

Americas Issue:

## Technologies@Work: Florida Lights Up

*Universities combine to morph into a statewide optical-based carrier.*

by Sam Masud

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Technologies@Work

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Larry Conrad admits that when a colleague first alerted him about the National Lambda Rail (NLR) two years ago, he hadn't even heard about the project. Now, if all goes well, the NLR, a nationwide optical network, will have soon have a node in Jacksonville, Fla., that will serve as the connection point for the Florida Lambda Rail (FLR), of which Conrad is the chairman.

Though it is the financial sector that is often cited as a leader in deploying metro optical networks, the FLR and the NLR have taken the concept and extended it to meet the regional and nationwide needs of universities and other research facilities for high bandwidth.

For Conrad, who is also chief information officer of Florida

State University, it took a leap of faith to make the financial investment in these networks. With no promise of taxpayer funds in the pipeline, FSU and eight other major public and private universities in Florida have committed to chip in money for an NLR node in Jacksonville although none of the nine members of the consortium is located there and the statewide FLR is yet to be built. "We would love state funding, but strategically this is too important to our future, so somehow we've got to find a way to make this happen," says Conrad.

These FLR member universities have signed on to build a statewide fiber network at an estimated cost of \$20 million, money they consider sufficient to acquire the fiber and light up a single 10-Gbps wavelength for a shared IP network. However, the Cisco ONS 15454 systems they will be using can provide up to 32 such wavelengths over a fiber pair should the added capacity be needed.

Each campus will have from 1 Gbps to 10 Gbps access to the FLR, which in turn will link at 10 Gbps to the NLR's Jacksonville node.

The FLR members also are contributing at least \$5 million toward the \$80 million that is expected to be needed to light up four 10-Gbps wavelengths across the NLR to which other regional optical networks similar to the FLR will be connected. The building of these regional optical networks and the NLR are also closely linked to the efforts of Internet2, a non-profit group representing more than 200 universities around the country as well as other interested entities, including vendors such as Cisco, Juniper and Nortel as well as carriers such as Qwest, Level 3 and Wiltel. These universities have access to the Internet2 consortium's Abilene network, a dedicated 10-Gbps IP network built with Juniper Networks' T-640 routers operating over Qwest's SONET backbone.

Touted by the Internet2 as the premier research and education network in the country because it leverages optical, middleware and IPv6 technologies, Abilene connects to other research networks such as the government-funded Energy Science Network, the NASA Research and Education Network, and the Defense Engineering and Research Network. Internet2's pledge to contribute \$10 million to the NLR gives it the right to a single 10-Gbps wavelength across the NLR's footprint.

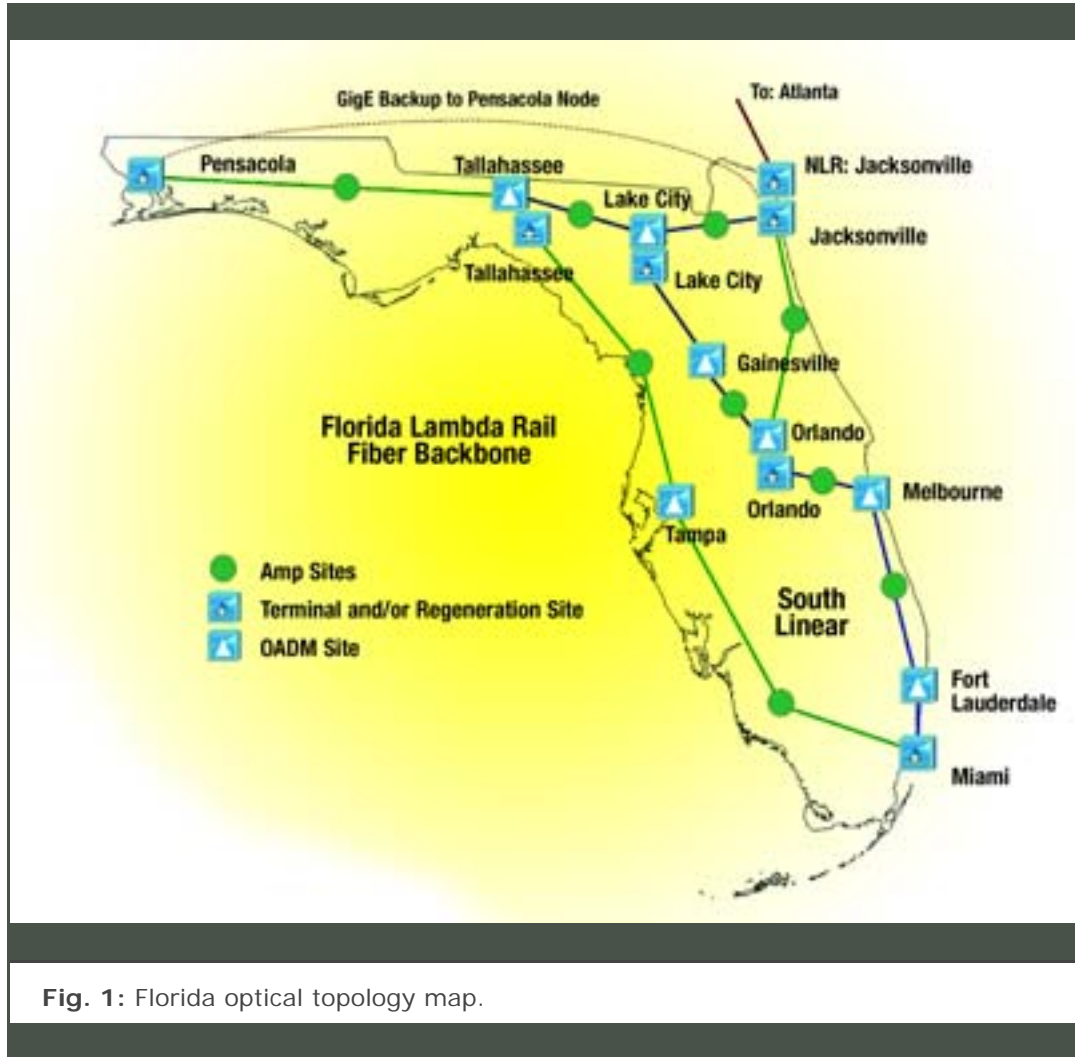


Fig. 1: Florida optical topology map.

Dark fiber for the NLR and the various regional optical networks has been acquired from Level 3 Communications under long-term agreements with National Research and Education Fiber Company (Fiberco). A limited liability corporation founded by Internet2, Fiberco, essentially playing the role of a broker, took advantage of the downturn in the telecom industry to acquire about 5,600 route miles of Level 3 fiber, most recently more than 1,500 route miles for the FLR. In effect what this marks is the emergence of the education sector pooling resources to become its own telecom company.

Although Level 3 is the preferred fiber supplier to Fiberco, Steve Corbato, president of Fiberco and director of network initiatives for Internet2, says that Fiberco may also look beyond such well-known carriers — for example, to utility companies — since universities typically tend not be located in the NFL cities, the markets most often targeted by these carriers. “This is one reason why we created Fiberco: To be able to go to non-traditional sources for fiber,” says Corbato. He conservatively estimates that overall the research and education community has purchased more than 27,000 route miles of fiber. Carriers, he says, like doing business with this sector because “we pay our bills.”

For the nine Florida universities the increased bandwidth — from 100 Mbps access to the Abilene network to 10-Gbps connectivity to the FLR — will enable researchers in multiple locations to share work and interact in real-time through audio, video, shared whiteboard etc., link computation resources with remote users and other computers, exchange very large files at high speeds, offer distance learning over the Internet, and serve as a reliable and flexible infrastructure that can grow and incorporate technological advancements. Various disciplines such as physics, computer sciences, bio-informatics, medicine, meteorology and oceanography require a grid of information and computing resources that are beyond the boundary of any one campus, and for which multi-gigabit are needed.

While it’s still unclear where all of the money for the FLR will come from, member universities expect that some IT funds will be freed by using the FLR to aggregate access to the Abilene network as well as the commodity Internet. “We’re committed to finding some way to make this happen,” says Conrad, who anticipates seeing the FLR fiber lit by mid-2005.

The NLR, however, has something even more ambitious in mind for the future since the Abilene and the FLR networks each offer a shared 10-Gbps IP fabric. “A routed infrastructure doesn’t provide the needed throughput because each layer of the IP stack adds overhead, and so the best you can get is about 6 Gbps. That’s impressive, but that’s not 10 Gbps,” says Conrad. Because the NLR/FLR will also support Ethernet services, the plan is to enable nationwide Ethernet. Plus, in the future, the traffic will be switched purely at the optical layer within the network.

“Ethernet is the next goal, but even at Layer 2 there is too much overhead, and that’s why we’re talking about an switched optical network at some point,” says Conrad.

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Sam Masud is a contributor to Telecommunications® magazine.

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