

Three DOE labs now connected with ultra-high speed network

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The U.S. Department of Energy (DOE) is now supporting scientific research at unprecedented bandwidth speeds – at least ten times faster than commercial Internet providers – with a new network that connects thousands of researchers using three of the world's top supercomputing centers in California, Illinois and Tennessee. The new network will be officially unveiled today in Seattle, Washington, at the gala opening of SC11, the premier international conference on high performance computing, networking, storage and analysis, where DOE researchers will use the network for groundbreaking climate data transfers and astrophysics visualizations.

"With the establishment of this high speed network, the United States is once again blazing a path for the future of Internet innovations," said Secretary of Energy Steven Chu. "Initially, this breakthrough will make sharing information between our labs much more efficient and pave the way for new discoveries, but it also holds the potential to change and improve our lives much like the original commercialization of the Internet did in the mid-90s."

The project, known as the Advanced Networking Initiative (ANI), was funded with \$62 million from the 2009 economic stimulus law and is intended for research use, but could lead to widespread commercial use of similar technology. The network now delivers data at 100 Gigabits per second (Gbps), making it one of the fastest systems in the world. It is the first step in the nationwide upgrade to the DOE's existing Energy Sciences Network (ESnet) and will serve as a pilot for future deployment

of 100 Gbps Ethernet in research and commercial networks. The initiative plans to accelerate by several years the commercialization of 100 Gbps networking technologies and uses new optical technology to reduce the number of routers used, as well as the associated equipment and maintenance costs.

The World Wide Web has its origins with high energy physicists at CERN who needed a better, faster way to share their data. Physicists in the United States, including Energy Department laboratories like Fermilab and the Stanford Linear Accelerator Center, were also among the earliest pioneers. If this network drives innovation that finds its way into widespread commercial use, it will be an example of history repeating itself. The need to share scientific data and linking computer networks together will likely drive the next generation of high speed Internet connection technology.

WHAT DOES 100 GBPS MEAN?

While the technology is advancing rapidly, the fastest commercial Internet providers use fiberoptic cables that enable a network to deliver about 10 gigabits per second. But that capacity must be split up among many consumers in the area, so a residential consumer might actually experience high speed Internet service in the range of 10 megabits per second. A megabit is one thousandth of a gigabit, so that's .01 gbps. In some areas, consumers on a more expensive service plan might get roughly .05 gbps. A 3G cell phone provides roughly 2Mbps for downloading data. A 100 Gbps network connection is therefore able to receive data about 50,000 times faster than your iPhone. Here's another way to look at it. In the roughly one hour it takes a typical home Internet connection to download an HD movie, the Department's network could download, for example, 20 years of data from the Hubble space telescope.

ABOUT THE ESNET NETWORK

DOE's Office of Science has for over 25 years provided the most leading edge network connectivity for science through ESnet, its national network that connects thousands of DOE researchers at more than 40 different national laboratories and supercomputing facilities, and links them to research partners around the world. This first stage of the network upgrade, which was completed today, connects DOE's three supercomputing centers – at Argonne, Oak Ridge, and Lawrence Berkeley National Laboratories. Over several months, ESnet will upgrade its core national network with 100 Gbps technology and provide 100Gbps service to additional data-intensive labs, enabling their science with greater speed, capacity and services for researchers. By the end of 2012, ESnet will further expand the network to link all of the DOE national lab sites, integrating them into the new 100 Gbps infrastructure. ESnet is managed by DOE's Lawrence Berkeley National Laboratory.

The goal of the research enabled by the network is to solve some of the most pressing challenges facing modern society. For example:

- Physicists seeking to understand the most basic building blocks of matter can access data generated by millions of atoms as they smash into each other deep underground at the Large Hadron Collider in Switzerland.
- Climate researchers hoping to better understand the extreme weather effects of climate variation will have access to some of the world's largest databases to improve the accuracy of their estimates.
- Researchers working on biofuels can access the DOE Joint Genome Institute's vast store of genomic data on energy-relevant microbes and plants.
- Computer scientists can perform national scale experiments with brand new [network](#) technologies with the goal of reinventing the structure of the Internet to provide a platform for new economic

opportunities.

Provided by DOE/US Department of Energy

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