Introduction to the StarLight International/National Communications Exchange Facility

Joe Mambretti, Director, (j-mambretti@northwestern.edu)
International Center for Advanced Internet Research (www.icair.org)
Northwestern University
Director, Metropolitan Research and Education Network (www.mren.org)
Co-Director, StarLight, PI-iGENI, PI-OMNI-Net (www.startap.net/starlight)

Hong Kong Workshop on Next Generation Open Communication Exchanges for Science Research
University of Hong Kong

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StarLight International/National Communications Exchange Facility

Abbott Hall, Northwestern University’s Chicago Campus
StarLight – “By Researchers For Researchers”

StarLight Is An Advanced Communication Exchange Facility And Prototyping Platform Built On An Optical infrastructure Optimized for High-Performance Applications World’s Highest Capacity Exchange First Facility Enabling Interoperability At L1, L2, L3 Currently Implementing A Multi-100 Gbps Exchange

View from StarLight

Abbott Hall, Northwestern University’s Chicago Campus
StarLight Infrastructure

StarLight is a large research-friendly co-location facility with space, power and fiber that is being made available to university and national/international network collaborators as a point of presence in Chicago.
The StarLight Facility Supports Many Different Private Networks

- International R&E Networks
- National R&E Production Networks
- National R&E Testbed Networks
- Other R&E National / Regional/ Local Production Networks
- State R&E Networks
- Commercial Networks
- Prototypes
- Experimental Networks
• An Advanced Network for Advanced Applications
• Designed in 1993; Initial Production in 1994, Managed at L2 & L3
• Created by Consortium of Research Organizations -- over 20
• Partner to STAR TAP/StarLight, I-WIRE, NGI and R&E Net Initiatives, Grid and Globus Initiatives etc.
• Model for Next Generation Internets
• Developed World’s First GigaPOP
• Next – the “Optical MREN”
• Soon - Optical ‘TeraPOP’ Services
iCAIR: Founding Partner of the Global Lambda Integrated Facility
Available Advanced Network Resources

GLIF is a consortium of institutions, organizations, consortia and country National Research & Education Networks who voluntarily share optical networking resources and expertise to develop the Global LambdaGrid for the advancement of scientific collaboration and discovery.

Visualization courtesy of Bob Patterson, NCSA; data compilation by Maxine Brown, UIC.

www.glif.is
StarLight As GLIF Open Lambda Exchange (GOLE)
TransLight/StarLight Collaborates with All IRNC/GLIF Initiatives

Connect to TransLight/PacificWave in Seattle via TransLight (Cisco Research Wave deployed on NLR)

With US HEP/LHC researchers, do trials to move multi-gigabit traffic between CERN and Brazil (Geneva to Amsterdam; via LHCnet to Chicago; via CAVEwave to DC; via AtlanticWave to Miami; via AmLight-East to Brazil)

Provide GLORIAD via StarLight with services to support multi-gigabit US traffic to partners in Russia, Netherlands, Nordic countries, Asia

Connect to TransLight/PacificWave in Seattle via TransLight (Cisco Research Wave deployed on NLR)
CA*net4 has 10x10Gb and Equipment at StarLight

Source: CANARIE
SURFnet6 National Optical R&E Network

- High Performance Optical Switching
- Numerous 10 Gbit/s Lightpaths
- Dynamic Provisioning
- 500,000 Users
- 84 Institutes
GLORIAD-Taj Expansion

The new Taj expansion is highlighted in orange on this map.

Global Ring Network for Advanced Applications Development
TransLight/Pacific Wave
10GE Wave Facilitates US West Coast Connectivity

Developing a distributed exchange facility on the US West Coast (currently Seattle, Sunnyvale and Los Angeles) to interconnect international and US research and education networks

www.pacificwave.net/participants/irnc/
KREONet2, KRLight

High-Performance S&T Facilities
(High-Performance Cluster/Supercomputers, Storage, Experimental Facilities, Visualization, Access Grid, DB Servers, etc.)

Source: Kreonet
UKLight via IRNC at StarLight

Source: Peter Clarke, David Salmon, UKLight
WHREN - LILA Proposal

- Joint response by FIU and CENIC to NSF IRNC solicitation
- 2.5Gbps persistent high-performance research network for South America to support U.S. and international science and engineering research and education communities
- Collaboration with research network operators and exchanges in the Americas
- Phased implementation over 5 years

Source: AMPATH
America’s Lightpaths (AmLight)
DOE’s UltraScience Net is at StarLight

A Circuit-Switched Testbed for DOE’s Next-Gen Network
LHCnet 2008
BIRN Collaboratory today: Enabling collaborative research at 28 research institutions comprised of 37 research groups.
NASA’s NISN is at StarLight

- **NGIX West**: New Generation IP Connections to West Coast Regional networks, Tier 1 ISP networks, the PacRim, Japan, and Australia.

- **MAE West**: Most Important IP Connections to West Coast Regional networks, Tier 1 ISP networks, the PacRim, Japan, and Australia.

- **Commercial Ameritech NAP Starlight**: Most Important Connections to Mid-West & SouthEast Regional networks, Tier 1 ISP networks.

- **NGIX East**: New Generation IP Connections to East Coast Regional networks, Tier 1 ISP networks, and Europe.

- **MAE East**: Most Important Connections to East Coast Regional networks, Tier 1 ISP networks, and Europe.

Source: NASA
DREN Network Is At StarLight
UltraLight Network: PHASE III

• Move into production
• Optical switching fully enabled amongst primary sites
• Integrated international infrastructure

Source: UltraLight Network
Distributed US Atlas Computing Network
Fenius GLIF
Demonstrations
Global Lambda Grid Workshop
SC10
HK GLIF Technical Workshop
StarWave: A Multi-100 Gbps Facility

- StarWave, A New Advanced Multi-100 Gbps Facility and Services Will Be Implemented Within the StarLight International/National Communications Exchange Facility
- StarWave Is Being Funded To Provide Services To Support Large Scale Data Intensive Science Research Initiatives
- Facilities Components Will Include:
  - An ITU G. 709 v3 Standards Based Optical Switch for WAN Services, Supporting Multiple 100 G Connections
  - An IEEE 802.3ba Standards Based Client Side Switch, Supporting Multiple 100 G Connections, Multiple 10 G Connections
  - Multiple Other Components (e.g., Optical Fiber Interfaces, Measurement Servers, Test Servers)
iGENI: The International GENI

- The iGENI Initiative Will Design, Develop, Implement, and Operate a Major New National and International Distributed Infrastructure.
- iGENI Will Place the “G” in GENI Making GENI Truly Global.
- iGENI Will Be a Unique Distributed Infrastructure Supporting Research and Development for Next-Generation Network Communication Services and Technologies.
- This Infrastructure Will Be Integrated With Current and Planned GENI Resources, and Operated for Use by GENI Researchers Conducting Experiments that Involve Multiple Aggregates At Multiple Sites.
- iGENI Infrastructure Will Connect Its Resources With Current GENI National Backbone Transport Resources, With Current and Planned GENI Regional Transport Resources, and With International Research Networks and Projects,
IRNC TL/SL Deliverables

• Continue Enabling Multi-National Application and Middleware Experiments Through Innovative Services and Technologies On International Networks:
  – High-Performance Digital Media Network (HPDMnet)
  – iGENI: the GENI-funded international GENI project* ###
  – SAGE: connecting people and their data at high-res*
  – CineGrid: it’s all about visual communications
  – GreenLight International: less watts/terabyte*
  – Science Cloud Communication Services Network (SCCSnet)*: the impending disruption

• Build Cooperative National and International Partnerships*
• Provide New Services, Including Many with Industrial Partners
• Capitalize On Other Emerging Opportunities*

### Now, In Part, A CISE/OCI Partnership!!

*Currently also funded by various NSF awards to UCSD/UIC/NU
www.startap.net/starlight

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