineering from Northwestern University and a Master of Science degree in Electrical Engineering from the University of Illinois at Urbana-Champaign.

**G. Keith Cambron *Senior Vice President*** AT&T Labs, USA



**The Multimedia Transformation**

**Abstract:** 2006 is the year multimedia services begin transforming our optical networks. IMS and IPTV place demands on long haul, metropolitan and distribution networks that spur the advance of ROADM, long haul and PON technologies. In this talk I will touch upon these technologies, and how they enable the next generation of multimedia services.

Keith Cambron is Sr. Vice President of AT&T Labs, AT&T's applied research and development subsidiary. He has a broad range of knowledge in telecommunications networks, technology and design, and experience ranging from circuit board and software design to the implementation of large public networks. His expertise extends to the areas of switching, call processing, line and trunk signaling, SS7, VF and RF transmission, system testing, Telco operations and traffic engineering, network reliability and performance analysis. Before the recent merger with AT&T, Cambron served as the President & CEO of SBC Laboratories, Inc. This role enabled him to bridge the innovation in the labs to bottom-line results for SBC companies.

Cambron has been profiled in Telephony and America's Network, and was published in the Proceedings of the IEEE Community Network Conference of 1992 and 1995. He taught Object Oriented Design at Golden Gate University in San Francisco and is a Senior Member of the Institute of Electrical and Electronics Engineers (IEEE). He received his B.S.E.E. from the University of Missouri, M.S. in Systems Management from the University of Southern California, and a Microsoft Windows Programming Certification from the University of California at Berkeley. Cambron is a retired Commander in the United States Naval Reserve.

# Service Provider Summit

The Service Provider Simmit is a 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.

## Keynote Presentation

**AT&T's Network Revolution: Building for Tomorrow**



**Chris Rice, Executive Vice President, Network Planning & Engineering, AT&T, Inc., USA**

New, advanced technologies are ushering in a new era of communications. In the years ahead, the network will look completely different than it does today. AT&T

will share its vision for the network of the future, providing an all-encompassing view of where the network is heading and what the revolution means for the communications industry and customers.

As Executive Vice President, Chris Rice oversees the Network Planning and Engineering Group for the new AT&T Inc. His responsibilities also include overseeing the development and deployment of advanced access, switching, and routing technologies for the company. Prior to being appointed to his current position in March 2004, he was responsible for SBC Communications' enterprise-wide technology direction, new technology introduction, platform development and network regulatory.

Previously, Mr. Rice served as Vice President-Network Engineering, where he was responsible for all current planning and engineering for SBC Southwest and SBC SNET. Prior to that, he was Vice President-Network Planning and engineering for SBC Internet Services, where he was responsible for all network planning, engineering, systems and operations. Since joining the company he has also held a variety of other management positions in network operations,

network engineering, network planning, project management and outside plant operations.

Mr. Rice began his career in 1980 with Southwestern Bell Telephone in toll switching systems network operations. In 1986 he joined Bell Communications Research ("Bellcore"), where he had responsibility for the support and systems analysis of operational support systems. In 1994 he held the position of Vice President-Network Planning and Engineering for Southwestern Bell Messaging Inc., where he was responsible for network operations, network planning and engineering, and information systems.

In 1989 he received the Texas Synergy Award for the Interdepartmental Showcase. In 1990 he received the Texas Synergy Award for Addison 1 AESS to DMS-100 Conversion. Mr. Rice received a B.S. in Engineering Technology in 1980 from Texas A&M University in College Station, Texas.

## Panel Discussions

### Panel I: The Future of Metro and Core Networks

Moderator: Brad Kummer, CTO, Cogent Technologies, USA

For decades telecom networks were designed to carry voice traffic, while data traffic was mostly

limited to enterprise networks. Each network design had its respective set of requirements for quality of service, capacity, survivability and restoration.

However, in recent years the communications industry has gone through fundamental changes: revenue generated through conventional voice services is rapidly diminishing, and ever more complex data and video services are delivered over telecom networks. At the same time global competition is putting major pressure on carriers to reduce their network operating costs. This situation has led to a new set of requirements for different parts of the network. While the next session will focus on the edge of the network, this first session is aimed at Metro and Core network infrastructure with its unique set of requirements to accommodate a wide range of traffic formats with different quality of service guarantees at the lowest possible cost.

Join a panel of experts from carriers around the globe who will present trends and strategies for designing the next generation Metro and Core networks that will satisfy the communication needs of the future.

**Speakers**

**Long-haul Network Evolution Trends**

*Chuck Norman, Chief Design Engineer, Sprint, USA*

Chuck Norman became Chief Design Engineer of Network Solutions Development at Sprint in October 2001. In this position Norman is responsible for p roviding oversight of architectural development across all platforms to ensure overall network optimization with the most cost effective implementation. He is also responsible for developing promising new technologies into implementable systems to support new service opportunities while improving quality of service. In addition, Norman identifies areas of potential cost reduction, utilizing advancements in standards and technology for all customer services worldwide. Norman has been with Sprint for

25 years in various research, planning, operation and engineering roles, including Director- Network Engineering, Director-Consumer Technology Lab and Manager-Standards. Norman was awarded four patents and has several more pending for his work in SONET, DWDM and optical transport network development

**Customer Controlled Optical Networking - An ASON Service**

*Scott Beckett, Group Product Manager - Advanced Optical Services, AT&T, USA*

Scott Beckett is a highly accomplished Product Management professional responsible for delivering innovative new AT&T products and features from concept to general availability. He is responsible for optical services, accounting for multiple billions in annual revenues and supporting Fortune 100 customers for AT&T. He is also responsible for analyzing market trends and managing introduction of new services from concept to launch. He has also been responsible

for creating MPLS-based enterprise VPN services and negotiating inter-carrier contracts for specific service offerings. Scott's expertise covers all areas tied to advanced telecommunications services, from new technologies that make them possible to the contractual arrangements with customers and realization of ongoing operations support. In his career with AT&T, Scott has received numerous awards in recognition for the contributions he has made in creating and developing telecommunications services based on emerging technologies. Scott has a B.S. in Marketing from Messiah College and a Masters Certification in Project Management from Stevens Institute of Technology.

**Future Deployment of WDM Systems in the UK**

*Dave Johnson, 21st Century Transmission Network Designer, BT, UK*

Dave Johnson has worked for BT since graduating in 1986. He initially worked on systems reliability, and then on research into self-organizing networks and novel network design and optimisation techniques. For the past six years, Dave has led a team developing solutions for BT's SDH and WDM transport networks. He currently leads a team of network designers responsible for the end to end transmission design of BT's 21st Century Network. Dave is a member of the IEE and a Chartered Engineer.

**A Commercial View of Long Haul Optical Networking In the Next Five Years**

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

Robert Feuerstein joined Level 3 Communications in 1999 and evaluated the technical and financial implications of new WDM optical transport technology, amplifier hut spacing, and various mesh and ring protection architectures for the Level 3 international fiber optic network. For the past two years he has worked in the Customer Network Engineering organization to support complex customer network design requirements. Previously Dr. Feuerstein was at the University of Colorado, where he and his colleagues demonstrated the world's first stored program optical computer, synchronized with fiber optic delay lines, as well as multi-wavelength optical packet switching techniques. He also taught courses in fiber optic communications. Dr. Feuerstein served as President of the Denver Section of the IEEE LEOS from 1994-1995.

### Panel II: Update on FTTX around the Globe

**Moderator: David Piehler, David Piehler Consulting, USA**

Delivering broadband services is rapidly becoming a cornerstone in almost every carriers'

business model. Bringing fiber closer to the customer is mandatory for any successful broadband strategy. There are several options to achieve this.

One option is to bring the fiber to the customer's premises or home (FTTP/FTTH). NTT of Japan has been following this model for a few years and in 2005 announced a new program, which will connect 30 million homes with fiber by 2010. In the US , Verizon started a major FTTP program in 2004. Several other carriers, municipalities and developers in Europe and North America are implementing their own initiatives. Another option is to bring the fiber to a cabinet or node (FTTC/FTTN) and use high-speed copper technologies to cover the final drop to the customer. Many carriers are using this approach, taking advantage of ever-increasing data rates in the latest DSL technologies. Key representatives in this group are SBC and BellSouth in the US, KT in Korea, and several major PTTs in Europe.

Attend this exciting session where executives from major service providers will present their views on the opportunities and challenges for FTTX around the world.

**Speakers**

**Verizon's FTTP Deployment**

*Vincent O'Byrne, Director -Technology, Verizon, USA*

Vincent O'Byrne has a PhD. from the University of Wales in the UK and an MBA from Babson College . He has over 18 years in the Telecommunications Industry in both Fiber-Optic Communications and Wireless Technologies. He is responsible within Verizon's Technology Organization for the definition of the requirements for Verizon's PON technologies as well as their introduction through Verizon's Integration Laboratories and First Office Application (FOA).

**FTTH Market - Growth and Expansion in Japan**

*Hiromichi Shinohara, Director, NTT Access Network Service Systems Labs, Japan*

Mr. Hiromichi Shinohara is Director of NTT Access Network Service Systems Labs. Since joining NTT's Laboratories in 1978, he has been engaged in the research and development of optical fiber cables, broadband networks and optical access systems. He also has been involved in the strategic planning of the broadband access networks.

**Project Lightspeed: FTTN and FTTP - Perfect Together**

*Eugene L. Edmon, Executive Director, Broadband Access, AT&T Labs, USA*

Gene Edmon is the Executive Director of Broadband Access for AT&T Laboratories Inc. Edmon leads a group responsible for all broadband access, except wireless. This includes all the flavors of DSL used for both consumer and business services, all access fiber technologies, and systems built on those physical layers.

Edmon joined SBC Communications in 1994. He worked in various capacities and was heavily involved in the early stages of DSL, the company s first consumer mass market broadband product. Edmon participated in making many of the key decisions for the direction of DSL service platforms and is well known in the industry. He has been a key management member of standards groups such as FSAN and FS-VDSL and has responsibility for SMEs at the DSL Forum, T1E1 and others. Prior to his current position, Edmon worked at Bell Labs for 10 years

on data communications, operations systems, and telecommunication products. He has Ph.D. and

MS degrees.

**Being a Service Provider on an Open Wholesale FTTP Network**

*Paul Morris, Executive Director, Utah Telecommunication Open Infrastructure Agency*

*(UTOPIA), USA*

Paul T. Morris is Executive Director of UTOPIA, a governmental entity created by 14 Utah cities to build an open wholesale fiber optic network to all homes and businesses within the member cities. He was the City Attorney for West Valley City, Utah, from 1983-2005 and Chair of the ULCT Telecommunications Task Force since 1997. From BYU he received a B.S. degree in Business Management in 1979 and a law degree in 1982. He received a M.P.A degree from

the University of Utah in 1991. In 2004, the FTTH Council presented Paul with its Star Award. Currently, Paul is the Chair of the Smart Community International Network.

# Short Courses

## Sunday, March 5

12:00 p.m. - 3:00 p.m.

**SC105 Modulation Formats and Receiver Concepts for Optical Transmission Systems**,

*Sethumadhavan Chandrasekhar, Peter Winzer, Lucent Technologies, USA.*

**SC132 Guided Wave Integrated Optic Devices and Circuits**, *Leon McCaughan, Univ. of*

*Wisconsin, USA.*

**SC171 Introduction to Optical Control Plane Standards and Technology: OIF UNI, GMPLS, G.ASON and All That!** *Greg Bernstein, Grotto Networking, USA.*

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

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

**SC218 Broadband HFC and Gigabit Ethernet Optical Networks**, *Winston Way, OpVista Inc., USA.*

**SC243 Next Generation SONET: How SONET is Evolving to Support Packets and**

**Wavelengths**, *Ori A. Gerstel, Cisco Systems, USA.*

**NEW! SC260 Biomedical Diagnostic Applications of Communications Technologies**, *Brett*

*E. Bouma, Harvard Medical School and Massachusetts General Hospital, USA.*

**NEW! SC262 Alternate Broadband Access: Wired and Wireless Technologies for the Last**

**Mile**, *Paul S. Henry, AT&T Labs - Res., USA.*

**NEW! SC266 Quantum Cryptography and Quantum Information**, *Matthew Goodman, Telcordia Technologies, USA; Richard Hughes, Los Alamos Natl. Labs, USA.*

**4:30 p.m. - 7:30 p.m.**

**SC120 Lightwave Component Measurements**, *Dennis Derickson, Cierra Photonics, USA.* **SC133 Reliability Methodologies for Fiber-Optic Components**, *David Maack, JDS Uniphase, USA.*

**SC137 PMD: Causes, Characteristics, Measurement, Emulation and Mitigation**, *Paul*

*Hernday, Fiberoptic Measurement Training and Consulting, USA.*

**SC177 High-Speed Semiconductor Lasers and Modulators**, *John Bowers, Univ. of California at Santa Barbara, USA.*

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

**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**

**Communication Systems**, *Dalma Novak, Pharad, LLC, USA.*

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

**SC264 Optical Ethernet and Data Networking for Large Enterprises**, *Jeffrey L. Cox, Xtera*

*Communications, USA.*

**NEW! SC265 Passive Optical Components and Filtering Technologies**, *Bruce Nyman, Princeton Lightwave, USA; Christi Madsen, Texas A&M Univ., USA.*

## Monday, March 6

8:30 a.m. - 12:30 p.m.

**SC210 Hands-on Polarization-Related Measurements Workshop**, *Paul Hernday, Fiberoptic Measurement Training and Consulting, USA; Rance Fortenberry, Bookham Technology PLC, USA; Daniel Peterson, MCI, USA; Ivan T. Lima, North Dakota State Univ., USA.*

9:00 a.m. - 12:00 p.m.

**SC114 Passive Optical Networks and FTTX**, *Paul Shumate, IEEE Lasers & Electro-Optics*

*Society, USA.*

**SC123 Erbium-Doped Fiber Amplifiers and Raman Fiber Amplifiers**, *John Zyskind, Optovia*

*Inc., USA.*

**SC141 Combating Degrading Effects in Non-Static and Reconfigurable WDM Systems**,

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

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

**SC178 Test and Measurement of High-Speed Communications Signals**, *Greg Lecheminant, Agilent Technologies, USA.*

**SC241 DWDM Technology: How It Works in Communication Systems**, *Stamatios*

*Kartalopoulos, Univ. of Oklahoma, USA.*

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

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

**NEW! SC263 Installation and Maintenance of FTTP Networks**, *Gerd Keiser, PhotonicsComm Solutions, Inc., USA.*

1:30 p.m. - 5:30 p.m.

**SOLD OUT - SC101 Hands-on Workshop on Fiber Optic Measurements and Component Testing**, *Lorenz Cartellieri, John Kim, Experior Photonics, USA; Peter Schweiger, Agilent Technologies, Canada; Karl Merkel, Agilent Technologies, USA; Michael Kelly, Agilent Technologies GmbH, Germany; Caroline Connolly, Richard Buerli, OptoTest, USA.*

**NEW! SC268 Hands-on Workshop on Outside Plant Splicing, Testing and Troubleshooting for FTTX Networks**, *Larry Johnson, The Light Brigade, Inc., USA.*

2:00 p.m. - 5:00 p.m.

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

*Telecommunications, USA.*

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

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

**SC144 WDM Networking Elements and Their Enabling Technologies**, *Rod Alferness, Lucent*

*Technologies, USA.*

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

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

**SC184 Introduction to Modeling High Data Rate Optical Fiber Communications Systems**,

*Curtis Menyuk, Univ. of Maryland, Baltimore County, USA.*

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

*Technologies, USA.*

**NEW! SC267 Silicon Microphotonics: Technology Elements and the Roadmap to**

**Implementation**, *Lionel Kimerling, MIT, USA.*

## Tuesday, March 7

8:30 a.m. - 12:30 p.m.

**SC185 Hands-on Polishing, Inspection and Testing of Connectors**, *The Light Brigade, Inc., USA; Seikoh Giken, USA; Norland Products, USA.*

**SOLD OUT - SC187 Hands-on Basic Fiber Optics for the Absolute Beginner**, *Dennis*

*Horwitz, Micronor Inc., USA.*

2:00 p.m. - 6:00 p.m.

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

**NEW! SC269 Outside Plant Hands-on Testing and Troubleshooting**, *Larry Johnson, The*

*Light Brigade, Inc., USA.*

**Prior Attendee Comments**

Here are just a few of the many positive comments received from last year’s Short Course

attendees.

**“Excellent overview of the current technology!”**

*Attendee from SC217 Integrated Optical Networks taught by Dalma Novak*

**“One of the best courses and instructors yet!”**

*Attendee from SC160 Microwave Photonics taught by Keith Williams*

**“Excellent insight to real world methods.”**

*Attendee from SC133 Reliability Methodologies for Fiber-Optic Components taught by David*

*Maack*

**“This was a well organized and well presented introduction. Thanks!”**

*Attendee from SC114 Passive Optical Networks and FTTX taught by Paul Shumate*