

ESnet Takes Lead in Evaluating Grid Services

ESnet, which operates the DOE Grids Certificate Services, recently completed an internal review that satisfied a European grid management authority's requirement and could serve as a template for other identity-authentication authorities to review their rules and practices.

The audit, carried out in December, examined ESnet's procedures and management practices for issuing digital certificates to DOE-supported scientists and engineers. The certificates hold encrypted information, or public keys, which identify the owners and allow them to access

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Fusion Workshop Provides Forum for Networking Needs

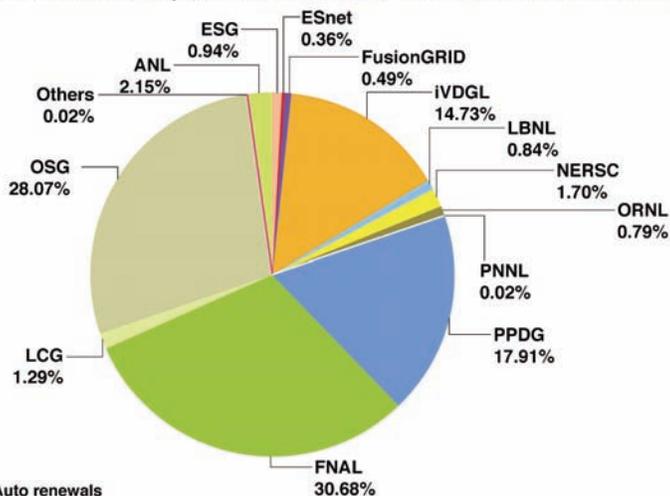
Scientists and program managers gathered at Gaithersburg, Maryland in March for a DOE Office of Science-sponsored workshop to identify the ESnet networking requirements for fusion research.

The Fusion Energy Sciences network requirements workshop provided a forum to communicate with ESnet about the ways in which scientists from the Fusion Energy Sciences research program uses the network. ESnet will incorporate the feedback into its infrastructure and service planning processes.

The workshop is part of the ESnet governance structure, and is designed to help ensure that ESnet meets the needs of researchers from all six program offices within the DOE Office of Science. ESnet held workshops for scientists in Basic Energy Sciences (BES) and Biological and

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DOEGrids CA Usage—Virtual Organization Breakdown
DOEGrids CA Statistics (7,647 active user and service certificates)



*DOE-NSF collab. & Auto renewals

**OSG includes (BNL, CDF, CIGI, CMS, CompBioGrid, DES, DOSAR, DZERO, Engage, Fermilab, fMRI, GADU, geant4, Glow, GPN, GRASE, GridEx, GROW, GUGrid, i2u2, ILC, IVDGL, JLAB, LIGO, mariachi, MIS, nanoHUB, NWICG, NYGrid, OSG, OSGEDU, SBGrid, SDSS, SLAC, STAR & USATLAS)

ESnet operates the DOE Grids Certificate Services. The pie chart shows the breakdown of active users and services with valid certificates to access grids.

New Metro Network Offers Greater Bandwidth, Services

The recently completed Chicago Metropolitan Area Network (CHI-MAN) connects Argonne National Laboratory and Fermi National Accelerator Laboratory to the Energy Science Network's new 10 gigabit per second IP and SDN backbones known as ESnet4. The CHI-MAN provides high speed and

diverse 10-Gbps connections between the two DOE laboratories and the research network interconnection facility known as "StarLight" and a Level 3 commercial telecommunications hub. Both StarLight and the Level 3 hub are located in downtown Chicago.

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Main ESnet Services Uninterrupted Despite Power Outage

Quick thinking and teamwork by ESnet staff kept the main networking service going during a power outage that shut down half of Berkeley Lab in early January.

The blackout occurred at 12:30 p.m. on January 9 when one of two power company transformers failed due to recent heavy rains and shut off power to 26 buildings at Berkeley Lab. Compounding the problem, an emergency generator feeding the ESnet data center failed to start, despite three automated attempts. The incident mobilized ESnet staff, who worked

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Power Outage *continued from page 1*

closely with people from the Lab's Facilities Division to ensure that the outage didn't cut off the most critical service to ESnet users, said Dan Peterson, ESnet's security and disaster recovery officer and a computer systems engineer.

Rushing to ESnet's main data center, Peterson and fellow ESnet engineers had about 10 minutes of available battery backup power in order to make decisions preventing or minimizing any negative impact to the routers, servers and other systems. Keeping the Bay Area Metropolitan Network (BA-MAN) functioning was the first priority. BA-MAN connects Berkeley Lab with other DOE facilities and the internet. Working with minimal emergency lighting and flashlights, the staff began moving 40-lb batteries from several uninterruptible power supply (UPS) systems to the one that powered the BA-MAN. Battery power also kept

core systems of the public key infrastructure (PKI) and other core ESnet services working until the systems could be properly shut down. PKI provides certifications to scientists and engineers running DOE research centers so that they can participate in various national and international grids.

"People were calm and communicated well with each other about potential safety hazards and what needed to be done," Peterson said. "We averted the potential degradation of the BA-MAN."

The staff shut down other services and systems until the backup generator kicked in roughly 25 minutes after the power outage began. Some of the systems remained off after the generator kicked in because the air-cooling system, which is critical for reducing overheating, is not connected to the emergency gen-

erator and remained off until full power restored.

The Lab's facilities managers initially estimated that the blackout would last

"We averted the potential degradation of BA-MAN (Bay Area Metropolitan Area Network)."

—Dan Peterson, ESnet

overnight. But their crew was able to re-route power from another transformer and brought electricity back online in two hours. This move turned on the cooling system in ESnet's data center.

ESnet engineers then worked on bringing some of the systems and services back on line. Staff safety was a top concern during the emergency, and no one was injured, Peterson said.

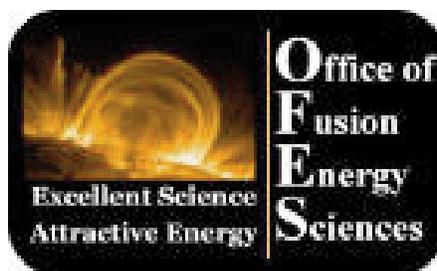
Fusion Workshop *continued from page 1*

Environmental Research (BER) programs last summer. Each year, ESnet will run workshops for two program offices.

"We don't ask the scientists what their network requirements are, but what their science process is — how they use the network and move their data," said Eli Dart, an ESnet engineer who organized all three workshops. "The workshop goals are to understand how the scientists use the network, and how their usage will change over time."

Participants gathered at the Gaithersburg Marriott Washingtonian Center for the invitation-only fusion workshop. For a day and a half, they discussed research trends and shared experiences about how they use the scientific network to advance their work.

Networking requirements can change because of new research facilities, upgrades to existing facilities and



changes in the science process, as well as funding and policy changes. For example, the opening of the Molecular Foundry at Berkeley Lab in 2006 has provided cutting-edge instruments and other resources to the international nanoscience community. Last year, DOE announced plans to spend \$375 million for building three Bioenergy Research Centers nationwide. These changes enable researchers to create simulations

and experiments that generate a large amount of data, which in turn require a high-bandwidth network and dynamic services.

The workshops set out to chart short-term and long-range network requirements, which would help ensure that ESnet provides the necessary services to scientists in the immediate future as well as for years to come.

Before attending each workshop, the participants described their science and the way in which they use the network in a "case study" document. These documents form the foundation of the discussions at the workshops. The combination of the case study documents and the workshop discussions form the basis of the workshop final report, which will be submitted to DOE program managers.

The final reports for the BES and BER workshops have been posted.

Grid Services Self Evaluation continued from page 1

information grids. The grids make it easy for researchers to manage their work and access computing resources at different locations.

ESnet took the lead among certification authorities (CAs) in the U.S. and Europe in reviewing its operation. The action came as the international consortium of CAs began to require audits for its members to ensure that the grids follow common policies and procedures in reliability identifying users and resources.

The review enabled ESnet to accomplish several goals, including convincing the European Union Grid Policy Management Authority (EUGridPMA) to accept the U.S. research science identification practice when issuing a certificate. ESnet volunteered to be the first certification authority to undergo the audit when the EUGridPMA asked its early members to carry out reviews.

"We want to be an early player in the audit process because we want to influence it," said Mike Helm, technical lead for ESnet's Federated Trust Group. "DOE Grids also must maintain a high standard for interoperability and a good working relationship with other CAs."

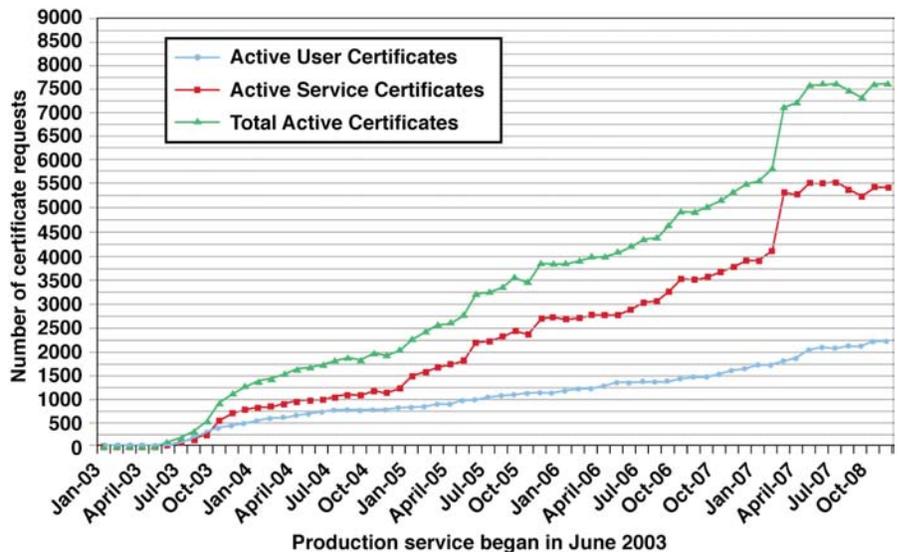
Helm led the audit effort, called Authentication and Trust Fabrics (ATF). The ATF team members and partners include Dhivakaran Muruganatham, Doug Olson, John Webster and Bruce Balfour.

Grid computing plays a growing role in the scientific community. Researchers and their collaborators often rely on computing and storage resources located at different parts of the country or across continents. For example, the LHC Computing Grid is set up to distribute data and coordinate research around the world when the Large Hadron Collider, located at CERN near Geneva, comes on line later this year and begins producing roughly 15 petabytes of data daily.

CERN will pipe the data to designated supercomputer centers in different countries, and these Tier 1 centers will then make the data available to other research institutions. Scientists can access the data through their own computers and networks that are connected to these Tier 2 institutions.

Establishing a good authentication

DOEGrids CA (Active Certificates) Usage Statistics



process is crucial for grid operators. ESnet, which began operating the DOE Grids Certificate Services in 2003, has played a leadership role in international grid policy management.

ESnet joined the EUGridPMA in 2002, although it recently co-founded The Americas Grid Policy Management Authority (TAGPMA) for CAs in North and South America. Both authorities, along with a third one in Asia, make up the International Grid Trust Federation (IGTF). IGTF sets authentication policies and guidelines, but it currently doesn't have one in place for carrying out audits.

By taking the initiative to do the audit, ESnet aims to set a good example for CAs looking for guidance on how to carry out a comprehensive review, Helm said.

Helm assembled the committee that carried out the ESnet review last December. The committee members were Dan Peterson from ESnet, Robert Cowles from the Stanford Linear Accelerator Center, former Berkeley Lab researcher Mary Thompson, John Volmer from Argonne National Laboratory, and Scott Rea from the Higher Education Bridge Certification Authority.

During the three-day audit, the committee scrutinized ESnet's policies and practices for managing the DOE Grid Certificate Services. In preliminary reports, committee members gave ESnet a good

grade and pointed to areas for improvement, such as doing a better job at documenting procedures.

The committee conducted the audit by using the OGF Auditing Framework, an auditing framework developed by members of the IGTF, and parts of NIST SP 800-53, technical requirements developed by the National Institute for Standards and Technology for tightening security in government-run networks. ESnet undergoes the 800-53 review annually as part of the mandated audit of Berkeley Lab.

Given that the NIST 800-53 audit provides a comprehensive review, ESnet would like to use the same process for satisfying other auditing requirements. Helm discussed the NIST 800-53 audit during a January meeting with EUGridPMA in Amsterdam. During a detailed presentation, Helm explained how the audit effectively pointed out problems to fix while validating the quality services provided by ESnet.

The presentation persuaded EUGridPMA officials to accept the research science identification practice used by CAs in the United States, an important win for ESnet to promote the overall acceptance of NIST 800-53 within the IGTF.

"We have moved the issue forward. We assured the EUGridPMA that we have a well-established operation that is able to deal with any problems," Helm said.

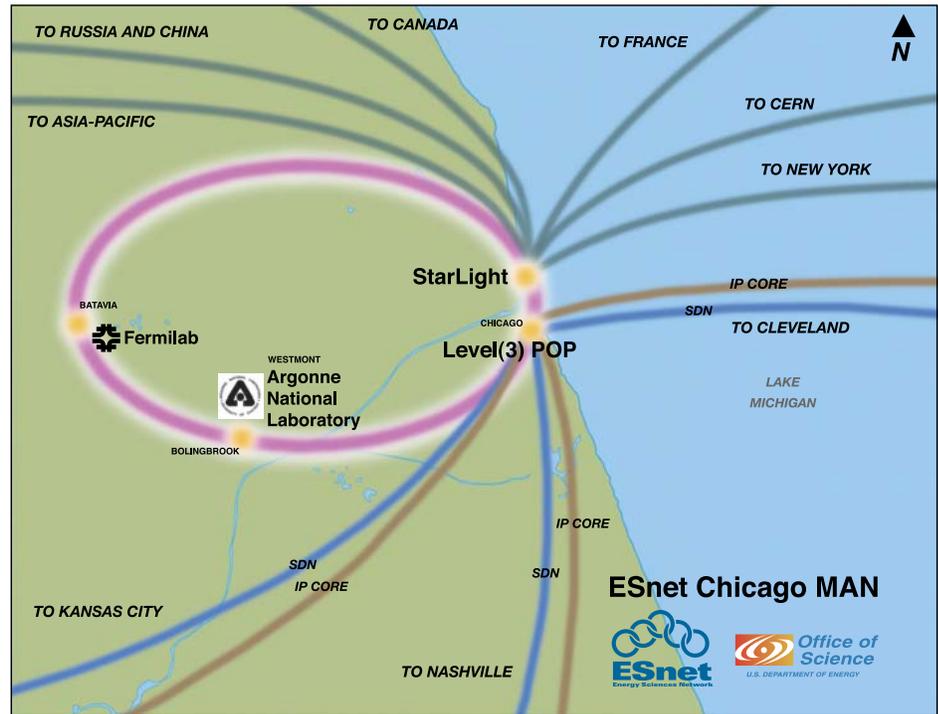
Chicago-MAN *continued from page 1*

"We worked closely with both labs in the area to provide a reliable, cost-effective, high speed network," said Jim Gagliardi, technical lead for ESnet's Operation and Deployment Group.

The project was a collaboration between the ESnet staff and those working for Linda Winkler at Argonne Laboratory and Phil Demar at Fermi lab. Winkler and Demar worked with a wide range of individuals and organizations to complete the build-out; these included Chicago transportation agencies, local state and city governments and telecommunications equipment vendors. Construction of the CHI-MAN was completed last December.

The CHI-MAN is one of the four Metropolitan Area Networks (MANs) that ESnet has helped build to support DOE scientists and their collaborators. The others are located in the San Francisco Bay Area (BA-MAN), Long Island in New York (LI-MAN, and E-LITE) and the partnership in the Mid-Atlantic region to connect to the Thomas Jefferson National Accelerator Facility in Newport News, Virginia.

The CHI-MAN is composed of multiple 10 Gbps optical wavelengths: four to carry normal Internet Protocol (IP) traffic and five to carry Scientific Data Network (SDN) circuit based traffic. Scientists use the IP traffic network for transferring smaller datasets, at gigabytes or less, while



they will employ the SDN network for larger jobs.

Fermi lab and Argonne Laboratory have additional circuits to boost the network's capability. Fermi lab is one of the two DOE Tier 1 labs that will receive data from the Large Hadron Collider (LHC) when it begins production later this year at CERN near Geneva. LHC is expected to produce roughly 15 petabytes of data

daily, making it a challenge to ensure trouble-free delivery from CERN to various research centers around the world.

In the United States, Fermi lab and Brookhaven National Laboratory on Long Island will be the Tier 1 centers that get the data directly from CERN. The labs will then distribute the experimental data to other research institutions both domestically and internationally.

About ESnet News

ESnet News is a quarterly that highlights the services and accomplishments by the staff of the Energy Sciences Network (ESnet), a high-speed communications network that serves more than 50,000 scientists and their collaborators at dozens of national labs and research centers funded by the U.S. Department of Energy. ESnet is headquartered at the Lawrence Berkeley National Laboratory. Learn about ESnet's services at <http://www.es.net>.

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