

Leveraging National LambdaRail: The Road to RON

In the May/June 2005 *EDUCAUSE Review* New Horizons column, Steve Corbató and Steve Cotter reported on the higher education opportunities presented by the availability of dark fiber and the rise of Regional Optical Network (RON) initiatives across the country. Spawned by National LambdaRail (NLR), RON initiatives are under way in Florida, Texas, Oklahoma, Louisiana, Virginia, New York, New Mexico, and Colorado, while significant expansions of existing RONs are being undertaken in Georgia, Washington, and California. Thus, the higher education regional networks that were so critical to the success of NSFNET over a decade ago are now reemerging, but with a difference. These optical-network-age regional efforts are better organized, have stronger financial underpinnings, and reflect a greater comprehension of complex telecommunications industry and market-based issues. Most important, these regional efforts enable the design and implementation of networks over physical communications infrastructure optimized for research and education (R&E) applications.

Just as NSFNET redefined the R&E networking future with the subsequent morphing into the Internet, the explosion of RONs—connected via a very high-speed national and international networking infrastructure—holds the potential to redefine many aspects of business and higher education in the United States today.

The Florida Model

Despite the fact that Florida is home to a number of top research universities and facilities, the major R&E networks did not establish significant presences within the

state in the past. One reason is the sheer geography of Florida: as a peninsula, the state is not exactly on the path to anywhere else in the country. Another reason is that there was nothing to connect to because of a lack of state support for building the kind of high-performance networking infrastructure that could take advantage of a direct connection to one of the major R&E networks.

This was not for a lack of trying. In the mid-1990s, the state-funded universities mounted a concerted effort to leverage the existing state-funded K-12 network (FIRN, Florida Information Resource Network) by expanding its bandwidth and funding to support higher education R&E needs. But this effort failed to garner legislative support. Next, the Internet2 initiative in the late 1990s offered another chance for the state universities to band together and build a high-speed networking infrastructure by forming the Florida GigaPOP. Yet before this investment could be leveraged by the limited number of Internet2 players in the state, the Abilene opportunity redefined the Internet2 value proposition. Although Abilene has been a very positive and highly successful initiative, it undermined the financial basis for the operation of the Florida GigaPOP.

In late 2002, several Florida university CIOs first became aware of the NLR initiative. Because of prior interest in and efforts toward establishing a high-speed R&E network in Florida, they were attuned to the kind of opportunity envisioned. Consequently, in three business days, several public and private institution CIOs were able to garner executive management support for pur-

suing a Florida node on the proposed NLR infrastructure.

The CIOs were able to garner that support *despite* the fact that a high-speed network in Florida did not exist to connect to the proposed NLR node. By making the moral commitment to support such a node, the CIOs were also committing themselves to defining and building a network in Florida—without any notion as to how they would do so or what it would cost. This is a real tribute to the university executives' vision and to the leadership of the campus CIOs—they immediately grasped the strategic importance a Florida node would have for each institution.

Leveraging NLR

The NLR initiative served as a catalyst for the creation of Florida LambdaRail (FLR). The launch of NLR focused attention on the dark fiber opportunity and provided a context, rallying point, and timeframe that the CIOs could use to bring together the consortium. The sense of a window of opportunity that would be open for only a limited time also galvanized the consortium to proceed as best it could with its own resources and to hope for—but not depend on—state support, which had been notably lacking up to that point.

With no history or experience in doing this kind of thing, the Florida CIOs leaned heavily on NLR for organization and governance models. They were able to leverage the Internet2 FiberCo initiative for the fiber routes (from Level 3 Communications) needed to cover the large distances in the state. In addition, Cisco's strategic relationship with NLR laid the foundation for an analogous strategic relationship with FLR. Cisco's

senior leadership and executive management team understood and supported the integral role that the RONS would play in the new NLR infrastructure. Finally, the NLR infrastructure allowed FLR to gain access to the network services its member institutions would need to justify their investment and provide a return by flattening the growth curve for their respective networking costs.

Via FLR and NLR, Florida has redefined the value proposition for high-speed networking for its universities and is providing faculty with capabilities that could not even be fantasized about just three years ago.

FLR

In May 2003, FLR LLC was established as a private not-for-profit limited liability company. An application for tax-exempt status was filed with the IRS, but as of May 2005, it had not yet been granted. Ten Florida universities participate as equity members in the corporation: Florida Atlantic University (FAU), Florida Institute of Technology (FIT), Florida International University (FIU), Florida State University (FSU), Nova Southeastern University (NSU), University of Central Florida (UCF), University of Florida (UF), University of Miami (UM), University of North Florida (UNF), and University of West Florida (UWF). Based on size and level of interest in participating in NLR and in other national research activities, equity member institutions were able to purchase from one to four units of ownership.

FLR operates as a highly outsourced company. There are no employees; support services such as administrative, financial, legal, and network operations are contracted out, primarily with the member institutions. Oversight is centralized and invested in a board of directors.

By deploying more than 1,540 miles of dark fiber, the FLR network infrastructure provides a statewide, dedicated optical data facility linking the major nodes located in Pensacola, Tallahassee, Tampa, Miami, Orlando, Gainesville, and Jacksonville, as well as the NLR nodes located in Jacksonville and planned for Pensacola. FLR utilizes Dense Wave Division Multiplexing (DWDM) technology enabled by Cisco 15454 Long Haul optronics, which can support up to thirty-two channels

(waves or separate networks). Each wave can support transmission speeds of up to 10 Gigabits (Gb) per second. Multiple waves along the various network segments support primary and secondary access for each member, and dedicated waves support research activities.

The mission of FLR is to provide a high-performance experimental, research, and production networking and support infrastructure that will enable member higher education institutions and their partners to participate in advanced research, education, and economic development activities. Network participants are able to gain access to the FLR infrastructure to conduct research requiring extremely high bandwidth. FLR offers both dedicated and shared (bandwidth-on-demand) 10 Gb Ethernet or 1 Gb Ethernet high-performance data circuits. Additionally, connections to the NLR infrastructure, the Internet2 Abilene Network, commercial Internet Service Providers, transport between member institutions, peering between FLR and other data networks, and dedicated wavelengths between FLR and NLR members are possible.

FLR is operational and offers several advantages for Florida higher education entities: a reliable and flexible network infrastructure that can grow and incorporate technological advancements; enhanced network performance and bandwidth capabilities; and collaboration, advanced communication, and research among participants in ways not possible using previous networks. Several participants are actively leveraging the FLR infrastructure to support their networking needs:

- The transfer of large data files multiple times a day from the National Center for Atmospheric Research (NCAR)
- Navy-sponsored research on the impact of hurricanes, tornadoes, and thunderstorms on the natural environment and man-made structures
- Large-scale simulations
- Enhanced distance-learning capabilities
- Very large data file transfers from the new high-energy physics facility at CERN
- Innovative research collaborations spanning national and international participants

As an example of the last item, physicists at the University of Florida, Florida International University, and the California Institute of Technology are able to share data samples ranging up to 100 Terabits (Tb) in size. This is possible because of 10 Gb/sec waves—from Los Angeles to Chicago, Chicago to Jacksonville, Gainesville to Jacksonville, and Miami to Jacksonville—that connect with the Internet2 Abilene Network and the NLR infrastructure.

Just as NLR served as a catalyst for FLR, FLR is serving as a catalyst for metro networking initiatives. In Tallahassee, a new fiber ring is being completed to connect local higher education entities and connect to the FLR POP. The Miami-area FLR members have all connected to the NAP of the Americas for their FLR connection. Pensacola is planning a local fiber ring similar to that of Tallahassee.

Looking Ahead

This column has outlined how leading research universities in Florida have leveraged NLR to capitalize on the dark fiber opportunity. FLR provides its members with the ability to tap the huge capacity of fiber-optic networks and create less expensive and more flexible collaboration and partnership models that essentially eliminate the issues of bandwidth and “place.” Having established a foundation for the next-generation networks needed to support large-scale research, education outreach, public/private partnerships, and new models of collaboration while providing the requisite IT infrastructure vital to economic development, FLR serves as an important model for the reemergence of regional optical network initiatives across the nation.

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