Implementing Testbeds for the Transition to Tbps-800G-400G WANs with OFCnet & SCinet updates

By:

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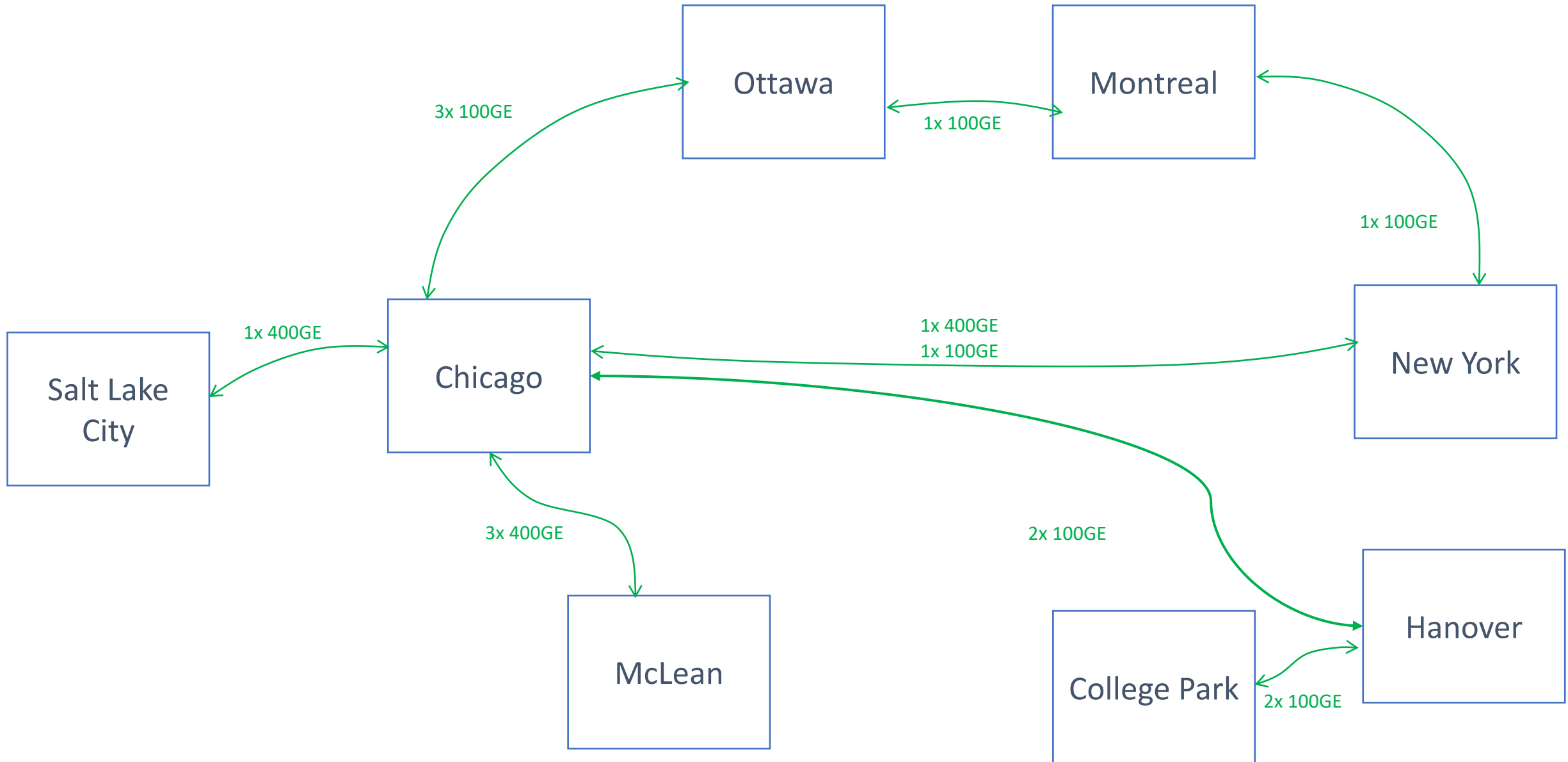
Agenda

CENI Upgrades to 800G

Current CENI Topology (Terabit Ring SC23 NRE)

# Ciena's research-on-demand network topology 2023

The Ciena Fabric node

What is [FABRIC]:

A Terabit core enabled Adaptive Programmable
Research Infrastructure funded by NSF (1935966).

- Designed to accelerate research in network sciences as well as HPC, ML & AI and Cybersecurity.
- Several Key R&E partners already participants of FABRIC, including Internet2 and ESnet.
- FABRIC interconnects with various other Cloud based Research Platforms in R&E.
- Currently in year #4 of Phase 1. Next grant for 4-year phase underway.
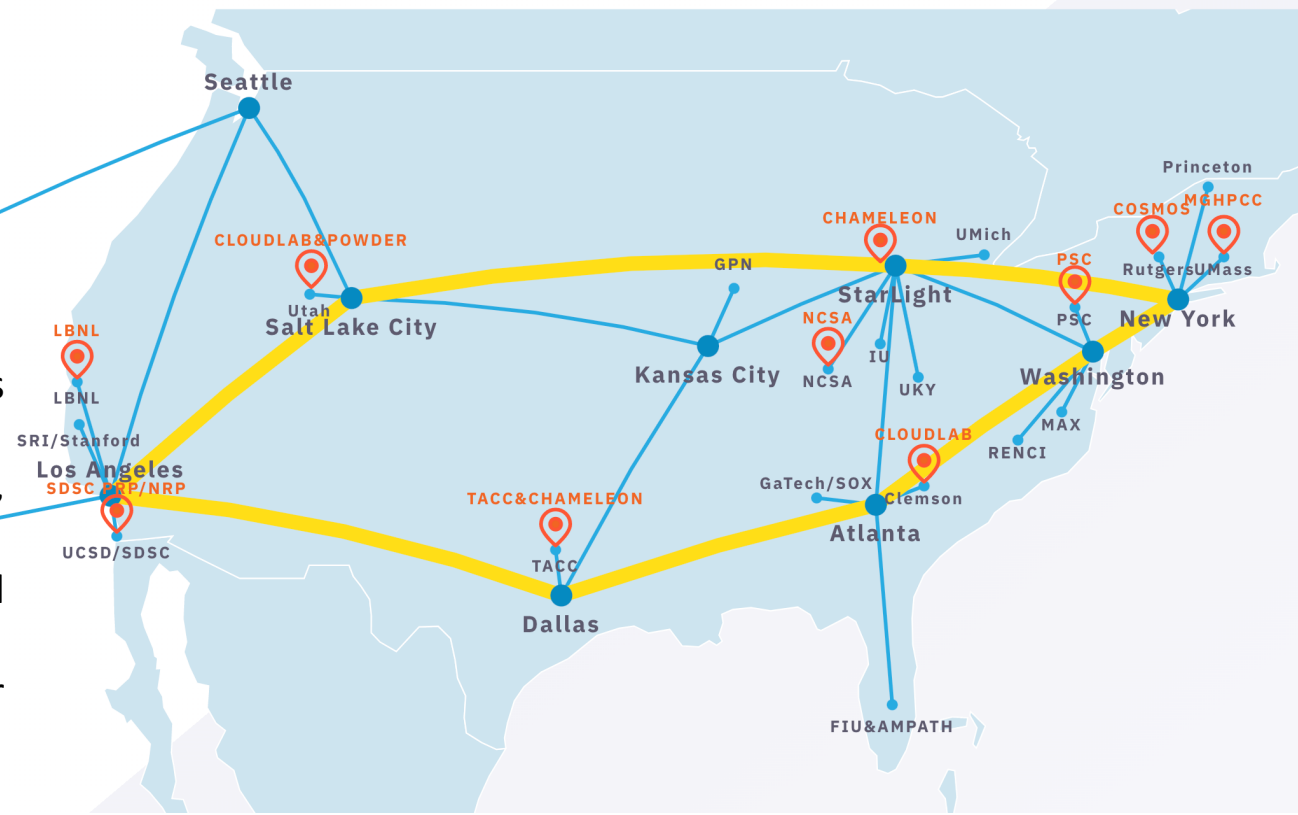
Typical FABRIC nodes consist of several RUs of compute elements, GPUs, FPGAs, Dataplane Switch and central orchestrator.

What Ciena Proposes:

- A Ciena version of a mini-FABRIC node, called *tfNode or traveling Fabric Node*.
- Node will be mobile and this rover FABRIC node will be used for demos, presentations at various events and conferences such as SC, OFC, I2 TechEx etc.
- Node will use Ciena RSP based 811x platform switch as Dataplane switch.
- Node will be complete with worker nodes, GPU elements, FPGA switches, storage etc.

Why Ciena FABRIC tfNode ?

- Cisco NSO and Cisco Routers dominate FABRIC as well as rest of R&E segment.
- Ciena tfNode will break this monopoly and penetrate the R&E Routing market.
- Ciena RSP + Cisco NSO integration will be a reference architecture for future RSP bids for sales.
- With tfNode, Ciena will contribute towards the first 400GE enabled FABRIC node.
- Ciena will also feature a world's interconnection with a single stream 400GE Data Transfer Node with this tfNode.

OFCnet Updates

Marc Lyonnais, OFCnet Chair

OFCnet Mission

- Highlight the Network aspect of OFC
- To Increase the Exhibits value proposition
  - ✔ Allow Current exhibitors to have live demonstrations *outside the CC*
  - ✔ Increase inter booth collaboration
  - ✔ Reduces the barrier of live demonstrations and collaboration
- To draw new attendees from different communities such as
  - ✔ Networking Science (Academia, Research Labs)
  - ✔ High Performance Networking Application Use cases
  - ✔ Emerging technologies, use Exhibits floor as a Science Accelerator
  - ✔ A place where companies (Quantum) get out of their stealth mode
- Bridge the technical and Exhibit program
  - ✔ Opportunity to demonstrate technical papers
  - ✔ Activities that will lead to new publications and Awards
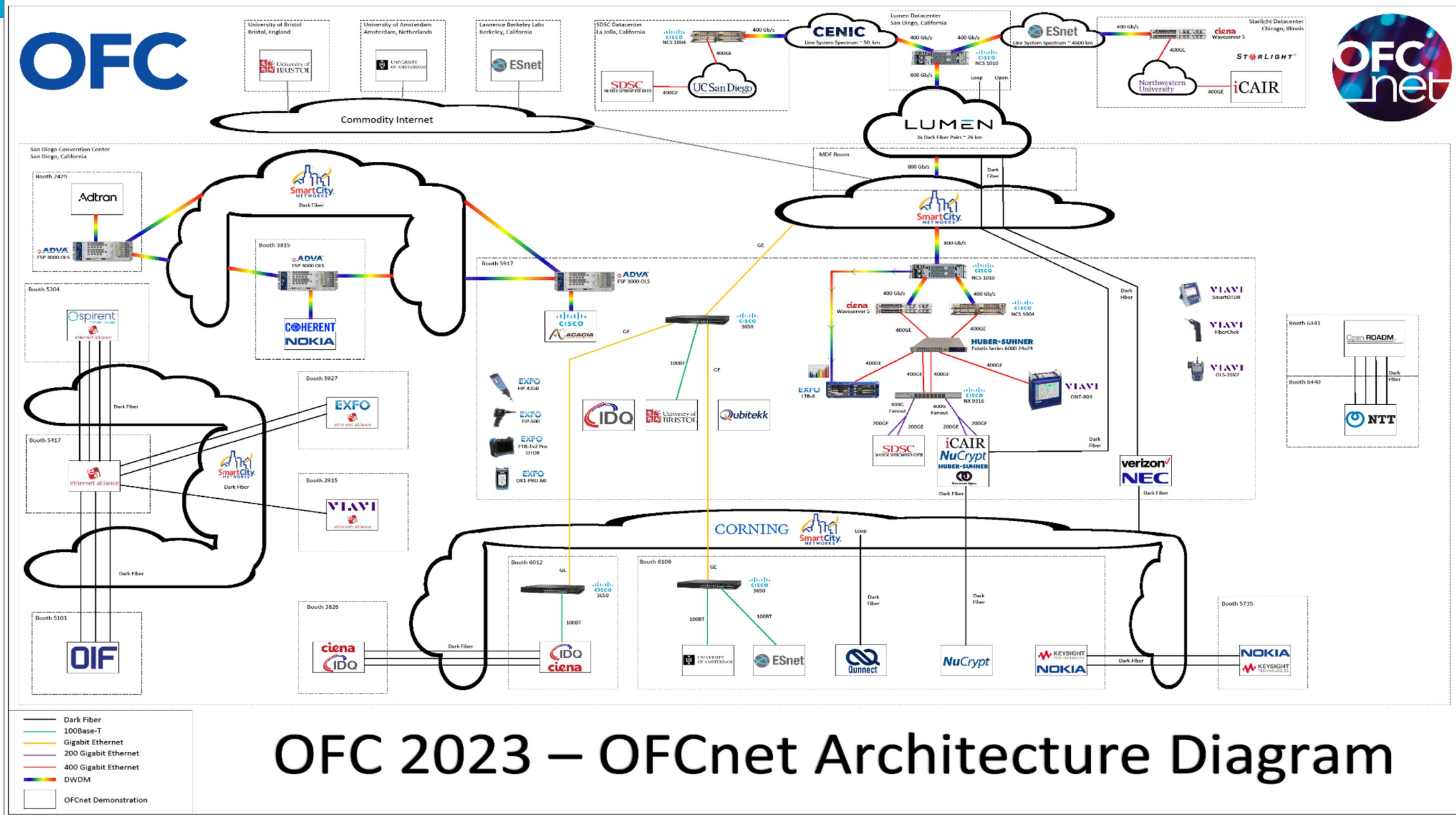
OFC 2023 – OFCnet Architecture Diagram

The 2024 Team Edition

OFCnet
Marc Lyonnais (Chair) Ciena
Jim Stewart (Vice Chair) UETN
Sana Bellamine (Deputy Chair) Will be OFCnet 2025 Chair
Casey Foulds (Program Manager) uTD
Jessica Pagonis Optica Liaison & Biz manager
Randy Giles Optica Scientific Advisor Liaison

Network Architecture
Scott Kohlert (Co-Team Lead) Ciena
Mike Blodgett (Co-Team Lead) ESnet

Logistics
Need one person

OFCnet Workshop, BoF
Cees DeLaat (Team Lead) UVA
Reza Nejabati
Andrew Lord
Gwen Amice (Co-Team Lead), EXFO

Short Course
Gwen Amice (EXFO)

Panel Preparation
Need one

Network Build and Vendor Reachout
Management team +
Tunde Sanda CENIC
Mike Blodgett Esnet
JoAnn Bender Internet 2
Need 2 extra

Demonstrations organization
Carl Williams (co-Team lead) CJW Quantum Consulting
Chris Tracy (co-team Lead) ESnet
Sergey Ten or Peter Wigley (Corning)

Security, Analytics and Measurements:
JP Velders (UVA) (co-Team lead)
Gwenn Amice EXFO
Gauravdeep Shami Ciena (Data Lake project) (co-Team lead)
Danial Ebling (UETN)
Catherine Simondi (IDQ)
Tom Hutton (SDSC)
Need 1-2 extra

Communications and Signage
Jennifer Inglisa (Optica) (Team lead)
Beth Harrington (Optica)
Ashley Collier (Optica)
Colleen Morrison (Optica)
Eve Griliches (Cisco)
Dave Brown (Nokia)
Rodney Wilson (Ciena)

OFCnet 2024 High Level Architecture
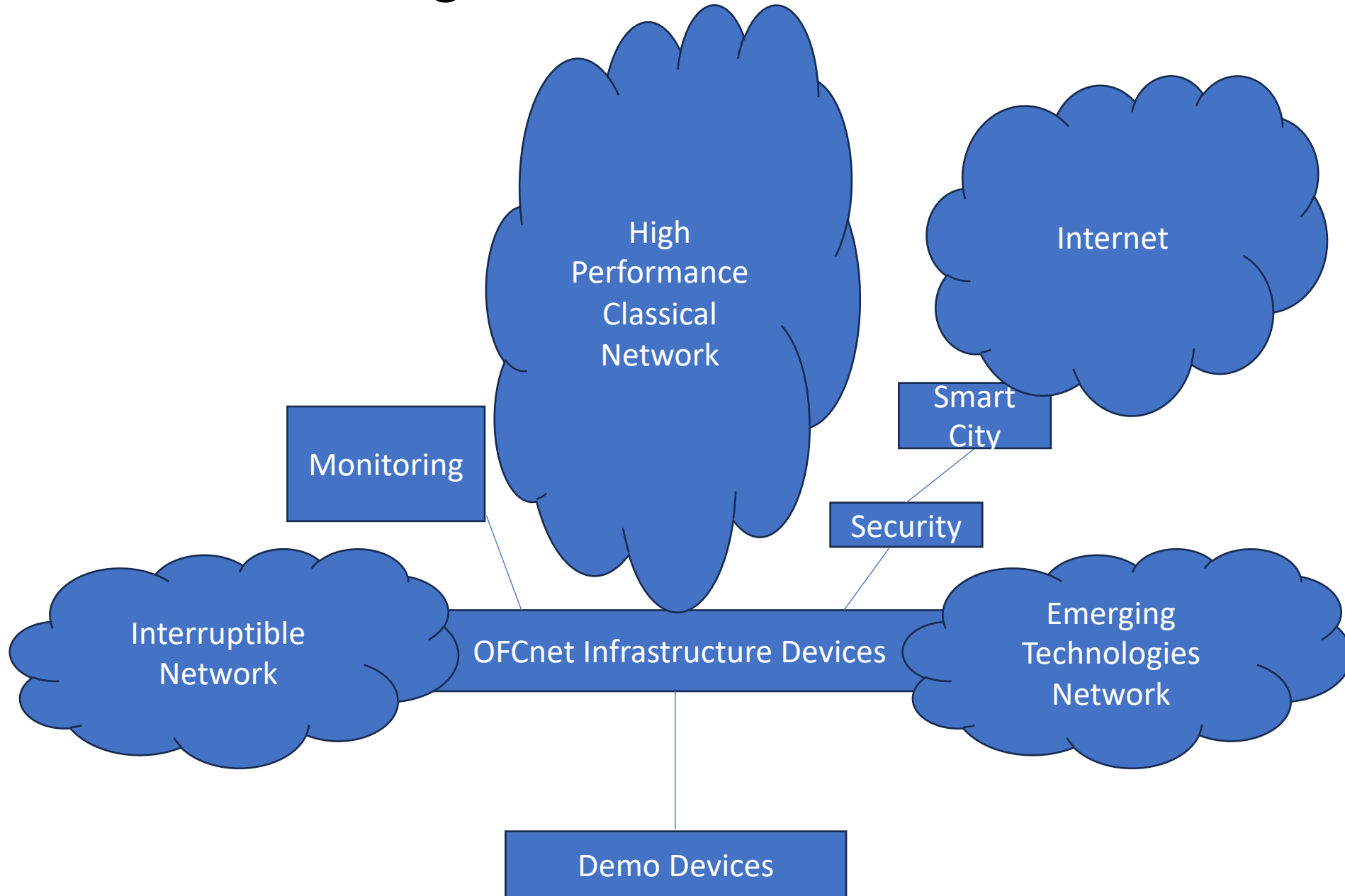
Workshop: How can OFC with a real-life Test-Bed accelerate innovation in the Design and Operation of the Next Generations Optical Photonic Networks?

Co-chairs: Cees de Laat, Reza Nejabati, Andrew Lord, Gwen Amice

The two- and half-hour workshop will open with a 10-minute presentation on the features and demonstrations that comprise OFCnet24. (ML) Then two one-hour sessions in which:

1. In a Panel Discussion Approach present and discuss lessons learned from technology demonstrations presented in OFCnet23. Speakers will be invited from those OFCnet23 demonstrators. (CdL, RN)
2. And in a Modified Rump Session approach to engage with industry and academic research labs regarding emerging technologies, research and innovation prototyping to be demonstrated at current and future OFCnet's. Speakers will be drawn from contributors at the OFCnet23 Birds of a Feather session and the present audience. (AL, GA)

The workshop will conclude with a 20-minute general discussion with the audience on technology directions that may define the architecture and portfolio of future OFCnet's and additional activities as tutorials, challenges etc. (all)

Shortcourse: Practical Fiber Optic network testing hands-on short course in a realistic network environment

Co-chairs: Gwenn Amice, Christine Tremblay (ETS)?

The course's primary focus is hands-on learning, ensuring participants gain practical expertise with access to the OFCNET network.

Topics covered include an introduction to fiber optics, transmission tolerances (loss, ORL, OSNR, CD, PMD), optical fiber testing equipment, and the critical concept of Optical Time-Domain Reflectometers (OTDRs). Participants learn not only the theory but also how to operate an OTDR effectively and interpret OTDR traces, identifying issues like splices, connectors, and macrobends.

Furthermore, the course explores chromatic dispersion, polarization mode dispersion, fiber optic connector maintenance, and troubleshooting techniques for common network problems. The unique opportunity to access the OFCNET network at OFC 2024 enhances the interactive nature of the course, enabling participants to develop the skills needed to characterize and troubleshoot fiber optic networks with confidence in real-world scenarios.

Deadline for submission: October 12, 2023

Submission includes 3 documents

- Extended abstract
- Network power and needs document
- Network Diagram

Network needs document requests:

1. Power: AC 110V or 208V; expected power consumption in Watts
2. Fiber: number of pairs needed within the convention center; **Is a dedicated fiber pair** required for external connectivity; **if external connectivity** is shared – expected bandwidth required and location of external source (city, state, country of origin if outside the convention center);
3. Type of fiber connectors required or preferred (clearly designate if required)
4. Space: Number of rack units required and additional space required in the OFCnet primary control room
5. Requested manufacturer loaned equipment required for the demonstration. Please include model *and* alternate models that may work.

Notification

- **Initial acceptance**: October 24, 2023;
- **Final acceptance pending confirmation of donated equipment** availability November 10, 2023;
- **Final full acceptance** December 8, 2023.

SCinet updates

On behalf of Brenna Meade

SC23 Research Team

Research Director: Scott Kohlert, Ciena

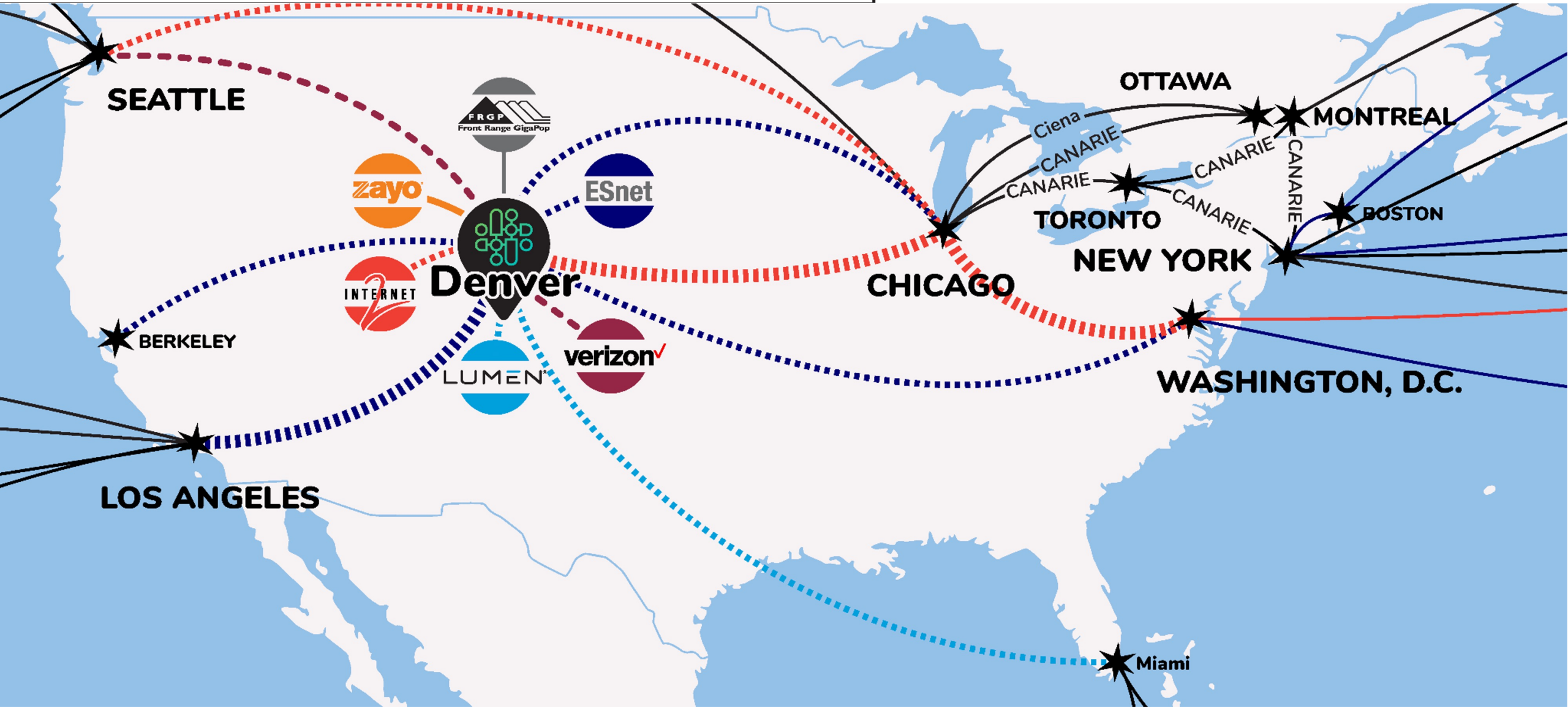NRE / XNET Co Lead: Debbie Fligor, University of Illinois, Champagne

NRE / XNET Co Lead: Brenna Meade, Indiana University

Deputy Lead: Andrew Lee, Indiana University

Demonstration	POC Name	Title
NRE-001	Joe Mambretti	1.2 Tbps Services WAN Services: Architecture, Technology and Control Systems
NRE-002	Joe Mambretti	400 Gbps E2E WAN Services: Architecture, Technology and Control Systems
NRE-003	Brenna Meade	AP-REX 2.0 Prototype Demonstration
NRE-004	Joe Mambretti	Global Research Platform (GRP)
NRE-005	Edoardo Martelli	LHC Networking And NOTED
NRE-006	Joe Mambretti	Packet Marking and Flow Labeling for Networked Scientific Workflows
NRE-007	Joe Mambretti	Software Defined Exchange (SDX) Multi-Services for Petascale Science
NRE-008	Paul Ruth	FABRIC-Chameleon Testbed Integration
NRE-009	Qiao Xiang	Fully-Automated Network Configuration Management for Large-Scale Science Networks
NRE-010	Se-young Yu	Multi-site data streaming orchestration with SciStream
NRE-011	Jim Chen	StarLight DTN-as-a-Service and SciTag Network Analytics Prototype for High-Performance Data Transport with Research Platforms
NRE-012	Jim Chen	High Performance Network Entropy Platform Prototype for Research Platforms Using International P4 Experimental Networks
NRE-013	Harvey Newman	The Global Network Advancement Group: A Next Generation System for Data Intensive Sciences
NRE-014	Tom Lehman	AutoGOLE/SENSE: End-to-End Network Services and Workflow Integration
NRE-015	Tom Lehman	SENSE and Rucio/FTS/XRootD Interoperation
NRE-016	Tom Lehman	FABRIC
NRE-017	Linden Mercer	Resilient Distributed Processing and Reconfigurable Networks
NRE-018	Mario Cromaz	Distributed Experimental Pipelines over WAN for Online Data Analysis
NRE-019	Jeronimo Bezerra	AmLight 2.0: Flexible control, deep visibility, and programmability @ Tbps!
NRE-020	Marcos Schwarz	Global P4 Lab
NRE-021	Y. Richard Yang	ALTO-TCN: Application-Defined Network Control for Data Intensive Sciences Through Deep Network Visibility
NRE-022	Mariam Kiran	5G on the Showfloor
NRE-023	Mariam Kiran	Quantum Networks a Reality
NRE-024	Alex S. Moura	Exploring FDT, QUIC, BBRv2 and HTTP/3 protocols in High Latency WAN paths for use on Data Transfer Nodes
NRE-025	Nolan Yoo	Point Cloud Animation-Streaming Playback Engine
NRE-026	Neil McKee	Standard Packet Drop Monitoring In High Performance Networks
NRE-027	Edmund Yeh	N-DISE: NDN for Data Intensive Science Experiments
NRE-028	Katsuhiro Sebayashi	Uncompressed 8K video processing using SRv6-based service function chaining between Japan and U.S.
NRE-029	Susumu Date	Performance Evaluation of DTNs Towards Research-EnhanceD ONION (RED ONION)
NRE-030	Kohei Ichikawa	Distributed Machine Learning over Heterogeneous Edge Computing Resources
NRE-031	Yoshiyuki Kido	Long-Distance Streaming for SBC MD System
NRE-032	Magnos Martinello	PolKA routing approach to support traffic engineering for data-intensive science

SC23 NRE Submissions

SCinet Research Theater

- 20 minute time slots
  - 15 min for presentation, 5 for questions and turnover
- NRE participants - 28 slots designated various times
- INDIS - Tuesday Nov. 14 14:00 - 18:00

Sign up schedule will be publicly available by Oct. 11

WINS : Women in IT Networking at SC

WINS fully funds 5-7 women per year to attended SC and work on the SCinet network. WINS strives to have a diverse set of applicants, to date having received 209 applications from 43 states with awardees coming from 21 states representing Higher Education and Community Colleges, Tribal K-12 school systems, Minority Serving Institutions (MSIs), DOE National Labs, Research and Education Networks (RENs), and for-profit organizations.

- 6 new participants, 1 deferred from SC23
- 2008 - 8% of SCinet were women
- 2023 - 39% of SCinet are women, 18% being WINS awardees

Applications for WINS are out Dec. 4, 2023 https://women-in-networking.net/