ESnet Update
ESCC, Summer 2012

Gregory Bell, Ph.D.

Director, Energy Sciences Network

Director, Scientific Networking Division

ESnet Coordinating Committee (ESCC)

Palo Alto, CA

July 17, 2012

Premise for This Update

Morning talk: Vision statement for ESnet. Broad brushstrokes.

Cliff Notes

1. our networks are discovery instruments, not infrastructures
2. progress in climate science is currently being impeded by data mobility problems; let's figure out how to fix them

Afternoon talk: Selected updates on more topics of relevance to ESCC community. Minimal overlap of content, but some.

This talk assumes:

1. You saw this morning's update (or if not, can watch the video / read the slides if you want)
2. You'll interrupt me at any time for questions!

Pardon our Dust (or the Art of Juggling)

A Year of Unprecedented Change for ESnet

- completing ANI project ($62M)
- building our first optical network
- transitioning to ESnet5
- managing 100G test-bed
- large, complex procurements
- retirements of two key leaders
- new Director, senior managers, staff
  - with certain decisions 'frozen' until announcement of Director
- adapting to new status as LBNL Division
- each of these changes an opportunity
- but for the time being, we're stretched pretty thin

My Staffing Slide From Winter 2012

Lauren Rotman

- responsibilities: partnerships and outreach
- recent background: Director of Communications for Internet2
- talks at ESCC: update on DOEGridsCA sourcing pilot

Patty Giuntoli

- responsibilities: infrastructure, collaboration, identity
- recent background: manager at LBNL, Kaiser, Oracle
- talks at ESCC: update on ECS video services

These two are now officially ESnet veterans.

Network Engineering Group Lead

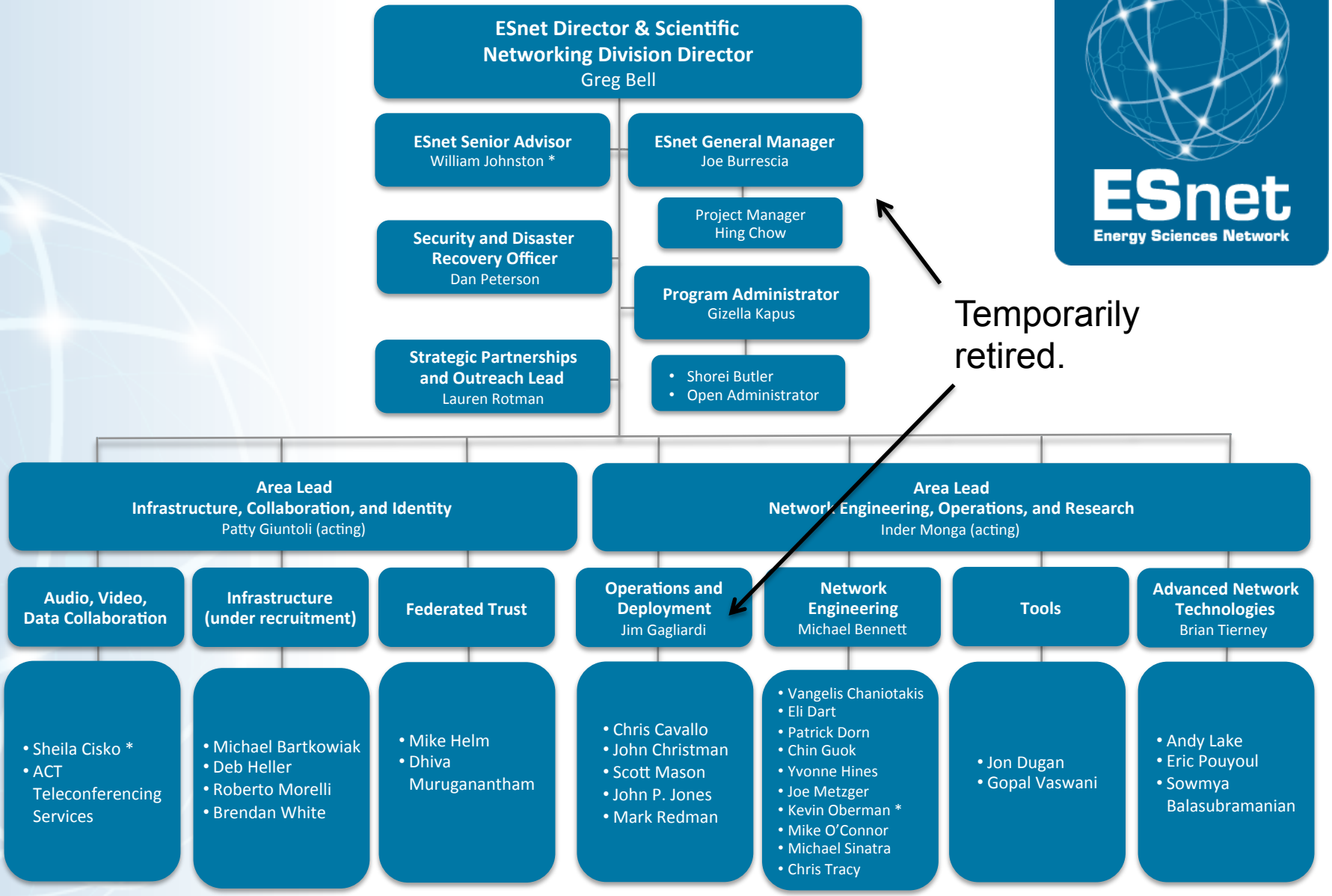
- selection process is underway and going well

Mike Bennett returns for encore performance!

ESnet Director

- recruitment is actively underway – your help appreciated

You're looking at him.


ESnet Director & Scientific Networking Division Director
Greg Bell
ESnet Senior Advisor
William Johnston *
ESnet General Manager
Joe Burrescia
Project Manager
Hing Chow
Security and Disaster Recovery Officer
Dan Peterson
Program Administrator
Gizella Kapus
Strategic Partnerships and Outreach Lead
Lauren Rotman
• Shorei Butler
• Open Administrator
Temporarily retired.
Area Lead
Infrastructure, Collaboration, and Identity
Patty Giuntoli (acting)
Area Lead
Network Engineering, Operations, and Research
Inder Monga (acting)
Audio, Video, Data Collaboration
Infrastructure (under recruitment)
Federated Trust
Operations and Deployment
Jim Gagliardi
Network Engineering
Michael Bennett
Tools
Advanced Network Technologies
Brian Tierney
• Sheila Cisko *
• ACT Teleconferencing Services
• Michael Bartkowiak
• Deb Heller
• Roberto Morelli
• Brendan White
• Mike Helm
• Dhiva Muruganantham
• Chris Cavallo
• John Christman
• Scott Mason
• John P. Jones
• Mark Redman
• Vangelis Chaniotakis
• Eli Dart
• Patrick Dorn
• Chin Guok
• Yvonne Hines
• Joe Metzger
• Kevin Oberman *
• Mike O'Connor
• Michael Sinatra
• Chris Tracy
• Jon Dugan
• Gopal Vaswani
• Andy Lake
• Eric Pouyoul
• Sowmya Balasubramanian

Decay of Burrescia Particle

Deputy for Operations

- Virtuoso at ‘getting to yes’
- Master of process excellence, metrics, reporting, business operations, making Vince happy

Lead for Strategic Projects

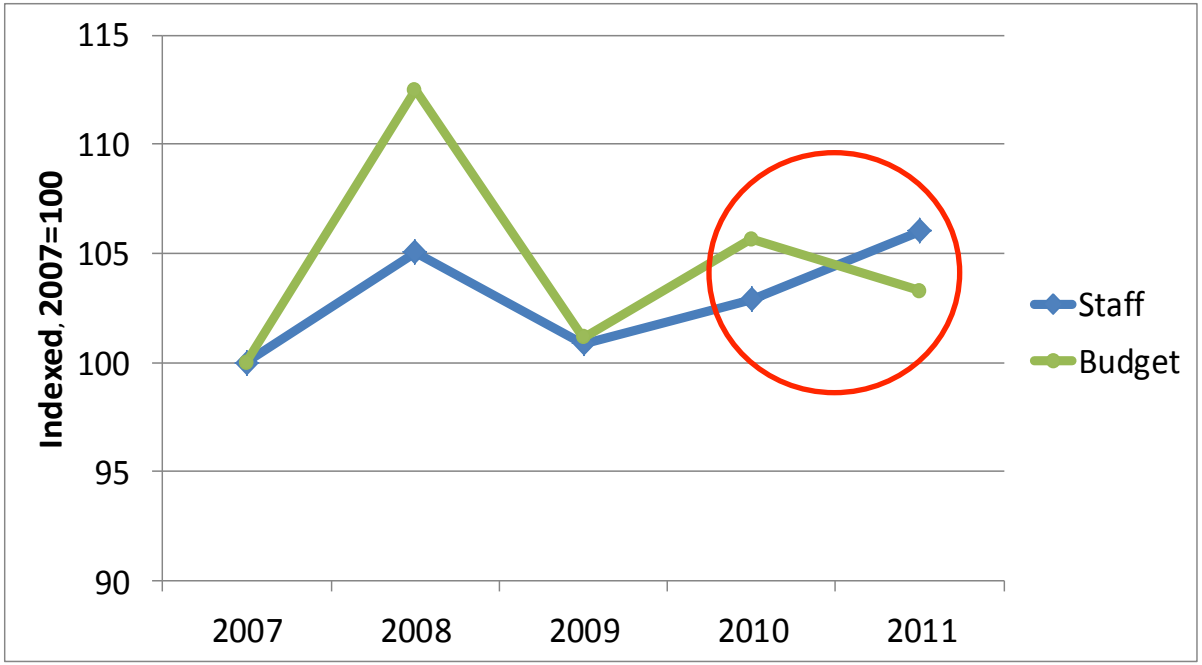
- Skilled at project management
- Familiar with our communities, programs

Decay of Gagliardi Particle

Group Lead for O&D
- Patty Giuntoli now Acting
- Also GL for INF

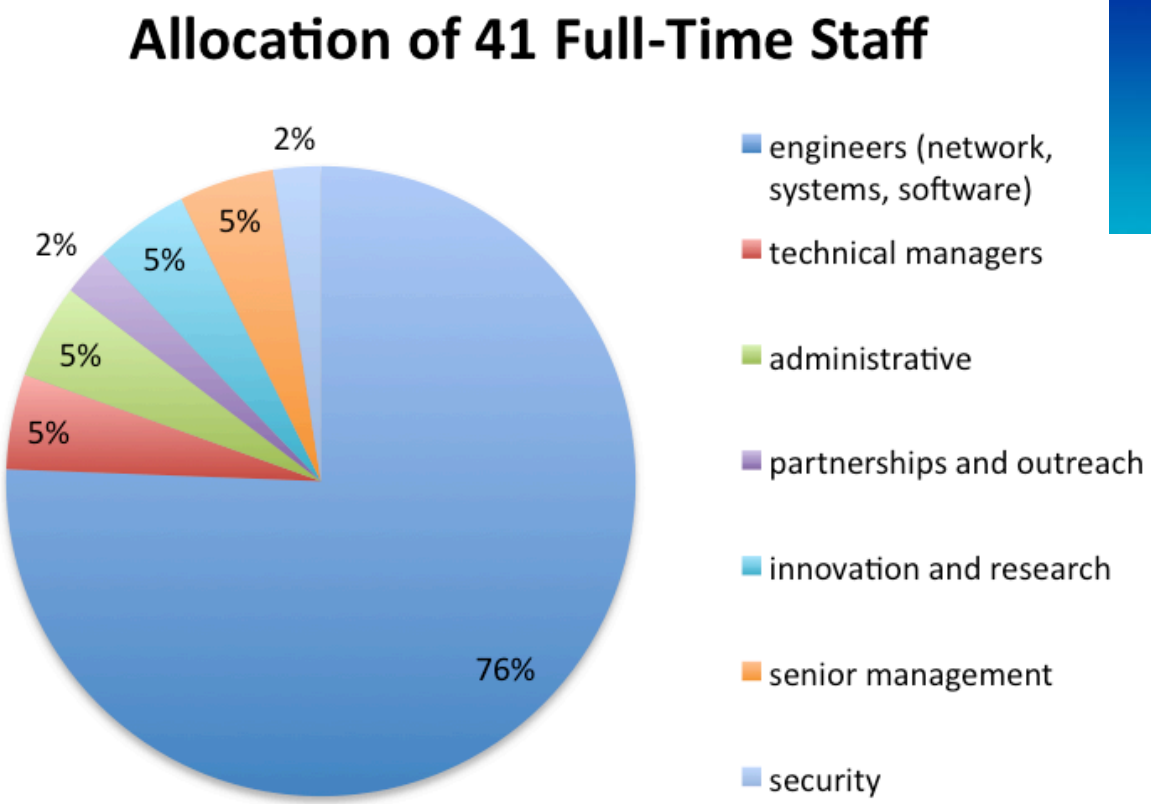
Network Engineer
- Early-career
- Under recruitment now

Growth in Staff for NRENs: from Capital to Service-Intensive Model?



Bert van Pinxteren, Networking to Services; Recent developments as documented by the TERENA Compendium. TERENA Networking Conference, Reykjavik, Iceland, 23 May 2012.

Growth in Staff



Recruiting, or soon to be:

- Deputy for Business Operations
- Lead for Strategic Projects
- Partnerships and Outreach Coordinator
- Post-doc for energy research
- Network and Systems Engineers
- Software Developers
- Contracts Specialist

Possibly more.

One Message from our Board

Increase your commitment to applied research, development and innovation.

Research, Development and Innovation

Why?

- to accelerate scientific discovery

How?

- collaborate with researchers, network peers, vendors, and you!
  - ✓ build and renew intellectual ties to UC Berkeley
- support national-scale testbeds
- perform internal technology development

Who?

- within ESnet, **this work is not confined to a few select 'innovators'**
- research & engineering should be tightly-coupled in a feedback loop
- anyone with a good idea has the chance to run with it

We'd Like Input on Testbed Futures

Control Plane

- Long Island fiber, Infinera transport
- Juniper, NEC OpenFlow, DTNs, VMs

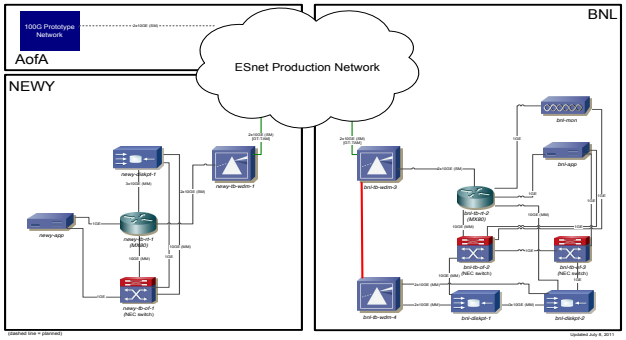
100G (started in January)

- High-speed protocol research
- Routed network from Argonne to NERSC

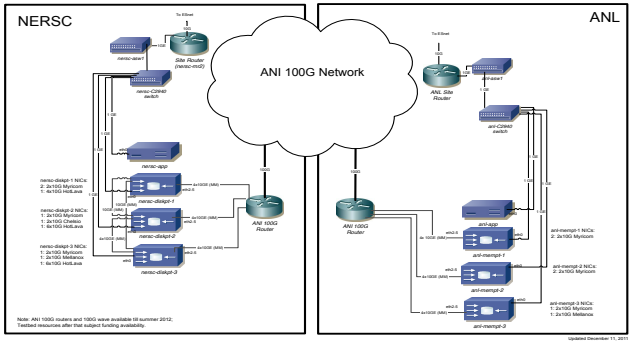
Dark Fiber

- Completely disruptive research
- Proposals include
  - quantum cryptography
  - architecture for 90% energy reduction
  - >100G tests and demonstrations

Long Island MAN (LIMAN) Testbed Architecture



ANI Middleware Testbed



LBNL Long Haul Dark Fiber Routes
12,924 miles

BayExpres Metro Fibers: 432 miles
ChiExpress Metro Fibers: 167 miles
NYExpress Metro Fibers: 6 miles

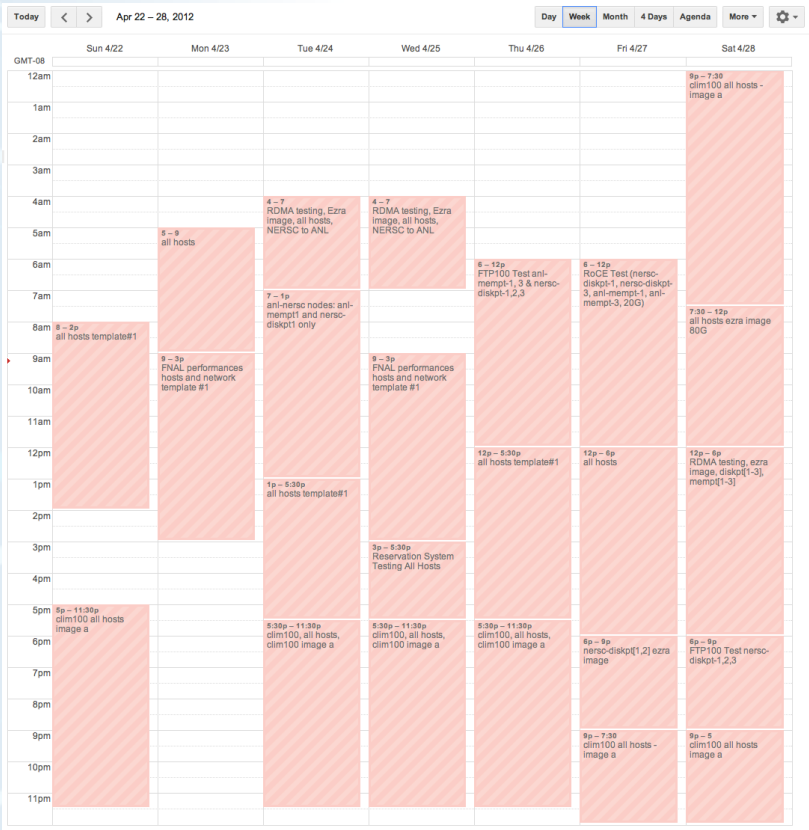
Testbeds Will be Judged by Their Impact

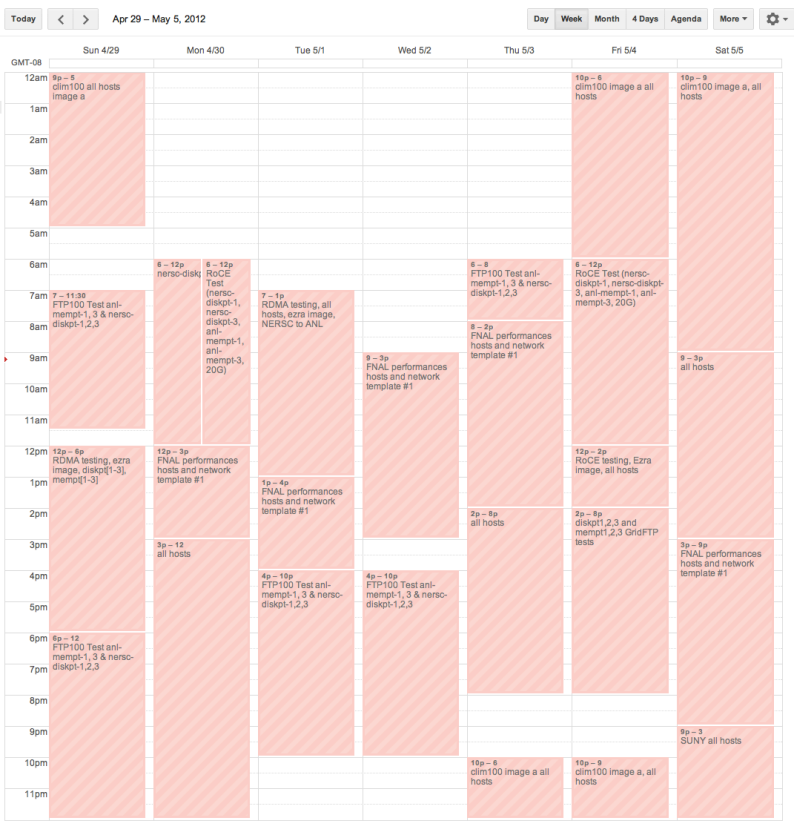
Accepted papers, with several more in the pipeline or under submission:

- Zhenzhen Yan, Chris Tracy, and Malathi Veeraraghavan, *A Hybrid Network Traffic Engineering System*, Proceedings of the IEEE 13th Conference on High Performance Switching and Routing (HPSR). June 2012, Belgrade, Serbia.
- Mehmet Balman, Eric Pouyoul, Yushu Yao, E. Wes Bethel Burlen Loring, Prabhat, John Shalf, Alex Sim, and Brian L. Tierney, *Experiences with 100Gbps Network Applications*, The Fifth International Workshop on Data Intensive Distributed Computing (DIDC 2012), June 2012 (PDF)
- Yufei Ren, Tan Li, Dantong Yu, Shudong Jin, Thomas Robertazzi, *Middleware Support for RDMA-based Data Transfer,* Cloud Computing High-Performance Grid and Cloud Computing Workshop, May 2012
- G. Garzolglio, D. Dykstra, P. Mhashilkar and H. Kim, *Identifying gaps in Grid middleware on fast networks with the Advanced Network Initiative*, International Conference on Computing in High Energy and Nuclear Physics (CHEP 2012), May 2012
- Also: demonstration of first 40G, multi-stream, long-distance RDMA transfers at SC11

See: http://www.es.net/RandD/advanced-networking-initiative/testbed-results/

A Couple of Screenshots that Make us Happy



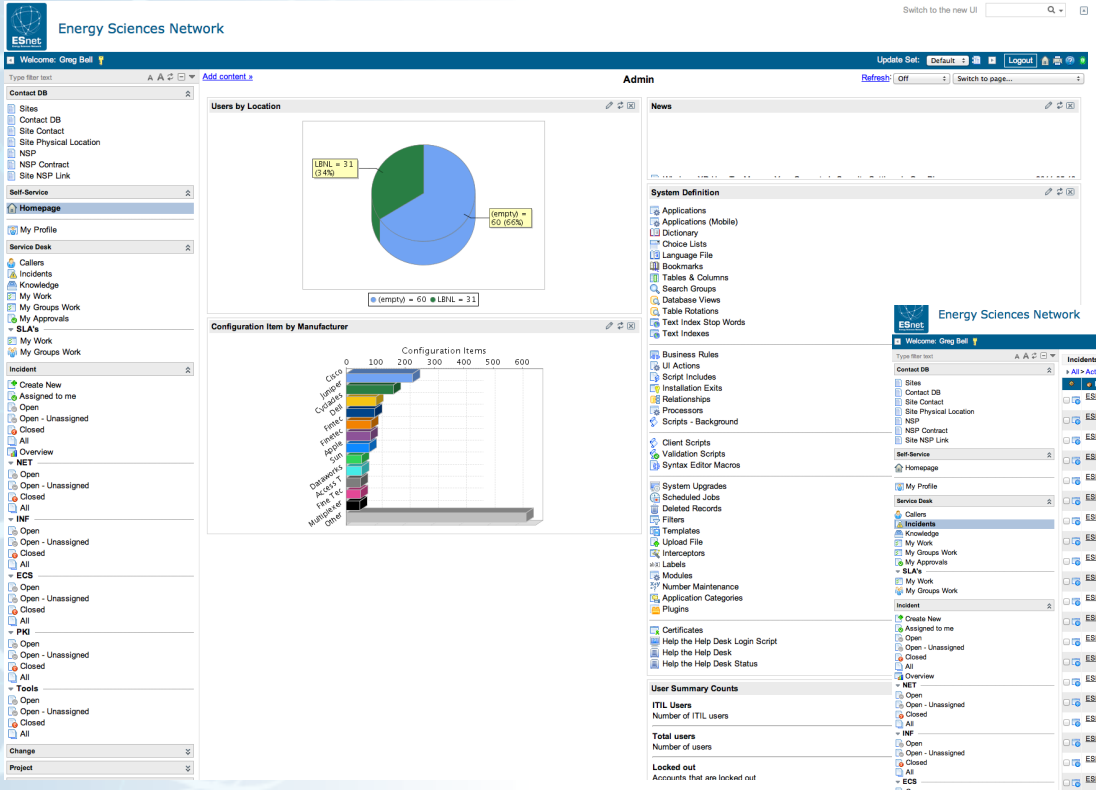


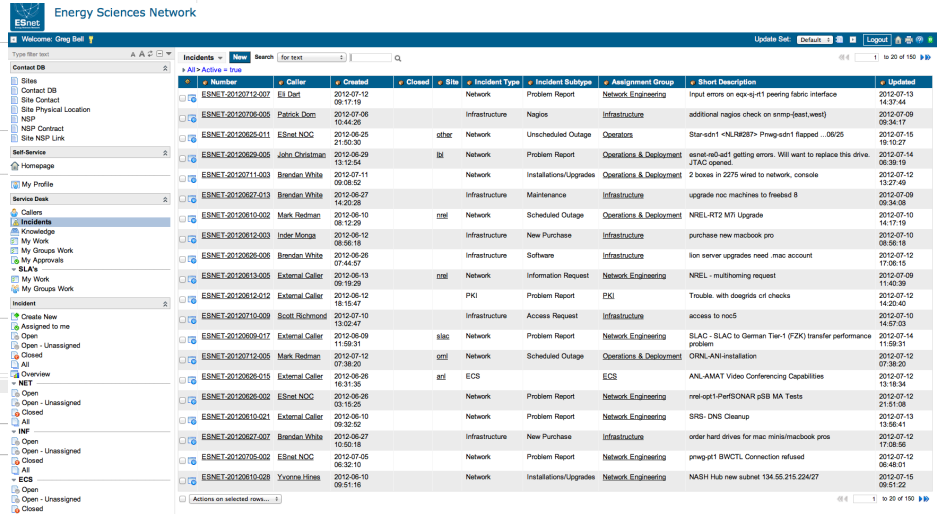
ServiceNow: Live for Incident, Inventory

Revolutionary for us. How many other SN customers?

Coming in Q4: service catalog for process automation.

How valuable is further MyESnet integration?





Collaboration Services: Never More Important, Never More Complex

- Increasing concern for carbon avoidance
- Severe federal travel restrictions
- Commodification of very high-quality features (HD, better audio, nice usability)
- Consumer technology: Google Hangouts, Skype, iChat, etc
- Newly-polished enterprise-scale solutions (Cisco, Microsoft)
- Cloud-based solutions on horizon
- Very limited resources within ESnet

NNSA Relationship Evolving

In conversation about supporting OneNNSA

- ONEcore, OneDOE, DOEcloud, ONEvoice, DOEnow

Moving to new direct-funded model for FY13.

- Reduces our distraction, increases efficiency
- Allows us to focus on our technical / service interface
- Site Coordinator relationship stays exactly the same

Next year: EERE, EM, IN?

ESnet as International Network (Again)

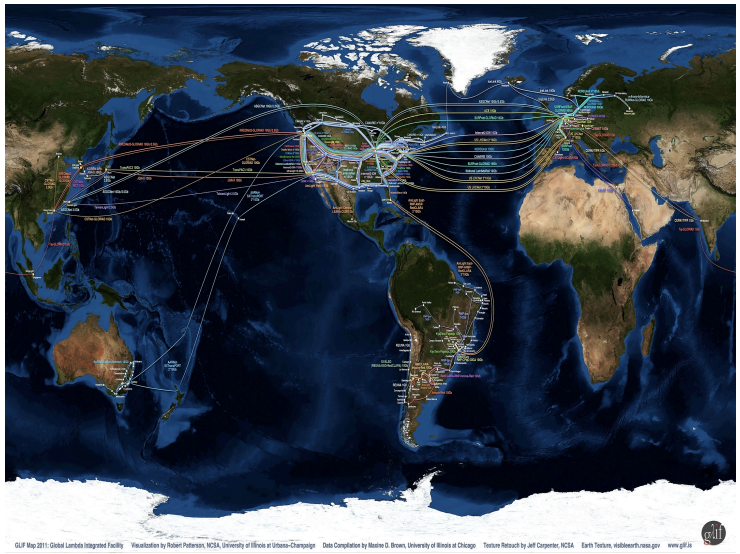
Mission Need for Trans-Atlantic connectivity

- reciprocal LHCONE, non-LHC GEANT
- RFP in draft

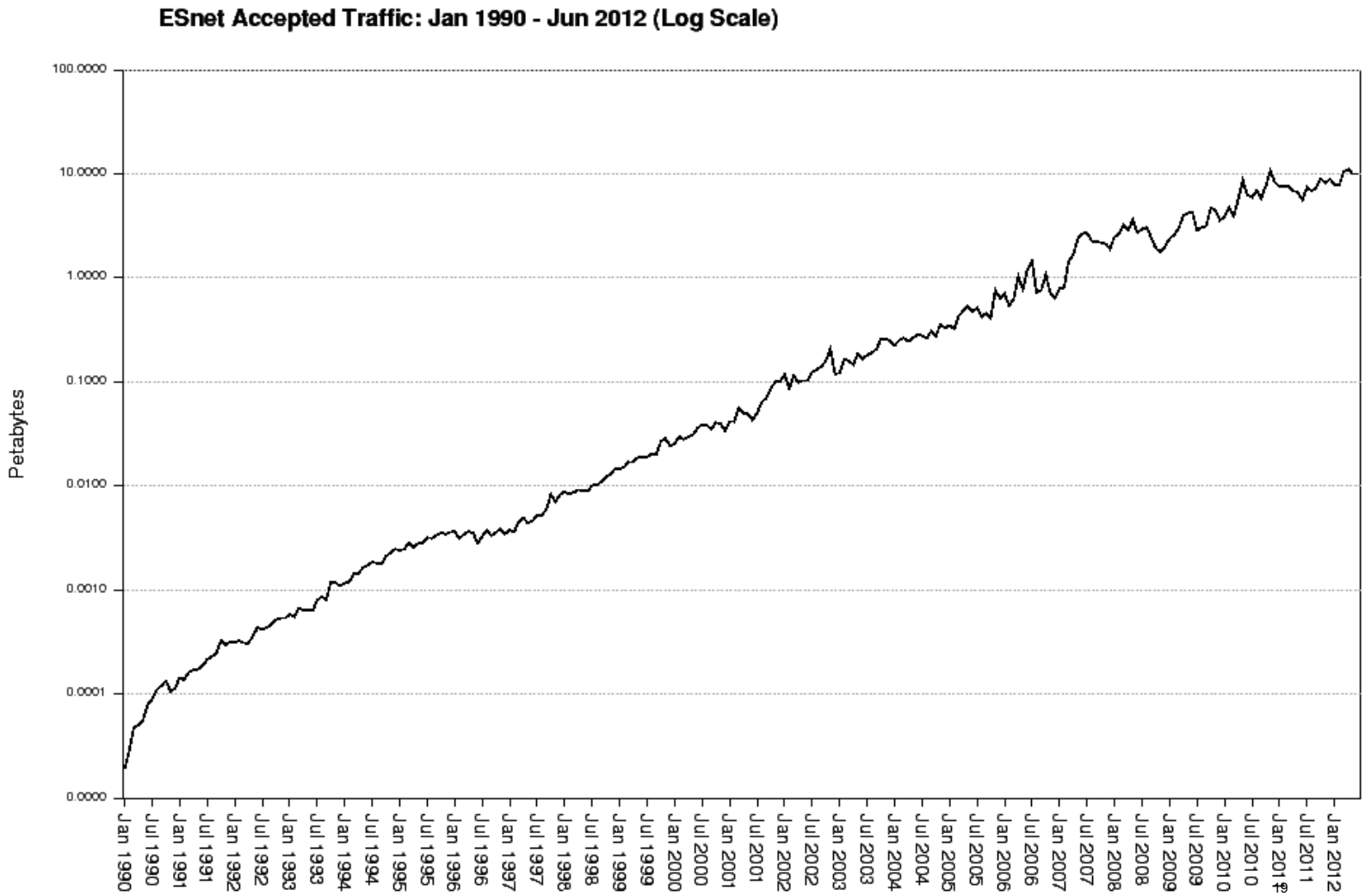
Trans-Pacific?

- Belle II, PNNL, David Asner PI
- Micro-workshop in October

At the same time, active discussion about global trans-oceanic strategy. Wet fiber?



We Want to Know about Major Data Flows (even in 3-5 year timeframe)



Compounded Moore's Law Growth Rates: Is this Coming to a User Facility in Your Back Yard? We want to know!

Characteristics of one new detector:

- high-throughput microscope for materials science
- KHz data rates x Megapixel detector resolution
  - 10^6 increase in data output compared to previous generation
  - 4×10^8 integers per second
  - 8 Gbps flow to supercomputer for real-time analysis
- testing begins in 18 months
- how many beamlines at the ALS?
- how many light sources like the ALS in the world?

Metrics Reform + Yesterday's BOF

Central question: ***how do R&E networks measure success?***

It's easy to count bits and bytes, but it's harder to quantify the impact of high-performance networks on universities, national labs, and global research collaborations.

Can we do a **better job** of identifying metrics that help us show the role our networks play in accelerating discovery?

1. broad survey
2. JT BOF
3. published report
4. ongoing dialog
5. new ESnet metrics for CY 13

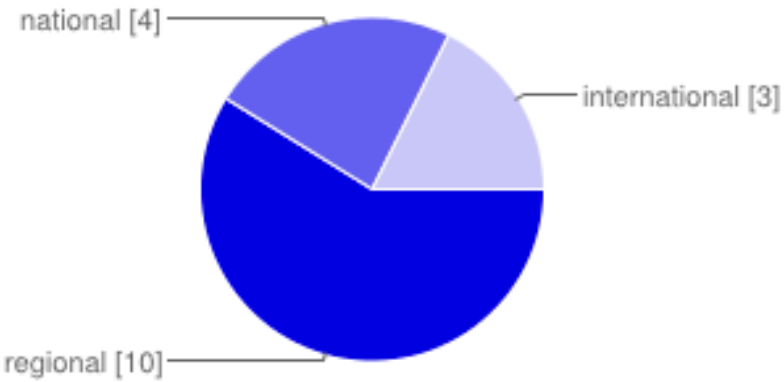
rough process

Survey Responses

18 responses

Summary See complete responses

What is the size of your network?



regional	**10**	56%
national	**4**	22%
international	**3**	17%

Interesting Feedback from Survey

- Significant percentage of large networks collect almost no metrics (no uptime, utilization info).
- Almost everyone is dissatisfied with the metrics they do collect.
  - recurring frustration with measuring value and impact
  - "It's tough to come up with a *meaningful metric that is within your ability to control and improve.*"

Brainstorming from the BOF

Multi-Party Metrics

- Time required to move reference data set from 1 facility to another?
- Availability of loss-free paths from core to core?

Soft Metrics (with thanks to Roy Whitney)

- Do we have an effective process for understanding future user needs?
- How effective have we been in advocating for architectural change on campus?
- Do we have the communication channels to speak directly to specific science communities?
- Are we part of an efficient feedback loop between network research and network operations?
- How many community members have we educated about what a modern network can do, in the past year?

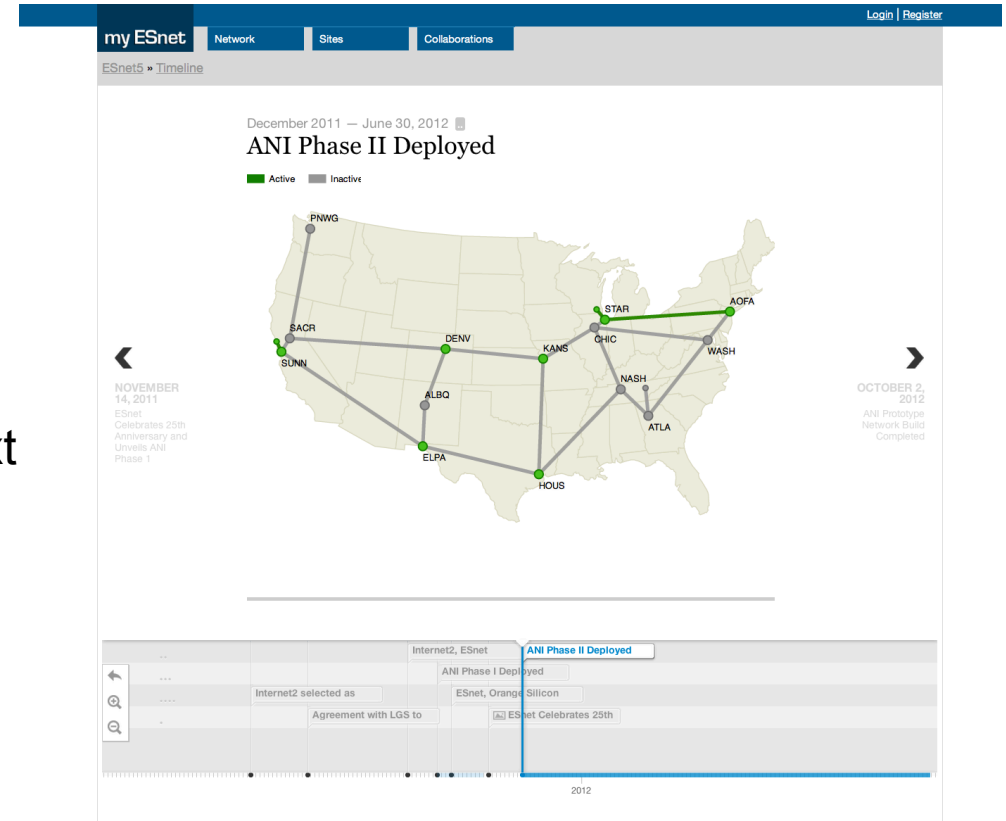
Metrics Reform

We are very interested in your reflections about metrics, and feedback about our metrics reform process. Send me mail: greg@es.net.

Another chance to comment: metrics survey + BOF summary will be distributed to ESCC.

MyESnet Timeline

- Timeline shows major achievements, deployment steps
- Topology diagrams, progress reports, context
- Updated as we roll forward



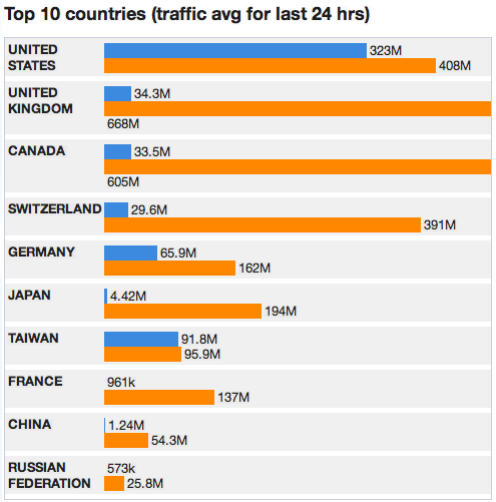
https://my.es.net/esnet5/timeline

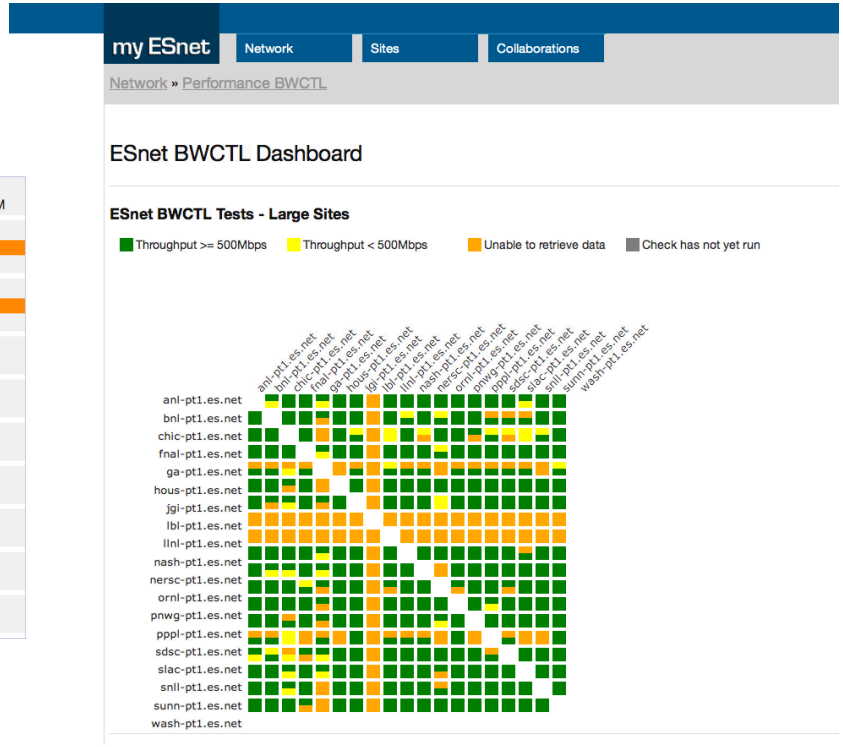
MyESnet Office Hours: Dean's Boardroom

We want the MyESnet portal to be useful to you.

To better understand your needs and interests, Tools Team will hold "office hours" in LK320 all day tomorrow.

Watch for the sign-up sheet!





Questions?

Thanks!

Greg Bell, greg@es.net

http://www.es.net/

http://fasterdata.es.net/