

StarLight Networking Initiatives

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Chicago's StarLight

StarLight is a Huge 1 Gigabit and 10 Gigabit Ethernet Exchange for United States National and International Research and Education networks



STARLIGHTSM

StarLight Facility-Connected US and International Networks

US National

- Abilene
- ESnet (DOE)
- “UltraNet”(DOE)
- DREN (DOD)
- NREN (NASA)
- NISN (NASA)
- vBNS+ (coming)
- USGS (coming)
- DTFnet
- NLR
- USAwaves (coming)

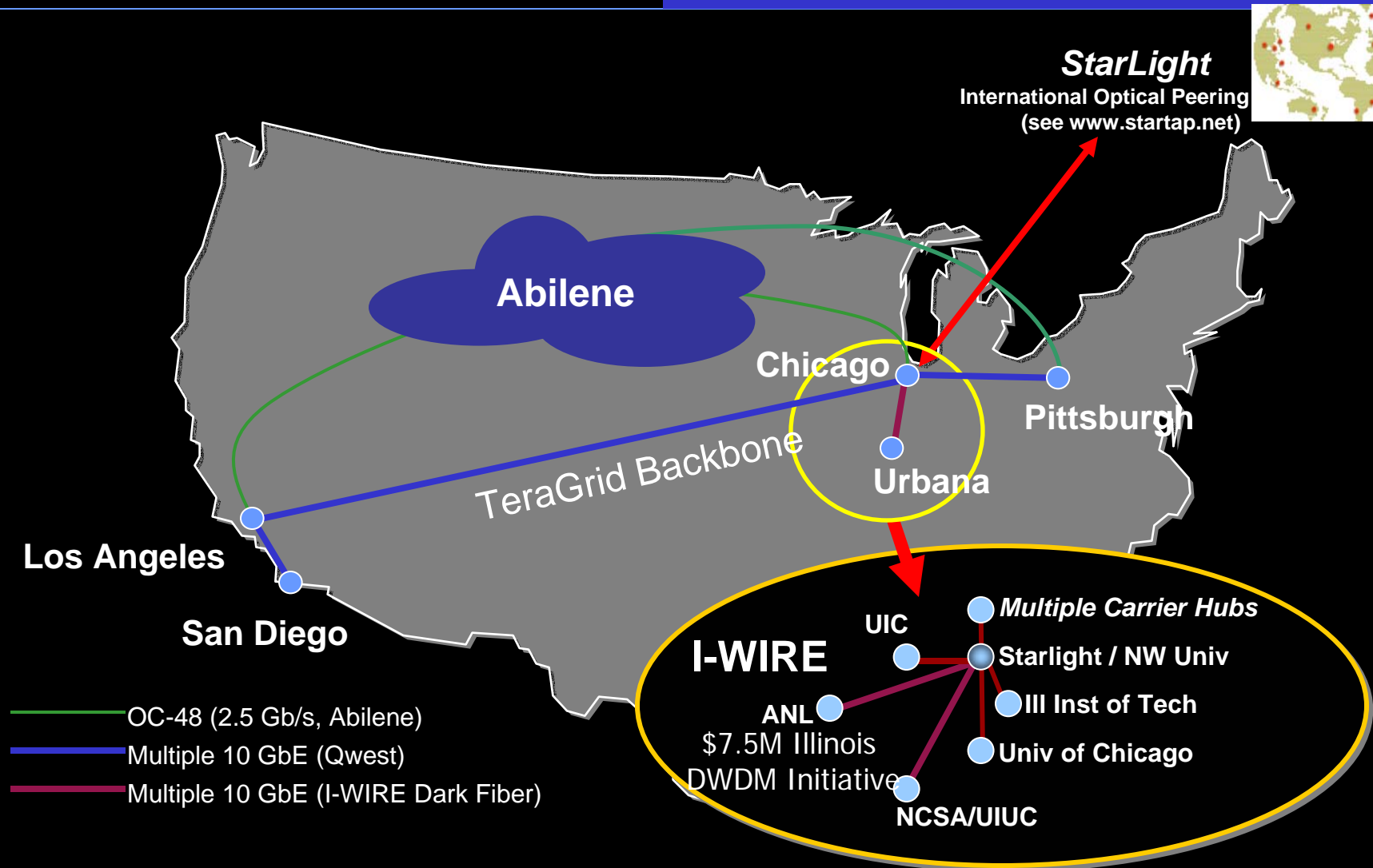
US Metro/Regional

- OMNInet
- MREN (Midwest)
- I-WIRE
- I-Light

- AMPATH (South America)
- ASnet (Taiwan)
- BELnet (Belgium)
- CA*net4 (Canada)
- CERN/DataTAG
- CERNET (China)
- GÉANT/Euro-Link (Europe)
- GEMnet (Japan)
- HARNET (Hong Kong)
- HEAnet (Ireland)
- KOREN/KREONet2 (Korea)
- NaukaNET/GLORIAD (Russia)
- RENATER2 (France)
- SURFnet (Netherlands)
- TaiwanLight (Taiwan)
- TAnet2 (Taiwan)
- TransPAC/APAN (Asia)
- UKLight (UK) (coming)

**Plus Abilene and CA*net4 International Transit Networks
Plus European transit via SURFnet/NetherLight**

TeraGrid has 10x10Gb over I-WIRE and Equipment at StarLight



Source: Dan Reed

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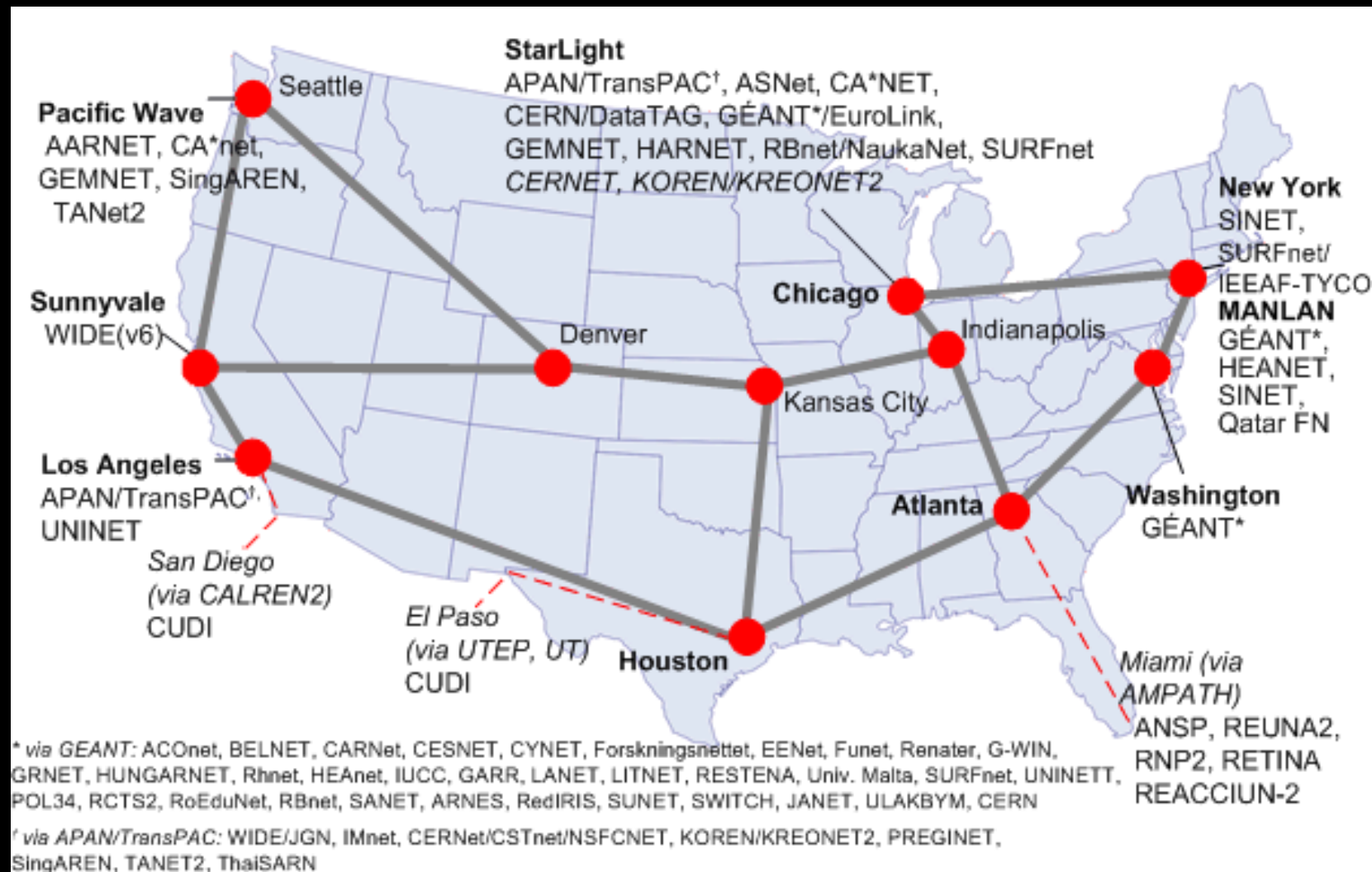
The Crisis Response Room of the Future Needs More than Static Images



SuperHD Streaming TV -- Virtual Reality -- 100 Megapixel Displays

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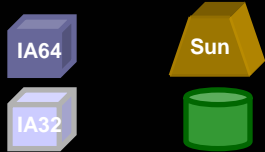
Abilene Peers with Many Internationals at StarLight



NSF Extensible TeraGrid Facility (ETF) at StarLight

Caltech: Data collection analysis

0.4 TF IA-64
IA32 Datawulf
80 TB Storage

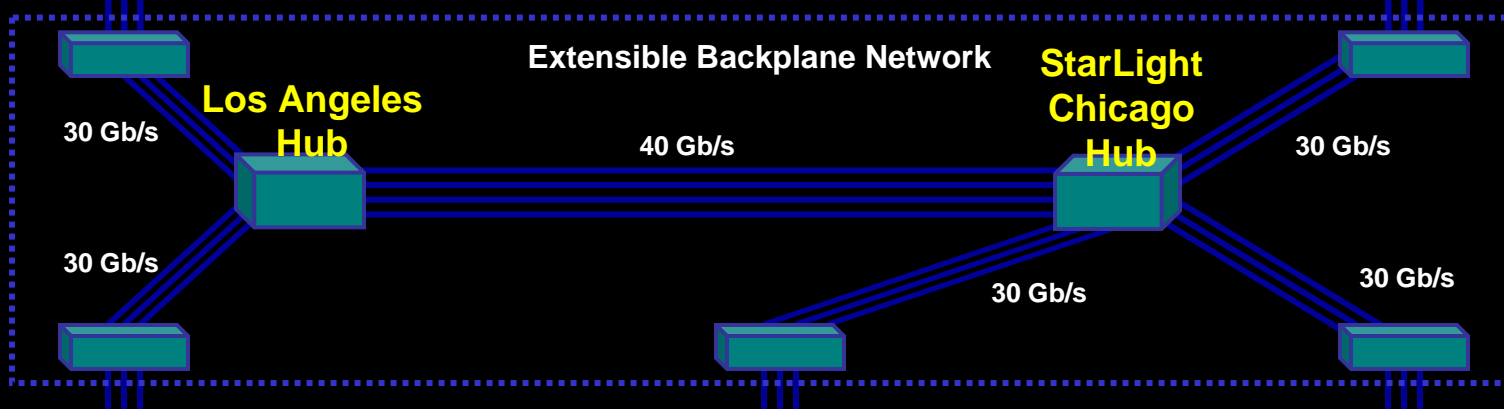
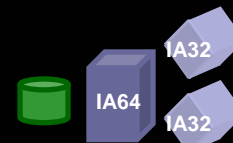


LEGEND

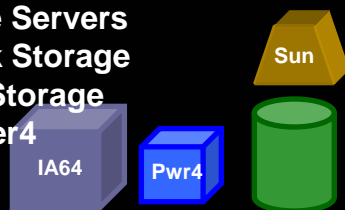


ANL: Visualization

1.25 TF IA-64
96 Viz nodes
20 TB Storage

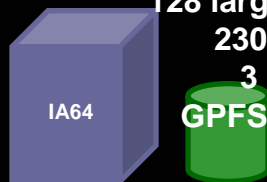


4 TF IA-64
DB2, Oracle Servers
500 TB Disk Storage
6 PB Tape Storage
1.1 TF Power4



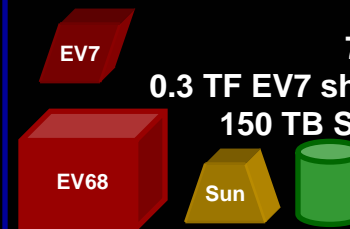
SDSC: Data Intensive

10 TF IA-64
128 large memory nodes
230 TB Disk Storage
3 PB Tape Storage
GPFS and data mining



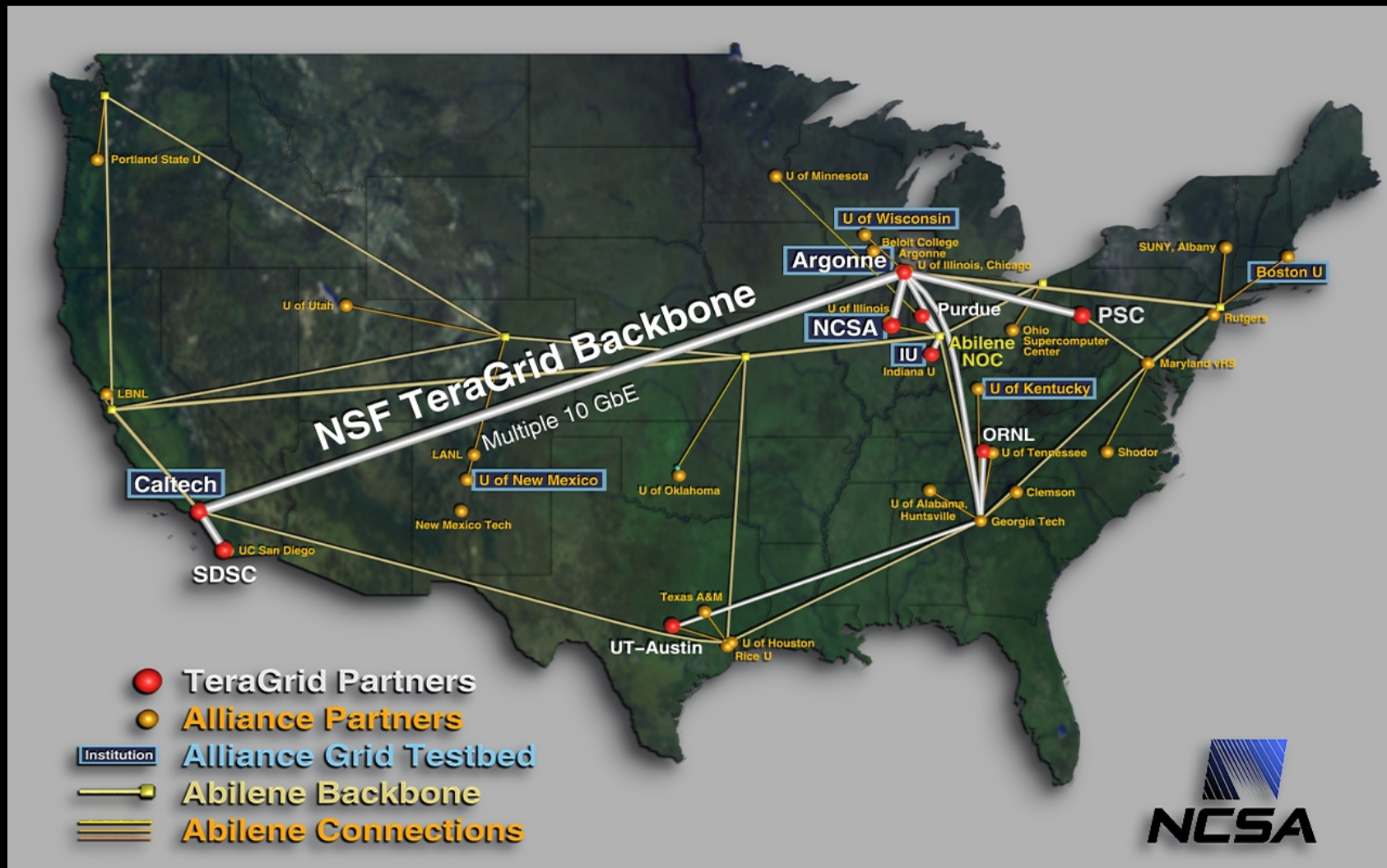
NCSA: Compute Intensive

6 TF EV68
71 TB Storage
0.3 TF EV7 shared-memory
150 TB Storage Server



PSC: Compute Intensive

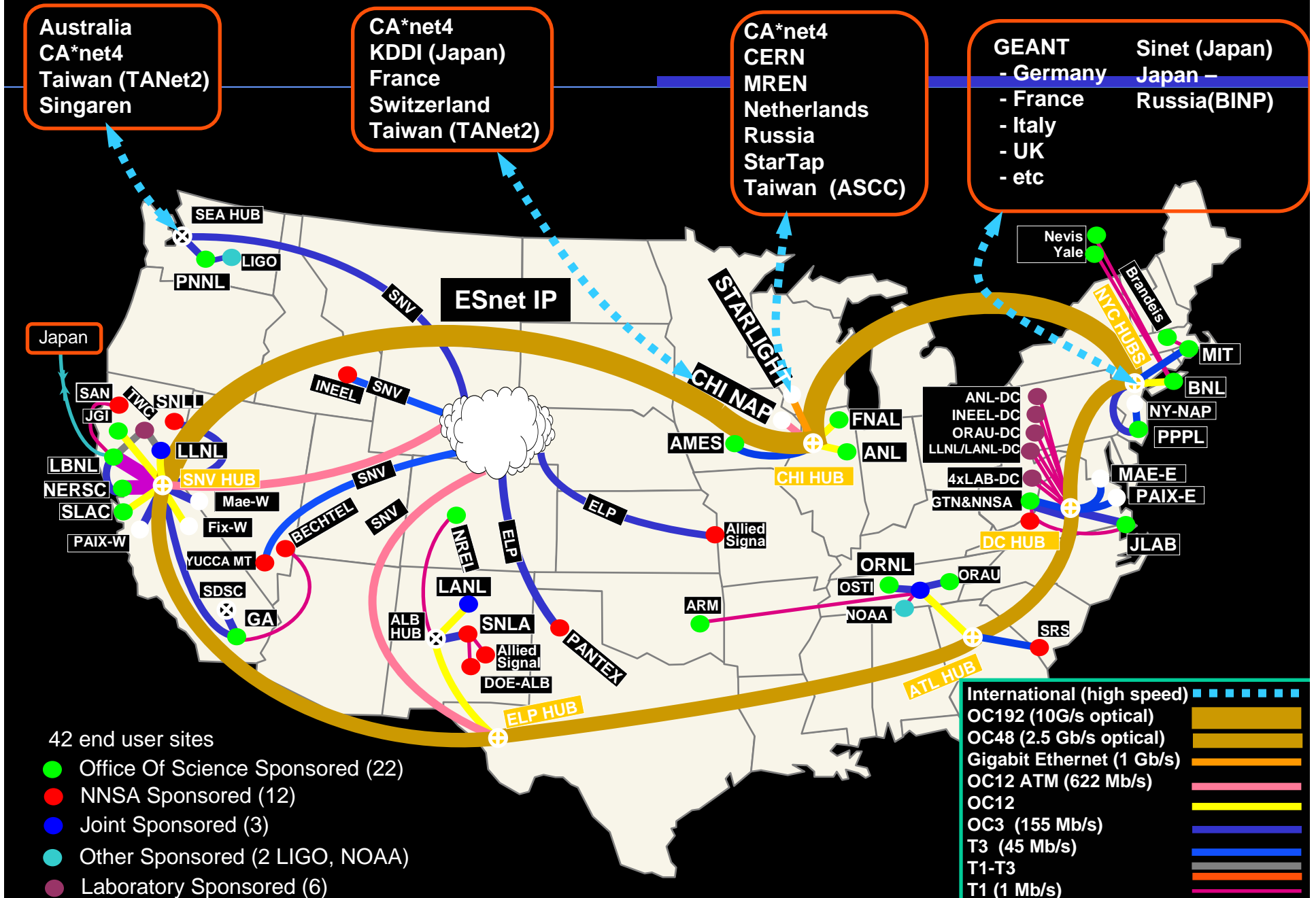
New Phase of ETF Connected via StarLight



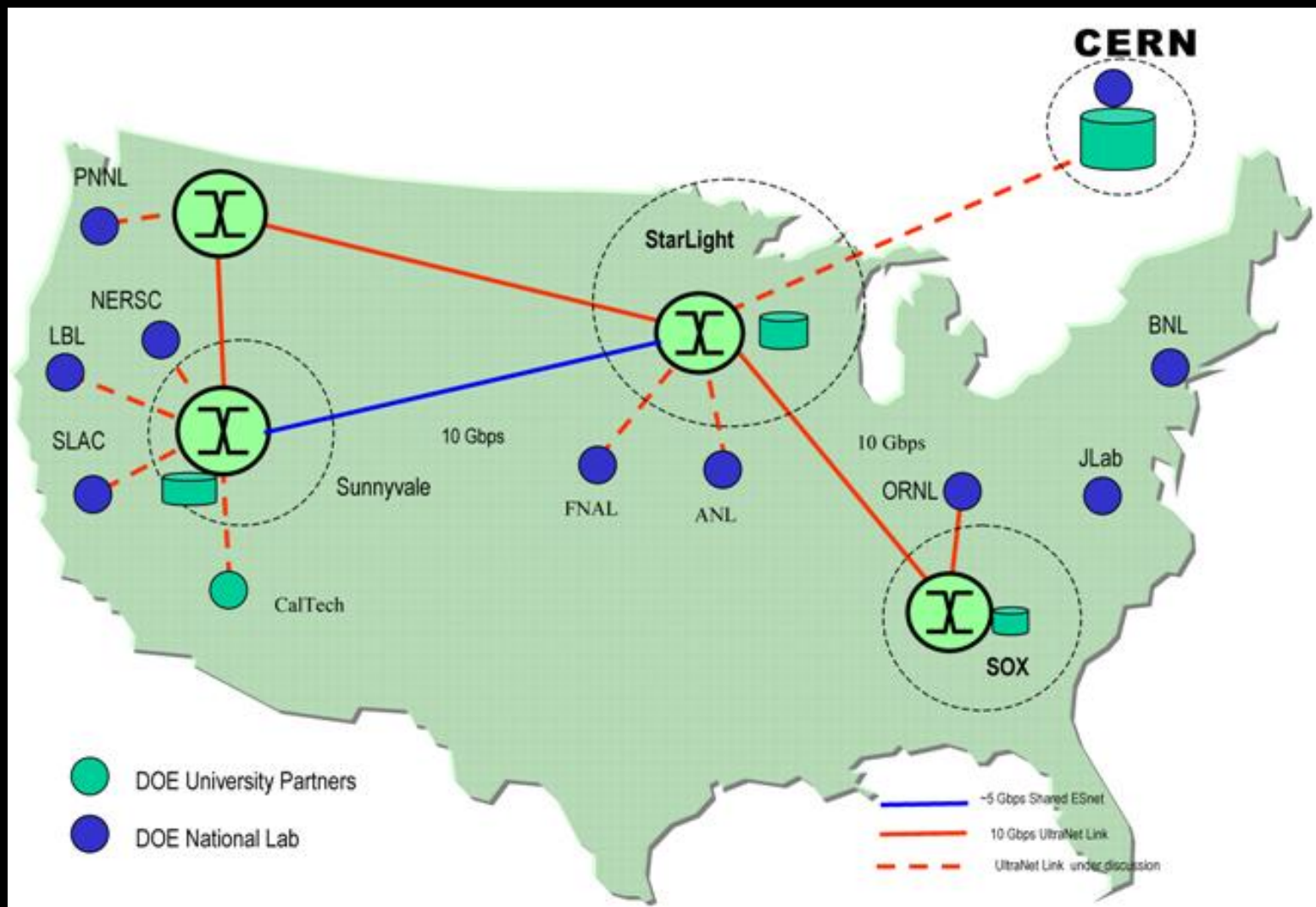
www.teragrid.org

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DOE's ESnet Connects Facilities and Collaborators at StarLight



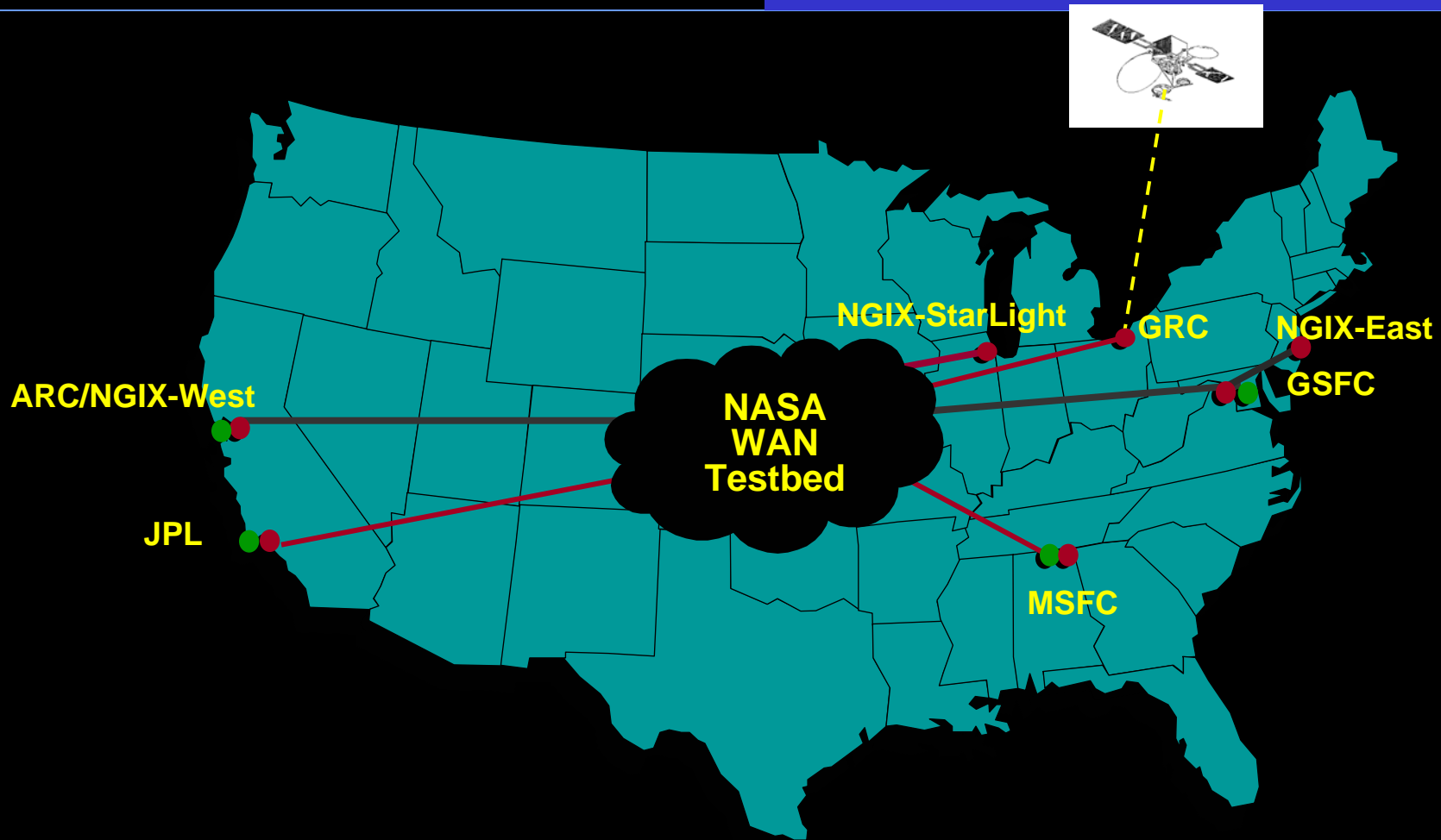
DOE UltraScience Net is coming to StarLight



<http://www.csm.ornl.gov/ultranet/topology.html>

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NASA's NREN Network Testbed comes to StarLight



NPN Sites ●

NREN Sites ●

Hybrid Ground Station (35 Mbps)

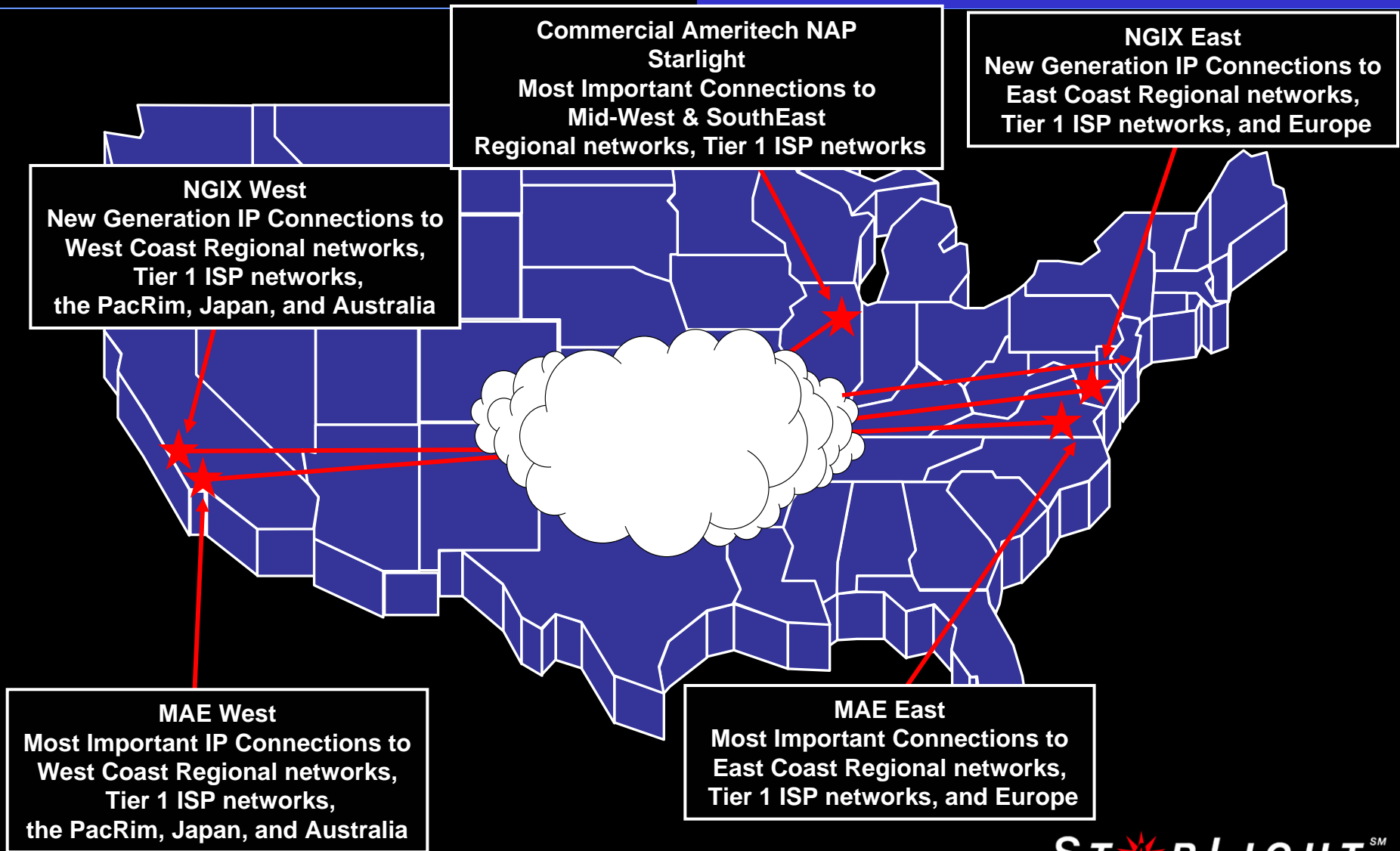
OC-3 ATM —

OC-12ATM —

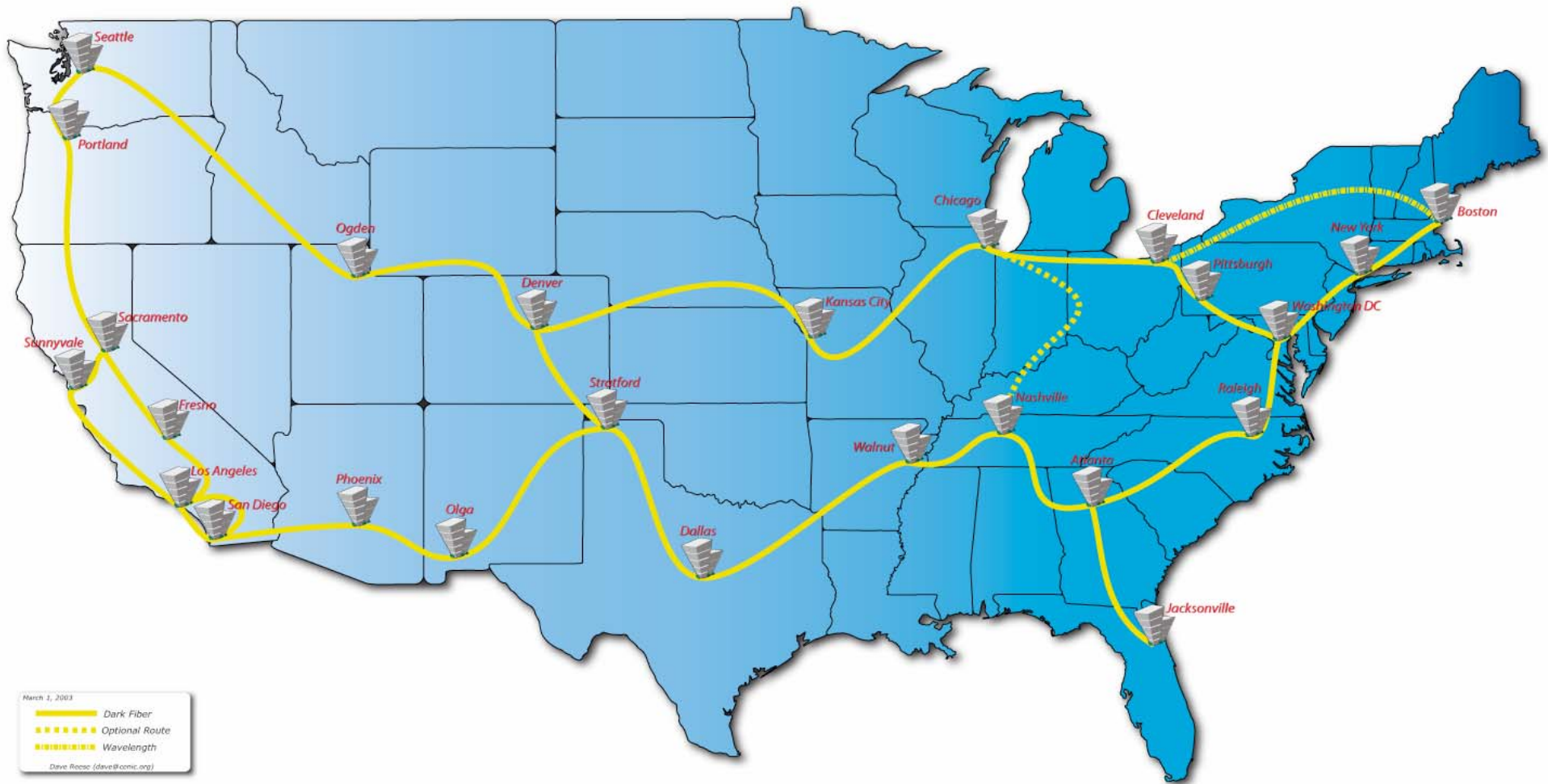
NASA WAN Testbed:

- NASA Research and Education Network (NREN)
- NASA Prototyping Network (NPN)

NASA's NISN is at StarLight



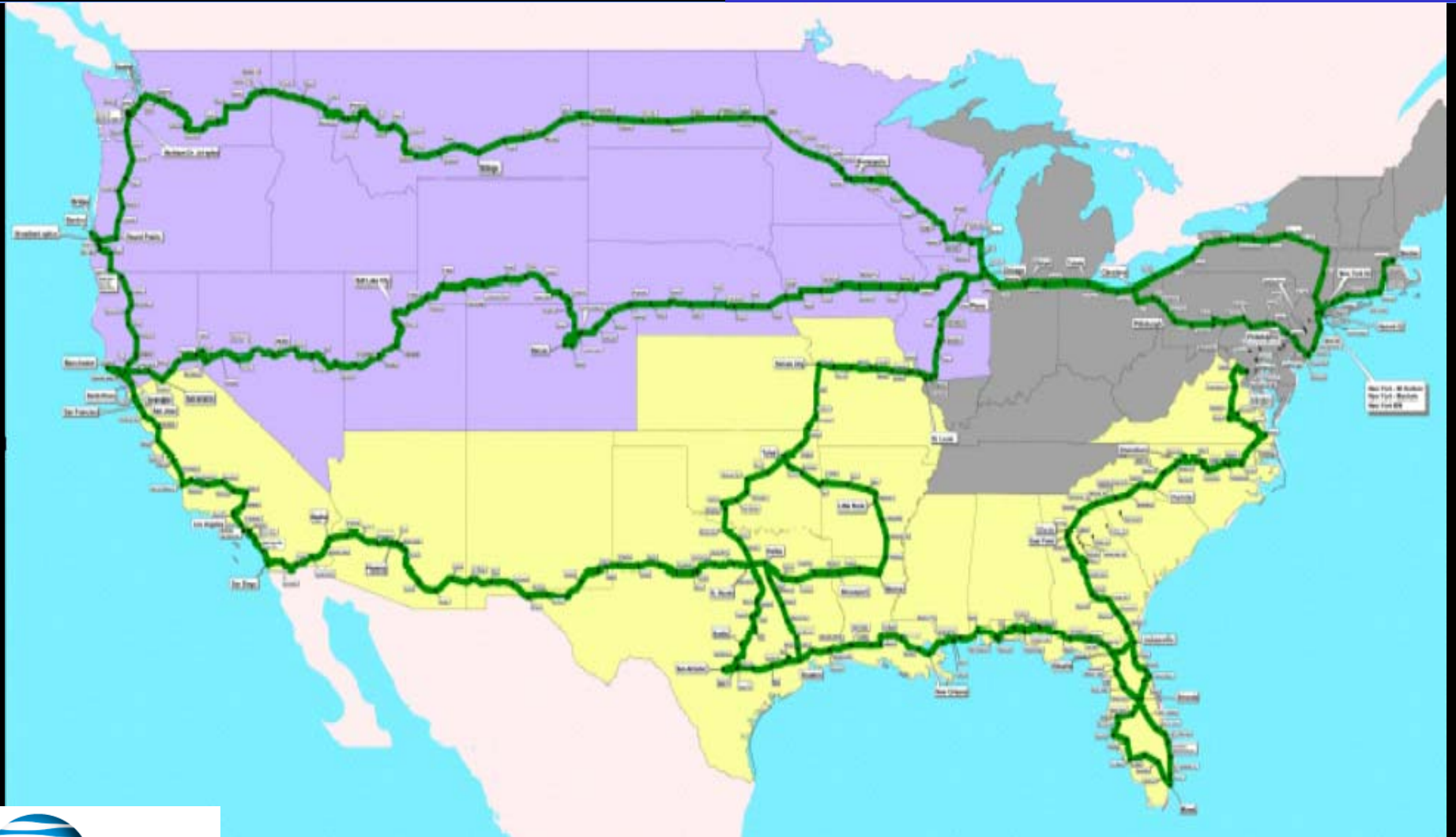
The First Link of the National Lambda Rail: StarLight \Leftrightarrow PSC for ETF



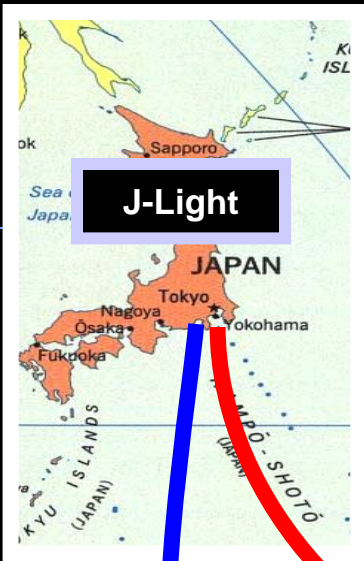
Source: John Silvester, Dave Reese, Tom West, CENIC

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USAWaves Over AT&T's Next Generation Network Will Come to StarLight



International GLIF Lambdas



European lambdas to US

- 10Gb Amsterdam—Chicago
- 10Gb London—Chicago
- 10Gb CERN — Chicago

Canadian lambdas to US

- 10Gb Chicago-Canada-NYC
- 10Gb Chicago-Canada-Seattle

US lambda to Europe

- 5Gb Chicago—Amsterdam

US/Japan lambda

- 2.5Gb Chicago—Tokyo

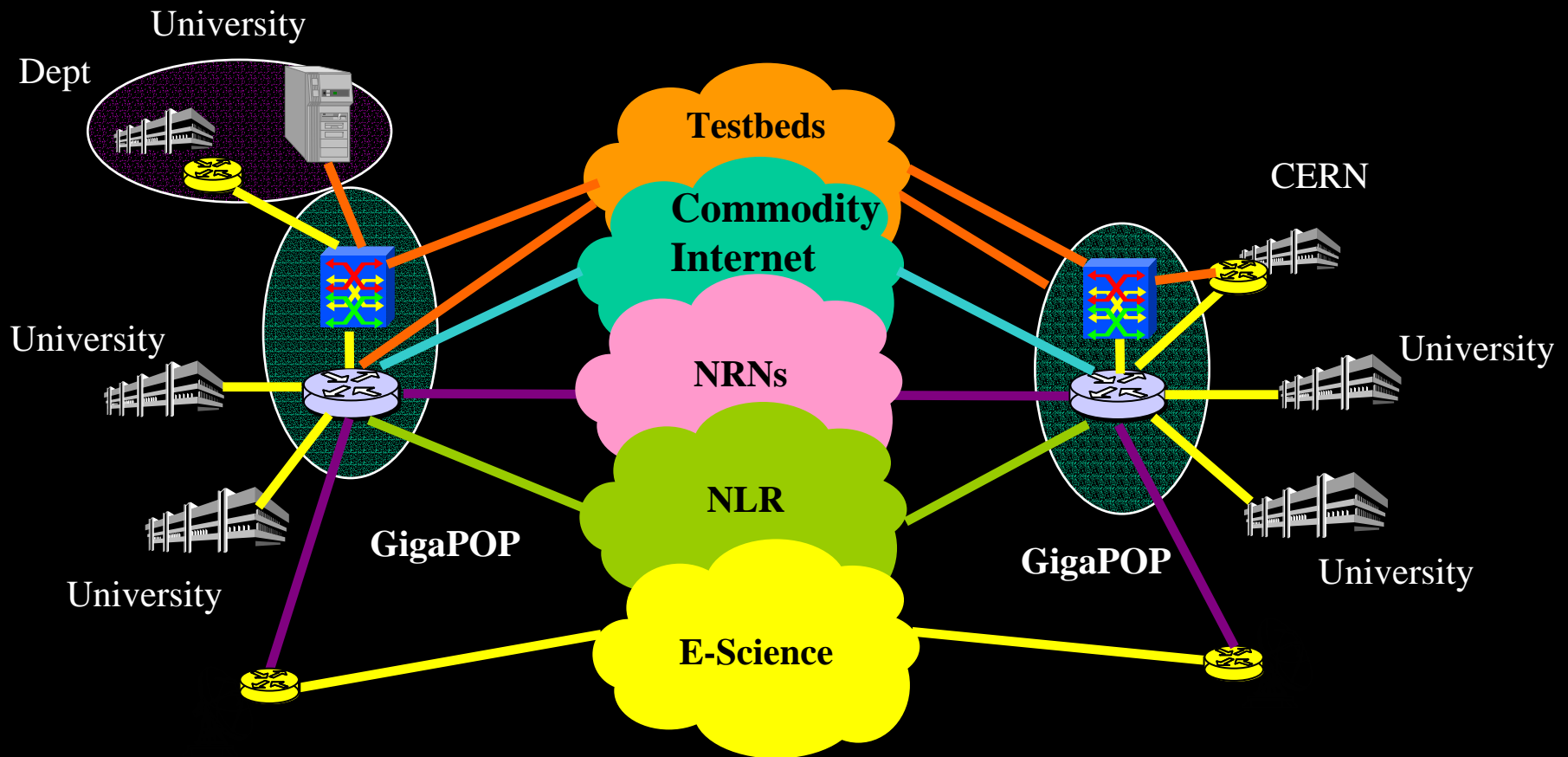
European lambdas

- 10Gb Amsterdam—CERN
- 2.5Gb Prague—Amsterdam
- 2.5Gb Stockholm—Amsterdam
- 10Gb London—Amsterdam

IEEAF lambdas (blue)

- 10Gb NYC—Amsterdam
- 10Gb Seattle—Tokyo

The Next International Optical Network According to the Global Lambda Integrated Facility (GLIF)

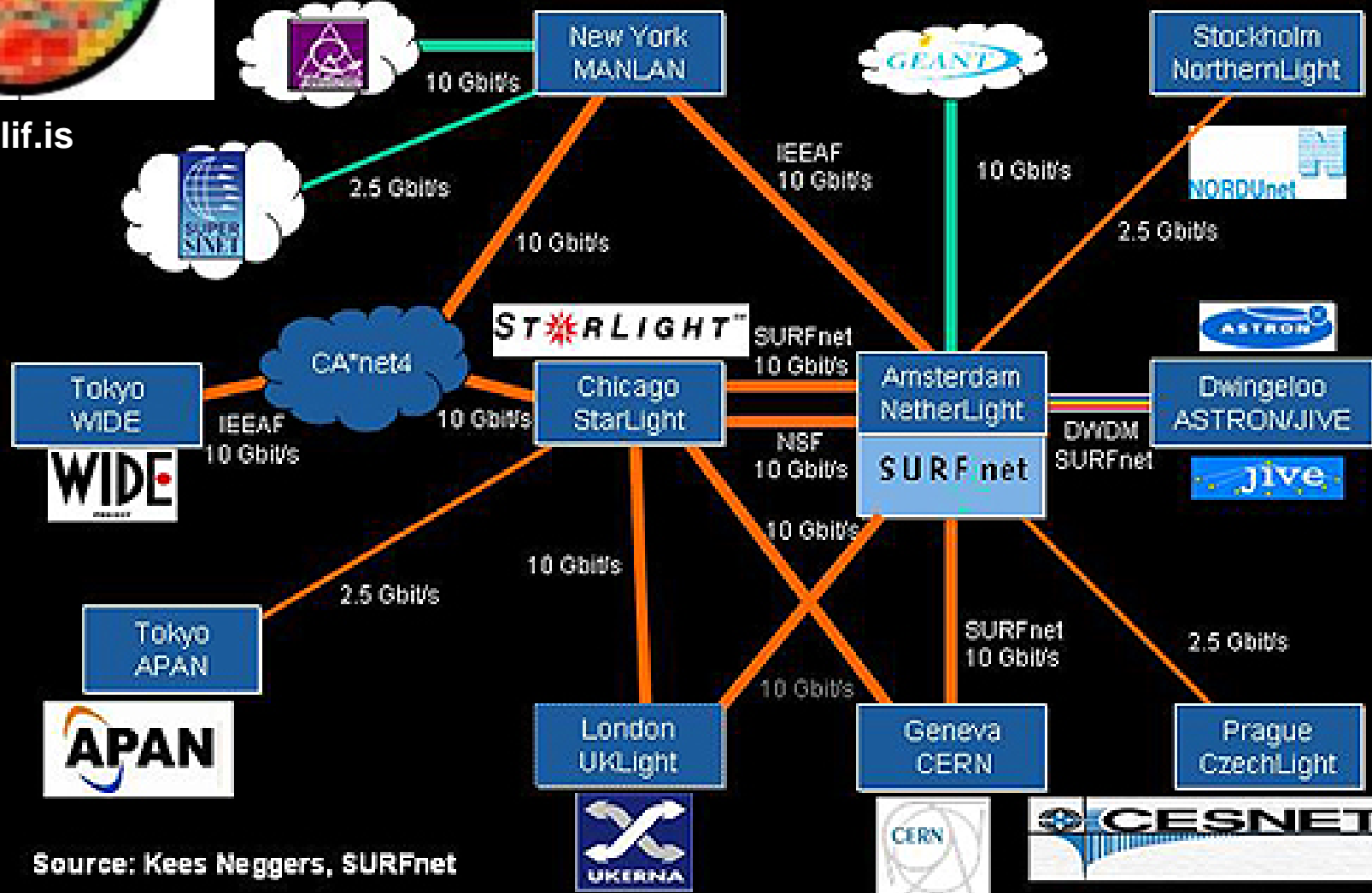


Source: Bill St. Arnaud



Global Participation: GLIF at StarLight

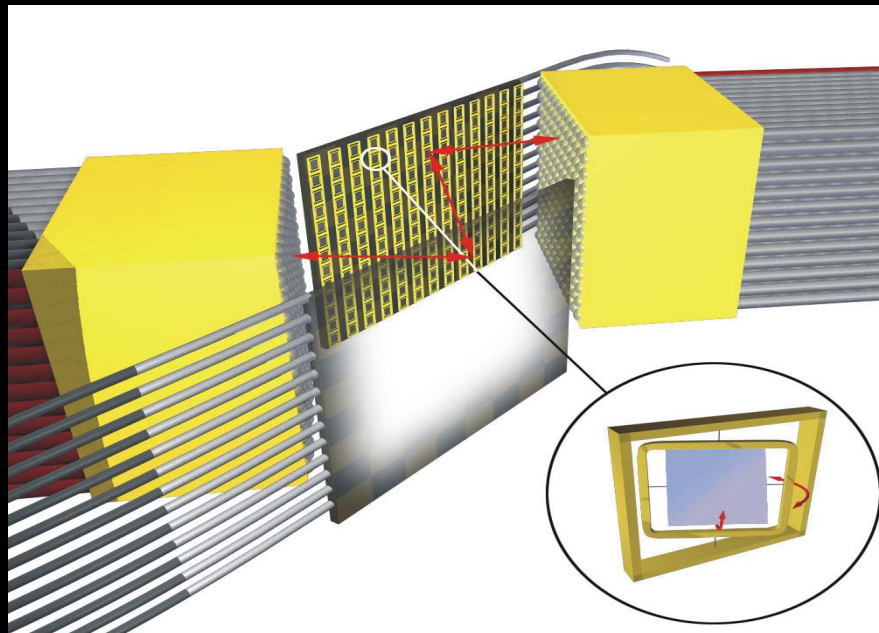
www.glif.is



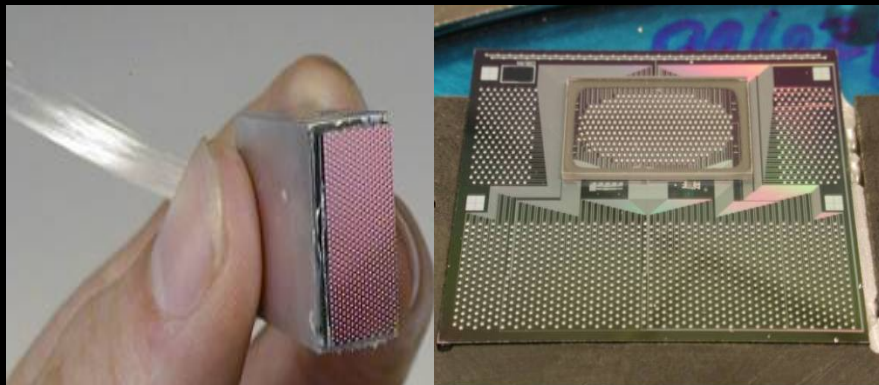
Source: Kees Neggers, SURFnet

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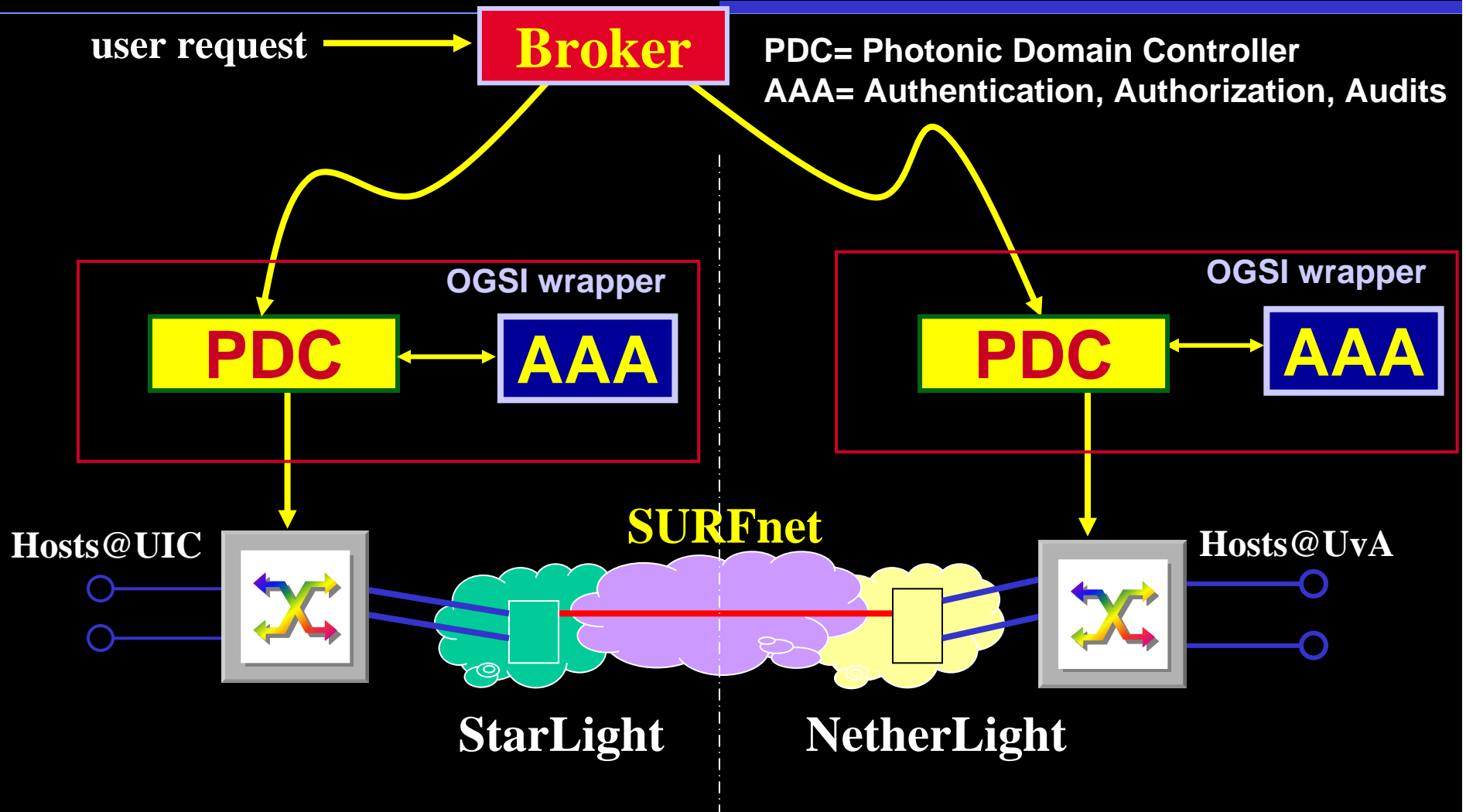
Calient DiamondWave Switches at Chicago's StarLight and Amsterdam's NetherLight Facilities



- 3D MEMS wavelength switch
- \$700/port at any speed
–1% the cost of 10G routing
- 128x128 switch installed at StarLight
- 64x64 switch installed at NetherLight



International Inter-Domain Lambda Setup



Thank You!

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 - Northwestern University for providing space, engineering and management
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- **NSF/CISE/ACIR and NCSA/SDSC for DTF/TeraGrid/ETF opportunities**
- **UCAID/Abilene for Internet2; IU for the GlobalNOC**
- **CA*net4 for North American transport**
- **Bill St. Arnaud of CANARIE, Kees Neggers of SURFnet, Olivier Martin of CERN and Harvey Newman of CalTech for networking leadership**
- **Larry Smarr of Cal-(IT)² for I-WIRE and OptIPuter leadership**