

ESnet Update

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Agenda



Network Overview

Testbed / Research Initiatives



3 Separate Networks

Optical Transport Network

- Provide 10/40/100G point to point wavelength services for production network & non-disruptive testbed purposes

100G Routed/Virtual Circuit Network

- Supports ~40 DOE labs/sites and has over 140 peerings with other networks (R&E and commercial)
- Fully instrumented with perfSONAR network performance and monitoring software
- ESnet developed layer 2/3 on demand or schedulable virtual circuit service for guaranteed network performance (latency/thruput) or traffic engineering/failover purposes

Dark Fiber Network

- 13,000+ miles long haul & metro fibers available for Advanced Networking Initiative (ANI) Testbed & disruptive research
- Can be used by commercial entities as well as R&E community

Dark Fiber Network

LBLN Long Haul Dark Fiber Routes
12,924 miles



9/13/11

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100G Network Timeline



ANI build to four primary sites (3 supercomputers and intl exchange point)

- Tested complete before end of December 2011 (hopefully by Supercomputing Conference in mid-Nov)
- Optical transport backbone will be ready for provisioning wave services by end of August 2011

Rest of network build complete by July 2012

Transition production network services to entire 100G footprint before November 2012



Testbed / Research

9/13/11

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Current ANI Testbed Research



16 projects have been given access to the testbed so far:

7 via direct DOE/ASCR funding, 9 via testbed proposal review process

5 from Industry; 6 from DOE labs; 5 from Universities

10 DOE-funded, 3 NSF-funded

Wide range of projects:

6: High-speed middleware

2: Wide Area RDMA

2: OpenFlow

2: TCP congestion control

2: Other network control plane

1: Security

1: 100Gbps end host hardware

1: Energy efficiency

1: Network flow classification

<http://www.es.net/RandD/advanced-networking-initiative/current-testbed-research/>



Recent Accomplishments

Energy monitoring experiments by Alcatel-Lucent;

20 Gbps disk-to-disk experiments by FNAL

40G Experiments

- Loaner OC-768 SONET cards from Infinera installed
- Loaner Bay Microsystems 40G InfiniBand to SONET gateway installed
- First long distance 40G RDMA testing has begun
- Loaner 40GE cards from Infinera installed schedule to arrive next month

Recent Accomplishments (cont.)



OpenFlow Experiments

- ESnet / NEC demo on using OpenFlow for RDMA at Joint Techs, Fairbanks
- Working on demo for SC11 to stitch together OpenFlow and OSCARS circuits for RDMA transfers
- UC Davis student has begun tests using OpenFlow for testing a route wavelength assignment algorithm

Building power baseline for 100G network

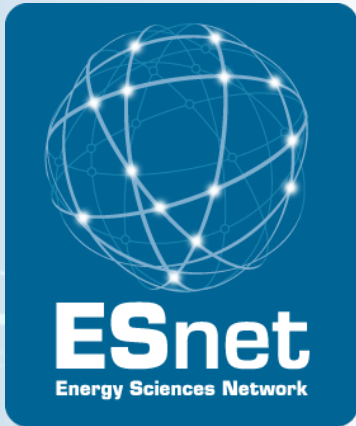


Goals:

- Instrument the 100G ANI for real-time power measurement
 - Power Distribution Units, temperature/humidity sensors
- Build tools to collect and visualize live network energy consumption
 - Flexible meta-data to create customized views.
 - Power consumed per path, per POP, per layer
- Create open datasets for network energy-efficiency research
 - IEEE's EEE, IETF's eMon, GreenTouch etc.
 - Juniper, Broadcom, Bell Labs, Level 3, BBN and others.
- Catalyze adoption of theoretical research/experiments by industry
 - Energy proportionality will require redesign of network equipment
 - Establish metrics based on quantified improvements against baseline

Joint-sponsored all-day workshop with GreenTouch at SC11

- Network and data center efficiency



Questions?

Thanks!

<http://www.es.net/>

<http://fasterdata.es.net/>

