



Revisiting the Spec: The Underpinning of Network Infrastructure Modernization



*Florida Institute
of Technology*

Founded in 1958 to provide advanced education for professionals working in the space program at what is now Kennedy Space Center, Florida Institute of Technology (Florida Tech) has increased in size and reputation to where it now serves 16,000 students and is ranked among the top 20 best small universities in the world according to Times Higher Education's World University Rankings. With the increasing enrollment and subsequent expanding campus has also come the demand for both faster network speeds and pervasive wireless.

As a leading engineering technical university, Florida Tech acknowledges the importance of maintaining a high quality IT infrastructure to support advancing technology and remain competitive. In response, the institute is embarking on a network cabling infrastructure upgrade across its campus of nearly 75 buildings. At the same time, Florida Tech has been challenged with connecting directly to the Florida LambdaRail education network and setting the foundation to remain technologically competitive.

Having seen various infrastructure standards come and go over the past few decades, Florida Tech did not want to build yet another building or remodel yet another space amidst the headache of mismatched components and performance uncertainty—especially considering the proliferation of power over Ethernet (PoE) to more devices than ever before, imminent plans to build a new state-of-the-art data center, and the need to upgrade its telephony system and expand its wireless footprint.

Throughout the process of analysis and evaluation, Florida Tech has ultimately discovered that revisiting the cabling specification and settling on a single high-performance copper and fiber cable and connectivity solution would ensure a higher quality end-to-end infrastructure with application assurance, better pricing and availability, more efficient inventory management, ongoing technical support and ultimately easier upgrades.

Time for a Refresh

As is the case with most colleges and universities today, the availability and speed of the campus-wide network is critical to remaining competitive and attracting the best students, with pervasive Wi-Fi as one of the top demands among students. Florida Tech is no exception. Just a few years ago, the campus offered very limited Wi-Fi and some buildings were still wired with outdated category 3 twisted-pair copper cabling. With a maximum frequency of just 16 MHz, category 3 cables can only handle network speeds of about 10 megabits per second (Mbps), which can require nearly an hour to download an average 4.5 gigabyte video. Colleges and universities ranked by the Princeton Review as “connected campuses” are no longer based on every dorm room having its own phone line like they were two decades ago. Considered the benchmark by which many students evaluate their choice of higher education, the Princeton Review now bases their ranking on factors such as the level of wireless network access and bandwidth, as well as technology services such as remote access to email and online course offerings and administrative and registration functions.

“Like most universities, our network definitely needed a refresh, including upgrading from traditional PBX telephony and overhauling our network security. From a student perspective, the expectation for pervasive Wi-Fi is the biggest driver—lack of Wi-Fi in any area on campus is the number one complaint we see from today’s younger demographic who, on average, all carry a minimum of two devices,” says Eric Kledzik, CIO and Vice President for Information Technology at Florida Tech. “Everyone today is looking at technology, and we need to keep up.”

To improve communications, support advancing technology and enable pervasive Wi-Fi and higher speeds across campus, Florida Tech realized the need to upgrade cabling infrastructure across campus from existing category 3, 5 and 5e cabling to category 6 cabling capable of supporting speeds of 1 gigabit per second (Gbps).

Eliminating the Hodgepodge

While Florida Tech has a list of preferred contractors, over the years those contractors have quoted a variety of cable and connectivity solutions for the infrastructure. As a result, Florida Tech ended up with a hodgepodge of inventory and mismatched components. For in-house smaller projects and moves, adds and changes performed by the institution’s own infrastructure team, this hodgepodge of components caused headaches.

Having a variety of products can be extremely frustrating for campus technicians. While cables and connectors may all be interoperable and standards based from a performance standpoint, components like patch panels and faceplates are typically designed to work with their specific manufacturer’s connectors. “When you need to replace a jack and it doesn’t fit in a faceplate, it can be a frustrating and time-consuming process for our team,” says Hilary Schrey, Operations Manager for Florida Tech Telecommunications Department, which is responsible for establishing cabling plans for new buildings and remodels, as well as assuring that all cabling standards are in compliance and overseeing quality assurance.

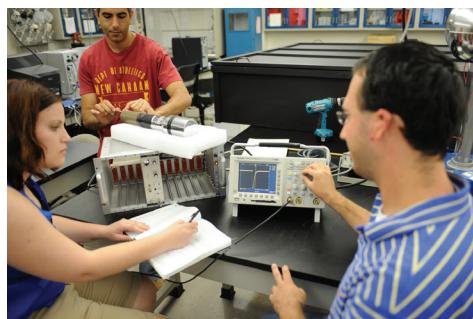
In addition to mismatched components, Florida Tech acknowledges that certain products are tuned to work together in way that can exceed standards-based performance parameters and provide more headroom. In contrast to mixing and matching various components, end-to-end systems also typically come with a warranty and a certain level of application assurance. Overall quality and reliability can also vary from system to system, not to mention price.

When it comes to selecting an end-to-end system, one of the more difficult tasks is sorting through the manufacturer-provided data, including independent test results, warranty claims and available support services. While independent testing goes a long way to ensure validity of performance claims, it leaves some holes. For instance, results can be based on different channel lengths and manufacturers can choose to hand pick the components used in the testing or use pre-terminated solutions rather than field termination. Unless testing procedures mimic typical field installations, such as testing components procured through distribution and terminated on site, performance values in independent test reports may not be representative of actual field performance. While some institutions perform their own “bake-offs” rather than relying upon independent test reports, having several different components already installed across campus allowed Florida Tech to see firsthand how the various systems performed in a real-life scenario.

At a time when Florida Tech did not have a standard in place, SENA-TECH, one of the institute's preferred low-voltage installers responsible for much of Florida Tech's network infrastructure upgrades and new builds, chose to deploy higher quality infrastructure components that offered superior performance. This ultimately demonstrated that quality and performance matter when striving to deliver a certain level of network service to students and staff.

"We have had various standards in place, and a significant portion of our network was made up with components from one manufacturer whose pricing worked well for us," says Schrey. "But in some locations, we saw that network links comprised of the higher-end components were outperforming the others and providing us with more headroom. In those locations, we did not have to drop below the level of service that we were aiming to deliver." Having enough headroom was especially a concern for longer links and environments subjected to interference from electrical transformers and other equipment.

Beyond the Headroom



While Florida Tech recognized the higher performing areas of the network, there were some limiting factors that prevented them from standardizing on the higher performing systems, primarily concerns surrounding pricing and availability. SENA-TECH and the manufacturer of the higher performing products worked together to address Florida Tech's concerns, including working with the local distributor to establish special fixed pricing and inventory that allowed Florida Tech to stay within budget and ensure available product when needed.

While network performance, pricing and availability are the top concerns when it comes to specifying one manufacturer's components, other considerations include the quality and availability of training programs, value-added support services and warranties. Services such as design assistance, contractor

referrals and installation audits can also be beneficial to educational institutions—and when these services are developed and funded by the manufacturer rather than fee-based; it shows a certain level of customer support and commitment. These services can especially be of value when an institution is planning a significant upgrade or new build. With several major projects on the horizon, including a brand new data center, Florida Tech realized the benefit of partnering with a manufacturer who was committed to helping them throughout the entire process.

In addition to design services, the manufacturer provided certified installer training for Florida Tech's infrastructure team. "We enjoy partnering with institutions who take an active role in fully understanding the various components that make up their network infrastructure," says John Kwong, technical Consultant for Siemon who provided the on-site training. "One of the main advantages of certifying Florida Tech's IT staff is that it allows the institution to conduct their own moves, adds and changes and still maintain the system warranty."

"With much of their inventory consisting of another manufacturer's cable and connectivity, I remember Florida Tech at first being hesitant about revisiting their spec. But with our continued advocacy for higher performance components and the ability to work with the manufacturer and distribution to deliver the right pricing and availability, the institute took a closer look at the additional value-added services available and realized that the decision was a no brainer," says Steven Terry, owner of SENA-TECH, one of the institute's preferred low-voltage installers responsible for much of Florida Tech's network infrastructure upgrades and new builds. "And it wasn't just the design services, training and warranty that impressed them. There was also the fact that the manufacturer is a family-owned company with components made in America, and they really demonstrated an interest in helping Florida Tech fulfill their future technology plans and goals."

In addition, a breadth of product was also part of the decision to revisit the spec and settle on a single end-to-end system. One area on campus that needed an infrastructure upgrade included the Clemente Center. Home to the Florida Tech Panthers, this state-of-the-art athletic facility includes several areas subjected to harsher elements. For example, rolling network equipment carts for outdoor events need to plug into outside weather-tight connections for network access. Thankfully the manufacturer also provided ruggedized fiber and copper solutions with connectors and patch cords that provide an IP66/IP67-rated seal to protect plugs and outlets. Offering total protection against dust and water ingress, the IP66/IP67 rating is a standards-based rating for ingress protection (IP) developed by the European Committee for Electro Technical Standardization (CENELEC).

Progress Well Underway

Florida Tech is now well on their way to completing a campus-wide infrastructure upgrade to category 6 cabling and 1 Gbps speeds to client devices, including the brand new 11,500-square-foot Student Design Center for Florida Tech's Colleges of Engineering and Science. Throughout the campus, the cabling is being used to connect everything from the new unified telephony platform, computers and wireless access points, to surveillance cameras, access controllers and even building automation controllers. Many of the devices, including all of the new VoIP phones and wireless access points, are also remotely powered over the cabling using PoE technology.

"We are rolling out a lot more PoE than ever before," says Scott McGill, senior network engineer for Florida Tech. "That is yet another reason why we needed to revisit our spec and settle on a single higher-performing cabling solution that is better able to handle the remote power delivery without impacting data transmission."



While category 6A cabling is the latest standards-based cabling available to support speeds of 10 Gbps, Florida Tech does not yet have the need for these speeds to the desktop or end device. "Currently, everything we do in the horizontal infrastructure is fully supported by category 6 cabling and 1 gigabit speeds to all client devices. We also have a 10 gigabit backbone fiber ring between core switches," explains McGill. "When we need to deliver 10 gigabit speeds to the desktop, we will then need to upgrade our core switches and backbone speeds. Given our needs, renovation timeline and expected infrastructure lifespan, we are at least 5 to 7 years out from needing to upgrade." Pathways at Florida Tech would also need to be upgraded in many locations to support the larger diameter of category 6A cable.

Supported by the cabling upgrade, Florida Tech has also made significant progress in improving Wi-Fi access across campus. While they have successfully increased the number of wireless access points from 325 to approximately 1400, students are still demanding Wi-Fi in more unusual spaces, which does present a challenge moving forward.

"When it comes to student demand, it's all about Wi-Fi and many of our wired connections go unused. We now have Wi-Fi access for all indoor locations and outdoors in common areas," says McGill. "We are doing our best, but deploying prevalent outdoor Wi-Fi in additional uncommon areas is a bit trickier as it can be difficult to find a means for mounting and connecting wireless access points and delivering power."

Florida LambdaRail



One of Florida Tech's biggest technology projects currently taking place is the deployment of fiber from the campus to the Florida LambdaRail (www.flrnet.org), an independent research and education network. Florida LambdaRail is owned and operated on behalf of partner institutions, including Florida Tech who is an equity partner in the network and currently sits on its Board of Directors. The Florida LambdaRail provides an ultra-high speed, interconnected, broadband service delivery network that enables Florida's higher education institutions and partners to collaborate, connect, utilize and develop new innovative broadband applications and services in support of scientific research, education, and 21st century economy initiatives.

"Internet service providers are no longer interesting in selling dark outside plant fiber links, and we are currently paying a transfer fee to use someone else's fiber. So we essentially need to become a private utility and deploy institution-owned direct fiber links to the Florida LambdaRail network," says Kledzik. "The LambdaRail network is rated for 100 gigabit capacity—it's where we get our Internet service and how we communicate with other universities."

This significant undertaking involves the deployment of approximately 17,000 feet (more than 3 miles) of 24 strands of outside plant singlemode fiber from the campus to the closest LambdaRail connection point. "Deploying outside fiber links involves underground directional boring and a lot of logistics coordination with the city of Melbourne and Florida's department of transportation," explains SENA-TECH's Steven Terry. "We are installing building and the main feed to the LambdaRail, and we have to be very careful to stay away from other underground services, such as gas, water and other fiber links." Considering the disruption and cost to deploy more than three miles of underground fiber, Florida Tech has ensured a future proofed installation, using just one of the four conduits for current needs and saving the remaining three for the future.

With their revised spec in place that standardizes on a single high-performance cabling system with a variety of value-added services that includes data center design services, Florida Tech's next big project is already on the right path. Over the next few years, the institute will embark on building a brand new modern data center from the ground up, which will consolidate many systems, improve the overall performance of the network and provide the scalability for the institute to continue keeping up with technology. The data center will also be a key showcase for the institute and included in future campus tours.

"While we are still a ways out from completion of the new data center, our decision to revisit the spec has already paid off," says Kledzik. "The same manufacturer of the higher quality components actually had one of their data center experts come to our facility to help us with the planning and design of the new data center and to highlight some key considerations that will help ensure scalability, performance and reliability. We have never received that type of service before from a network infrastructure provider."

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