

## Internet2's Dynamic Circuit Network Case Study: The LIGO Project at Syracuse University



The Laser Interferometer Gravitational Wave Observatory (LIGO) project was created to detect cosmic gravitational waves and to develop gravitational-wave observations as an astronomical tool. LIGO is funded by the National Science Foundation and operated by the California Institute of Technology and the Massachusetts Institute of Technology.

### The Problem

Research is carried out by the LIGO Scientific Collaboration, a group of nearly six hundred scientists at universities around the United States and in 11 other countries. Syracuse University researcher Dr. Duncan Brown is among the scientists involved in this global effort. His work requires occasional access to several terabytes of data from other remotely-located LIGO participants.

### The Solution

NYSERNet, which provides advanced networking for the New York research and education community, is deploying dynamic circuit networking capabilities throughout its region to support big-science researchers. In doing so, NYSERNet is connecting its infrastructure to the nationwide Internet2 Dynamic Circuit Network (DCN). This will allow users to set up short-term dedicated network paths on demand for high-performance data transfers like those associated with LIGO.

In contrast with shared IP-based networks, such as the commercial Internet, DCN offers greater control over dedicated network resources and enables demanding applications, like LIGO, to maximize their utilization of the network. DCN circuits can be set up quickly, in durations lasting from a few hours to a few weeks, to provide researchers with a flexible, cost-effective use of the resources.

### Better Use of Bandwidth

Bill Owens, director of advanced technology and networking for NYSERNet, believes that the LIGO project is tailor-made for DCN, and sees other application communities adopting DCN to improve their application performance and support better use of bandwidth on the network in the longer term. Today two NYSERNet member campuses are connected to the Internet2 DCN, including Syracuse University, while three others are in the process of installing a connection.

"At all levels—campus, regional and connections to national backbone—we are challenged by the presence of individual applications that have very high peak utilization, but only occasional needs," said Owens. "It's not cost effective for us to overbuild the network to support all of them, and then have the bandwidth go unused most of the time. Dynamic circuit networking offers us a platform to support those needs."

### The Result

NYSERNet is currently working with Internet2 Connector CIC OmniPoP, a networking collaboration of the large research universities in the Midwest that is centered in Chicago, as well as WiscNet, a research and education network in Wisconsin, to configure DCN connections between Syracuse University and the University of Wisconsin-Milwaukee. The connection will enable Dr. Brown to collaborate and share data with his LIGO colleagues at that site. The researchers are now working to test the connection and expect to begin sharing research data during the summer of 2008.

### About DCN

To learn more about what DCN can do for your campus, read the back of this page and visit <http://www.internet2.edu/network/dc/>.

# About the Internet2 Dynamic Circuit Network

Internet2's DCN is a revolutionary, optical circuit network for creating short-term circuits between end-users that require dedicated bandwidth, including reliable connections lasting from minutes to days.

## Why Should I Use DCN?

DCN provides flexible bandwidth for the most demanding applications. This is particularly useful for projects such as the Large Hadron Collider and other big-science efforts that can stress out the campus backbone for short but schedulable periods.

## How Does it Work?

An Internet2 member connects to the DCN through an Internet2 Connector. The DCN provides dynamic circuits across the Internet2 infrastructure to regional optical networks. This includes links to other national and global research networks like ESnet in the United States or GÉANT2 in Europe.

Seamlessly setting up optical circuits across independently operated networks requires the coordination of multiple administrative domains. Internet2's DCN uses control plane software to enable provisioning across domain boundaries with the appropriate authentication and authorization.

## How do I Get Started?

Researchers at Internet2 universities wishing to collaborate using the DCN should first contact their campus network organization for support. The campus network team can then determine if their

institution has an appropriate connection to an Internet2 Connector, or other regional network. If the Internet2 Connector has not yet established a physical connection to the DCN, a request for that connection should be made to the connector.

Once a connection is established, a request should be sent to [network@internet2.edu](mailto:network@internet2.edu). An Internet2 project manager will be assigned, and will work with the connector and the Internet2 Network Operations Center (NOC) to implement the required network connections and implementation of the software to ensure delivery of the service.

## Acknowledgments

Control plane software is under development through several on going projects, including the NSF-funded DRAGON project, the ESnet OSCARS program, and the GEANT2 AutoBAHN project. Other participants include the University of Southern California/Information Sciences Institute East (USC/ISI-East), Mid-Atlantic Crossroads (MAX), the University of Amsterdam, Nortel, and other regional and national networks.

## Connecting to DCN

