

# OFC/NFOEC'11 Review

Protection & Restoration, Circuit Packet  
Integration, 100G Technology

*Prepared by Chaitanya S. K. Vadrevu*

# Sessions

- **OWAA**      **Protection and Restoration**
- **NThC**      Restoration and Network Design
- **NTUA**      Control and Packet Integration
- **NWA**      100G Technology & Applications
- **OThI**      Routing and Path Computation
- **OThAA**      Optical Networking and Impairments

<b>Code</b>	<b>Title</b>	<b>Author/Affiliation</b>	<b>Topic</b>
OWAA1	Terabits Networking for Extreme Scale Science	Thomas Ndousse-Fetter, <b>DoE, USA</b>	New network architecture and protocols for future Exascale computing. Hybrid networking, new TCP and UDP protocols, 100 GigE
OWAA2	Multi-Failure Post-Fault Restoration in Multi-domain DWDM Networks	Feng Xu <sup>1</sup> , Min Peng <sup>2</sup> , Ammar Rayes <sup>3</sup> , Nasir Ghani <sup>1</sup> , Ashwin Gumaste <sup>4</sup> <b><sup>1</sup>UNM, <sup>2</sup>Wuhan Univ., <sup>3</sup>Cisco, <sup>4</sup>IIT Bombay</b>	Schemes for restoration from large-area failure events, natural disasters in multi-domain WDM networks.

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OWAA3	A Novel Two-Step Approach to Surviving Facility Failures	Chunming Qiao <sup>1</sup> , Bingli Guo <sup>2</sup> , Shanguo Huang <sup>2</sup> , Jianping Wang <sup>3</sup> , Ting Wang <sup>4</sup> , Wanyi Gu <sup>2</sup> <i><sup>1</sup>SUNY, <sup>2</sup>BUPT, <sup>3</sup>CUHK,  <sup>4</sup>NEC</i>	Robust service dependent virtual node mapping that ensures survivability of services in the event of failure
OWAA4	A Novel Segment-Based Protection Algorithm for Multicast Sessions in Optical Networks with Mesh Topologies	Tania Panayiotou, Georgios Ellinas, Neophytos Antoniadou, Antonis Hadjiantonis <i>Univ. of Cyprus, CUNY,            Univ. of Nicosia</i>	Separate requests in the multi-cast tree into multiple groups and protect each group using a single backup path

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OWAA5	A Network Design Technique for Selective Restoration	Kostas N. Oikonomou, Rakesh K. Sinha, Robert D. Doverspike <b><i>AT&amp;T Research Labs, NJ</i></b>	An interesting metric to characterize the robustness of a network, heuristics to determine which links to add capacity for restoration under all failures, reducing access router ports
OWAA6	An Efficient Partial Link Monitoring Scheme for Inter-Domain Routing Under Dynamic Traffic Scenarios	Pengfei Zhang, Yaohui Jin, Weiqiang Sun, Wei Guo, Weisheng Hu, N. Ghani <b><i>Shanghai Jiao Tong Univ., UNM</i></b>	A novel partial inter-domain link-state advertising policy for dynamic traffic

# Trends

- Hybrid circuits/packets
- Dynamic exchange of capacity between circuits and packets
- Transport Protocols for 100G Networks
- Service dependent virtual node mapping
- Network planning for full restoration of premium services
- Multi-domain protection and routing

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NThC1	Comcast Optical Network: A Truly Converged Infrastructure	Shamim Akhtar, <b>Comcast, USA</b>	Discusses various Comcast services, network infrastructure, optimizing different network components, dynamic optical layer
NThC2	Assessment of Capacity Upgrade Using 40Gbps DPSK Transmission in 10Gbps DWDM ROADM Networks	Guodong Zhang, Pedro Meledina, Craig Skolnick, Gary Armiento, <b>AT&amp;T Labs, USA</b>	A study for capacity upgrade using 40Gbps DPSK transmission in 10Gbps optimized 50GHz spaced DWDM ROADM systems.



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NThC3	Optical Network Design Algorithms that Consider Optical Path Add/Drop Ratio Restrictions for OXC Hardware Scale Reduction	F. Naruse, Y. Yamada, H. Hasegawa, K. Sato <b><i>Nagoya Univ., Japan</i></b>	Considering constraints on the number of optical paths that can be added/dropped at each node to minimize switch cost
NThC4	Demonstration of QoS-Aware Video Streaming over a Metro-Scale Optical Network Using a Cross Layer Architectural Design	M. S. Wang, A. Wang, B. G. Bathula, C.P. Lai, I. Baldine, C. Chen, D. Majumder, D. Gurkan, G. N. Rouskas, R. Dutta, K. Bergman <b><i>Columbia, NCSU, RPI, Univ. Houston.</i></b>	Cross layer architectures to compensate optical power fluctuations through optical-power-aware-routing for support high QoS video streaming

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NThC5	Availability-Aware SRLG Failure Protection in Survivable WDM Mesh Networks	Xu Shao, Yong-Kee Yeo, Xiaofei Cheng, Luying Zhou <i>Institute for Infocomm Research, Singapore</i>	Heuristic to ensure survivability SRLG requirements and availability requirements while assigning paths
NThC6	Multi-failure Restoration Demonstrations with Multi-Vendor Interoperability in Control Plane enabled WSON	S. Huang, L. Liu, S. Yoshida, I. Nishioka, R. Hayashi, K. Kubo, T. Tsuritani <i>NEC Japan, KDDI R&amp;D Japan, Mitsubishi Japan, NTT Japan</i>	Technologies for multi-failure automatic restoration such as colorless, directions ROADMs, distributed RWA, GMPLS control plane

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NThC7	Relaxed Maintenance Protection Architecture by Dynamic Backup Path Configuration	S. Kamamura, T. Miyamura, K. Shiimoto <i>NTT Japan</i>	Set up an additional backup path dynamically using a centralized control mechanism in case of failure of primary or existing backup path for 1+1 protection

# Trends

- ❑ SRLG, availability based protection
- ❑ Redundant backup or nodes for protection
- ❑ Cross-layer protocols that communicate optical layer information such as optical power fluctuations to upper layers
- ❑ 100G based backbone, dynamic optical services
- ❑ Network design algorithms to incorporate add/drop ratio's at OXC's, switches
- ❑ Colorless, directionless ROADMs

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<b>Code</b>	<b>Title</b>	<b>Author/Affiliation</b>	<b>Topic</b>
NTuA1	ASON/GMPLS Control Plane Status	Lyndon Y. Ong, <i>Ciena Corporation</i>	Optical control plane is shown to be beneficial. Recommends OTN transport.
NTuA2	Benefits of Closer and Methods for Automatic Cooperation between Packet and Transport Networks	David McDysan <i>Verizon</i>	Cooperation between Transport/Circuit and Packet networks to exchange parameters such as latency while setting up virtual circuits

<b>Code</b>	<b>Title</b>	<b>Author/Affiliation</b>	<b>Topic</b>
NTuA3	Minimally Intrusive Identification of Traffic-Bearing Optical Fibers	K. Reichmann, N. Frigo, P. Iannone, L. Nelson, G. He, F. Audet, D. Gariepy, G. Schinn <b>AT&amp;T Labs-Research, U. S. Naval Academy, EXFO</b>	Approaches to identify faulty circuits and to treat those circuits without disturbing those which are working properly
NTuA4	Miniature Detachable Photonic Turn Connector for Parallel Optic Transceiver Interface	D. Childers, E. Childers, J. Graham, M. Hughes, D. Schoellner, A. Ugolin <b>US Conec, NC</b>	Design, assembly, and qualification of a miniature novel photonic turn connector.

# Trends

- Exchange of information from transport/optical layer to packet layer for effective routing/forwarding such as latency, losses etc
- Approaches to isolate and identify faulty circuits and to repair them
- Hybrid circuits/packets
- OTN based transport mechanisms



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<b>Code</b>	Next slide	<b>Author/Affiliation</b>	<b>Topic</b>
NWA1	100G – Key Technology Enablers of 100 Gbit/s in Carrier Networks	Kim Roberts <b>Ciena Corporation</b>	Discussion of coherent detection, CMOS technology, advanced DSP for high bandwidth transmission systems
NWA2	100 Gb/s Dual-Carrier DP-QPSK Performance after WDM Transmission including 50GHZ Wavelength Selective Switches	L. E. Nelson, S. L. Woodward, S. Foo, M. Moyer, D. Yao, M. O' Sullivan <b>AT&amp;T Labs- Research,</b> <b>Ciena Corporation</b>	Characterize tolerance of a 100Gb/s dual-carrier dual-polarization-QPSK signal to carrier frequency separation and frequency

Code	Title	Author/Affiliation	Topic
NWA3	Nonlinear Tolerance of 112-Gb/s DP-QPSK in a Live Field Upgrade Trial over a 848 km 10G DWDM link	H. Griesser, A. C. Colomer, F. J. Arribas, S. Bayer, J. L. Arevalo Benitez, H. Wernz, R. Magri, G. Bruno <b><i>Ericsson GmbH, Telefonica, Telefonica I&amp;D, Ericsson Espana, Ericsson Genova</i></b>	Field trial of a coherent detected DP-QPSK at 112 Gb/s over a Telefonica live link of 848 km testing long term stability, determining noise margin, optimum launch power of format
NWA4	Scaling 112 Gb/s PDM-QPSK Hybrid Optical Networks	A. Stark, Y-T. Hsueh, S. Searcy, T. Detwiler, M. Filer, S. Tibuleac, G-K. Chang, S. E. Ralph <b><i>ECE, Georgia Tech ADVA Optical Networking</i></b>	Experimentally and numerically investigate nonlinear transmission impairments for a hybrid PDM-QPSK/OOK network

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NWA5	Adaptive Network Access with 100 Gb/s Ethernet by Packet-based Lane Bundling	K. Hisadome, M. Teshima, Y. Yamada, O. Ishida <b>NTT Japan</b>	Lambda on demand network access for 100Gb/s Ethernet interface by inverse multiplexing on parallel 10G paths
NWA6	100G Photonic Integration Challenges	Edmond J. Murphy <b>JDSU</b>	Discussion of photonic integration and the role of integrated components and modules for 40G and 100G and beyon.

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OTh1	Carbon Nano-tubes and Graphene Photonics	S. Yamashita, <i>University of Tokyo</i>	
OTh2	Nonlinearity-Preserved Graphene/PVAc Composite in Optical Deposition for Fiber Mode-Locked Lasers	H. Kim, J-H Cho, S-Y Jang, Y-W Song <i>KAIST, UCLA</i>	Efficient optical deposition of graphene onto optical fibers preserving nonlinearity guaranteed by graphene/PVAc composite formation

<b>Code</b>	<b>Title</b>	<b>Author/Affiliation</b>	<b>Topic</b>
OTH13	Passive Mode-Locker Incorporating Physically Exfoliated Graphene for Fiber Ring Lasers	Y. M. Chang, H. Kim, J. H. Lee, Y-W Song <b>Seoul Univ., UCLA, KAIST</b>	Realization of passive mode-locked fiber laser using an intracavity intensity modulating effect in multilayered graphene
OTH14	Fiber Laser Mode Locked by Carbon Nanotubes-N-Methyl-2-Pyrrolidone Solution in Fiber MicroChannel	C. Mou, A. Rozhin, K. Zhou, S. Turistyn <b>Aston Univ., UK</b>	Demonstrated an Erbium-doped picosecond fiber laser mode locked by carbon nanotube in N-methyl-2-pyrrolidone solvent in an in-fiber micro-channel

<b>Code</b>	<b>Title</b>	<b>Author/Affiliation</b>	<b>Topic</b>
OTh13	Phase Noise and Timing Jitter Elimination for Mode-Locked Lasers Based on External Graphene Layers	K. Wu, J. H. Wong, Z. Luo, C. Ouyang, P. Shum, Z. Shen <b>NTU Singapore</b>	Demonstrate a noise eliminator based on external graphene layers for mode-locked lasers



# Trends



- Graphene based Photonics

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