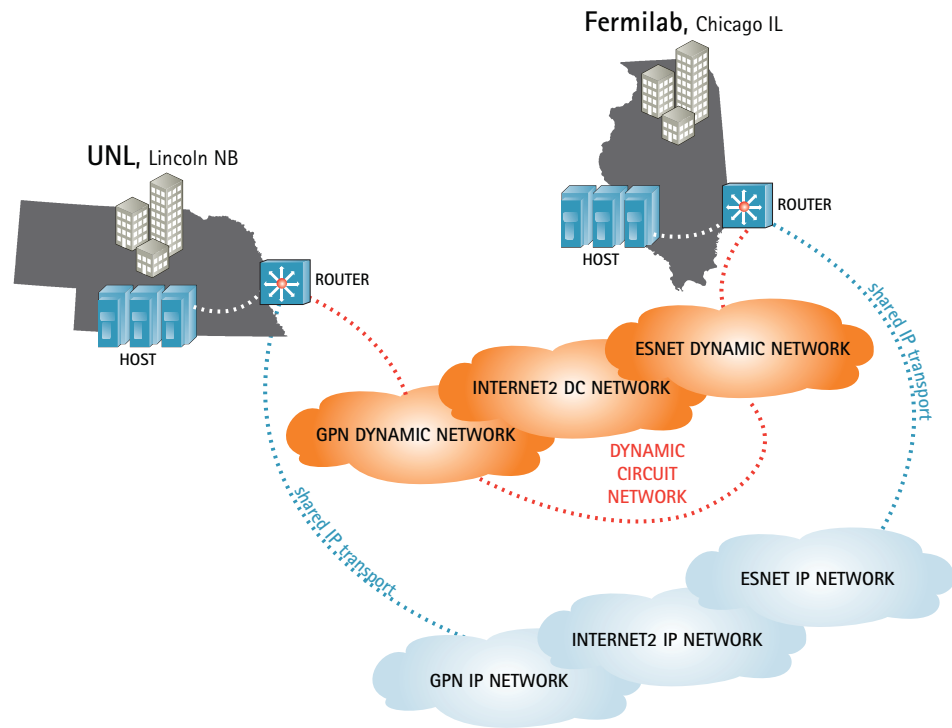


Overview: Internet2's Dynamic Circuit Network



The Internet2 Network

The Internet2 Network is a high performance, hybrid optical and packet network that provides advanced capabilities using inter-connected infrastructures. The infrastructure supports the IP Network which has traditionally been provided by Internet2 and the new Dynamic Circuit Network, which enables the set up and connection of short-term, point-to-point circuits.

The Dynamic Circuit Network (DCN) is provided by the Ciena equipment and is in an early developmental phase of adoption. Essentially, DCN is a switching service that creates short term circuits between users; as such, its value depends on having a set of users physically connected to it who want to make connections between each other periodically.

How does the DCN work?

The DCN enables users to create point-to-point circuits across Internet2 using control plane software to set up and tear down the circuits. Dynamic circuit setup is an automated process. A variety of control plane software is under development, building on the work of the DRAGON and OSCARS projects, with the goal of providing automated reservations in the future.

A user connects physically to the dynamic circuit infrastructure either as a single circuit to be switched, or as a point-to-point circuit that multiplexes multiple circuits over the physical connection. On request, a dynamic circuit is created across Internet2 from one user to the other, in standard SONET bandwidth increments up to 10 Gbps. Dynamic circuits have lifetimes ranging from a few minutes to a few weeks.

The figure illustrates a high level view of how

Internet2 Seeks DCN Early Adopters

To support the development, deployment, and use of innovative hybrid optical networking capabilities, Internet2 is initiating a no-fee trial of the Internet2 Dynamic Circuit (DC) Network. Interest is invited from any Internet2 Connector with a connection to the Internet2 IP Network.

Connectors selected to participate will receive a connection to the DC Network at the same bandwidth as its IP Network connection at no additional cost. The timing and scope of the trial connections will be managed based on the limited resources available to support participants. The DC Network is currently in a developmental stage through the end of the calendar year. It is expected to provide persistent services to applications beginning in 2008. The trial will run through the end of 2008.

The Internet2 DC Network provides the ability to set up dedicated circuits within seconds that last for hours. Initially, circuits may last for several days, though as use of the DC Network increases, the maximum time for a circuit is expected to decrease. The circuits are provisioned across the new nationwide Internet2 infrastructure based on the switching capabilities of the Ciena CoreDirectors and can vary in standard SONET bandwidth increments to 10 Gbps. The control-plane technology and protocols used to implement the circuits are based on work in the DRAGON project, the HOPI project, and others.

Additional information about the DC Network is available at: <http://www.internet2.edu/network/dc/>

All interested parties should send email to network@internet2.edu



a connection might be made between the University of Nebraska-Lincoln (UNL) and Fermilab using the Internet2 DCN infrastructure in combination with circuit infrastructures of Great Plains Network (GPN), which is the Internet2 Network Connector for UNL, and the Department of Energy funded, Energy Sciences Network (ESnet4's Science Data Network).

In this scenario, a researcher at UNL, a CMS Tier2 site engaged in CERN's Large Hadron Collider experiment, is receiving periodic 8.5 Gbps downloads from Fermilab, a Tier1 site. Rather than potentially impacting UNL users of the IP network with large CMS data flows, a short-term, dynamic circuit is established across domains to handle the traffic. The CMS traffic is switched from the shared IP path onto a dynamic circuit, and an entire 10 Gbps path is now devoted to this application.

Physical connection to the Ciena equipment, which is provided at an Internet2 PoP, may be Ethernet – with or without VLANs – or SONET. Circuits that cross Internet2 are segments of longer point-to-point circuits, including segments in regional optical networks (RONs) other provider networks (such as ESNet in the U.S. or GÉANT2 in Europe) and Internet2. When setting up such short-term, cross-domain circuits, coordination with each of the domains is required to "stitch" together the segments from each domain into an end-to-end circuit. Internet2, with their partners, has developed software to set up cross-domain connections automatically. Collaboration with others developing such software will lead to the ability to create multi-continent circuits automatically.

To make cross-domain connections Internet2 Network Connectors and user organizations will need appropriate control plane software compatible for their switch. Internet2 provides an experimental open source version of such software, which is being used by the Internet2 DCN. This software allows circuits to be made by network administrators and/or directly by applications. Control plane software is under development through several on-going projects including DRAGON, OSCARS, and AutoBAHN projects with resources from organizations including Internet2, ESNet,

DANTE (GÉANT2), the University of Southern California/Information Sciences Institute East (USC/ISI-East), Mid-Atlantic Crossroads (MAX), and others.

How to connect to DCN?

Connecting Internet2 Network Connectors
The first part of this process is the establishment of a physical connection at both ends of the desired circuit. To start this process send a request to network@internet2.edu. An Internet2 project manager will be assigned to this request, and work with the Internet2 Network Connectors at both ends and the Internet2 Network Operation Center to implement the physical connection to the DCN infrastructure.

Once this physical connection to the DCN infrastructure is established, a connector can create end-to-end circuits with any other similarly connected dynamic network.

The next part of this process is for the connector to install and run control plane software on their switch. This software interacts with the Internet2 DCN and enables the creation of an end-to-end dynamic circuit.

Connecting Researchers
Researchers at Internet2 member institutions wishing to collaborate using the DCN would contact their campus network organization for support. First, the campus network team would find out if their institution has a connection to an Internet2 Network Connector or RON (at minimum a connection to the Internet2 IP Network).

Next, has their connector established the physical connection to the DCN? If that is not available, a request for that connection should be made to their Internet2 Connector or RON. (This needs to be done for both ends of the path.) If assistance is needed at this step, please send an email to network@internet2.edu.

Once the connector accepts the campus request, the connector will send a DCN connection request to network@internet2.edu.

After the physical connection to the DCN is made, and the connector has installed and run the control plane software, the connector and the campus network team would work together to bring that DCN connectivity to the campus.