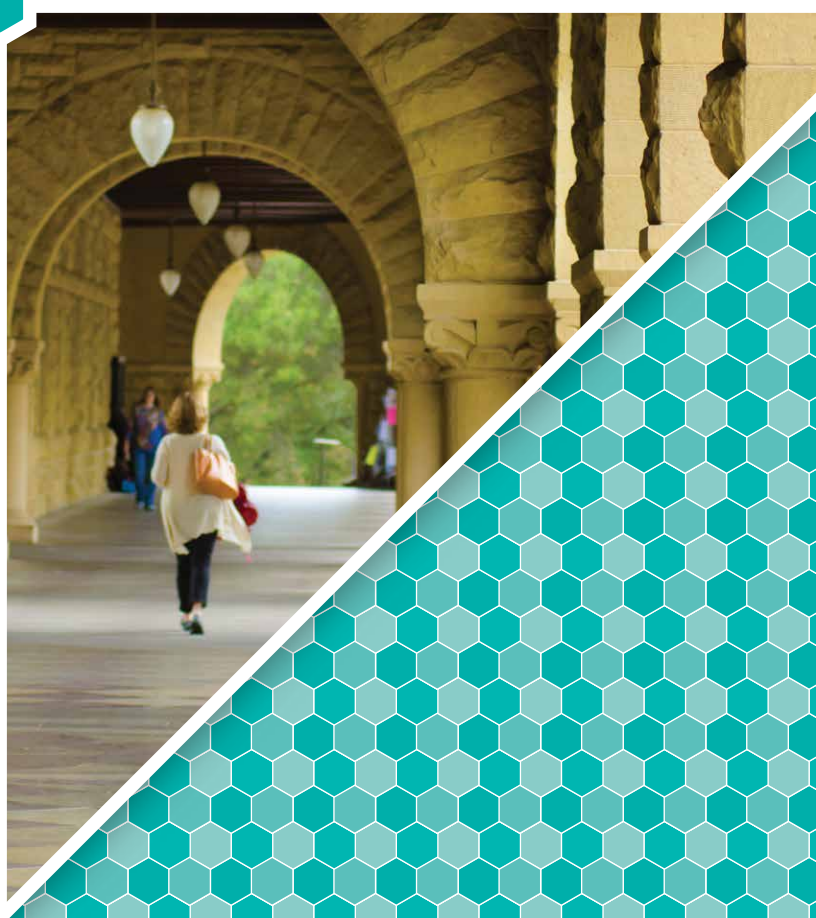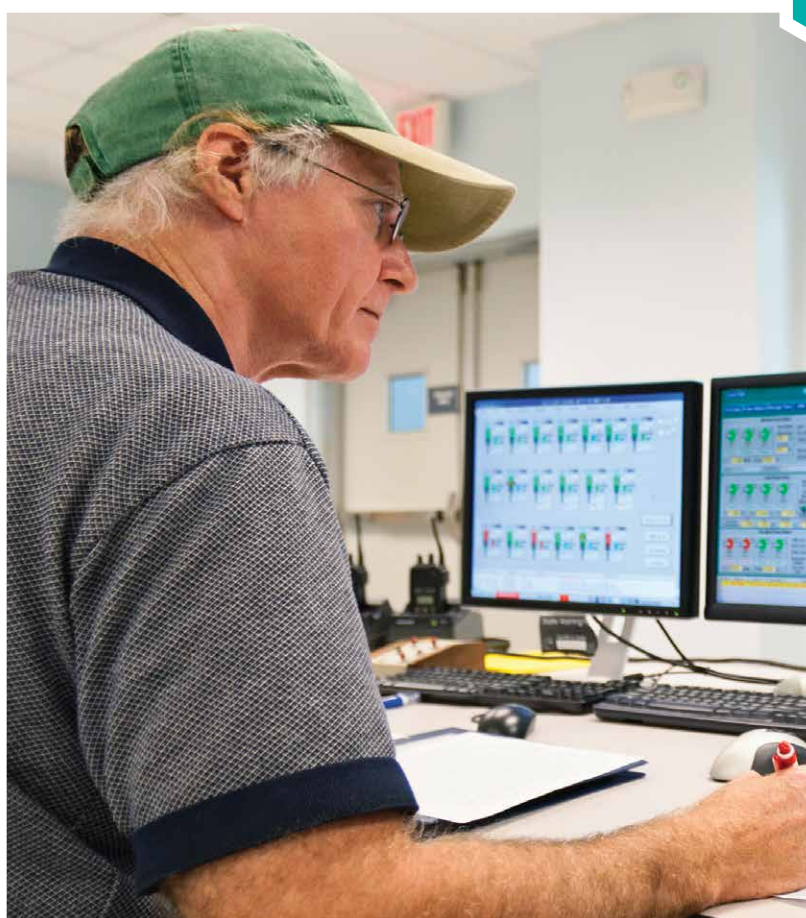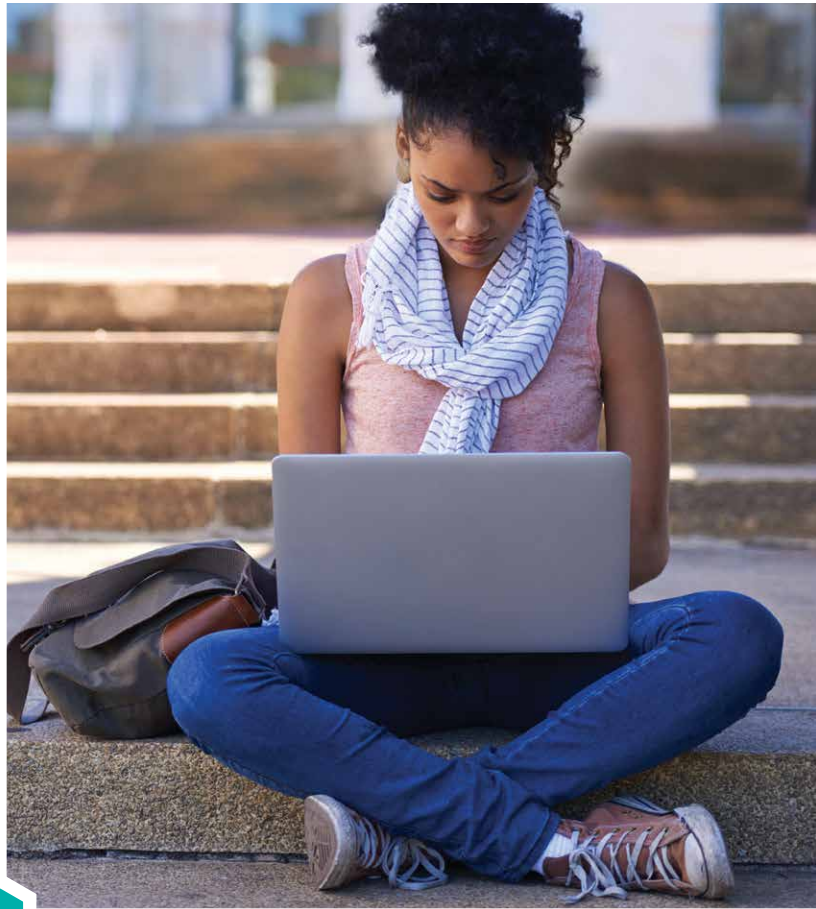**OARnet**
An OH·TECH Consortium Member

Annual Report 2015–16

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Chancellor John Carey directs the Ohio Department of Higher Education and oversees the strategic initiatives of the Ohio Technology Consortium and its member organizations in support of the state's technology infrastructure needs.

"OARnet connects millions of Ohioans, enabling them to communicate, learn, collaborate and innovate in many new and exciting ways."

— *John Carey, Chancellor, Ohio Department of Higher Education*

OH·TECH | Ohio Technology Consortium
A Division of the **Ohio Department of Higher Education**

The Ohio Technology Consortium (OH-TECH) serves as the technology division of the Ohio Department of Higher Education and comprises a suite of technology and information member organizations unsurpassed in any other state: OSC, OARnet, OhioLINK and eStudent Services. Their consolidation under the OH-TECH banner allows each organization to pursue assorted synergies and efficiencies.

OARnet

Connect. Aggregate. Collaborate. Our powerful trilogy of goals provides the necessary technology infrastructure to assure a prosperous economic future for Ohio and beyond. At the Ohio Academic Resources Network (OARnet), we connect our clients—found throughout education, healthcare, public broadcasting and government—by increasing access to affordable broadband service. We reduce the cost of vital technologies for our members through aggregate purchasing. We collaborate with peers locally, within the state, across the country and around the globe to spur communication and collaboration.

From the director

I've been at OARnet for 20 years, and during my tenure we have endeavored to keep current and relevant, experiencing a significant degree of transformation, especially over the last few years. In 2012, we upgraded our statewide network backbone to 100 gigabits per second. In 2014, we began the process of adding 3,500 additional customers as we welcomed aboard agencies of the state of Ohio and developed OneNet. And, this year, to better address changes in client usage and fluctuating enrollments, we adjusted our decade-old pricing model to focus more on services delivered rather than enrollments reported.

We accomplished all this through engagement with you, the OARnet community. Throughout this evolution one thing has remained constant—the critical roles people play. OARnet is an organization that has always determined its path moving forward by first listening to what our members tell us about their needs, their challenges and their opportunities. OARnet is an organization that looks to partner with people in other organizations to provide innovative solutions, whether it's offering VMware, having a new presence in a data center or negotiating a new long-term contract for fiber.

And, finally, OARnet is an organization of dedicated professionals, from engineers to service desk reps to client relations managers. Without their extraordinary skills and commitment, OARnet would not be able to meet expectations at the high level we've set for ourselves.

Paul Schopis

Paul Schopis
Interim Executive Director

2015–16 highlights

New Pricing Model

In response to the fluctuating enrollment and changes seen during swings in the economy, OARnet piloted a new pricing model for clients, based upon IntraOhio network traffic and content subscription, which reduces reliance on a fixed FTE fee.

Data Center Services

OARnet helped several clients to migrate their disaster recovery sites to the State of Ohio Computing Center. Fifteen additional Ohio data centers connected to the OARnet backbone, providing diverse geographic options for effective disaster recovery.

Gateway Project

OARnet launched a federated authentication system for member institutions in 2015–16. The Gateway gives clients the ability to easily access performance metrics and maintain a list of contacts, which enables OARnet staff to quickly and effectively serve them when problems arise.

Communities

OARnet connects Ohio's education, health care, public broadcasting and government communities through more than 2,240 miles of 100 gigabits per second, high speed broadband fiber. These communities voluntarily choose to participate in OARnet's shared services programs because of the benefits and value added services they receive.
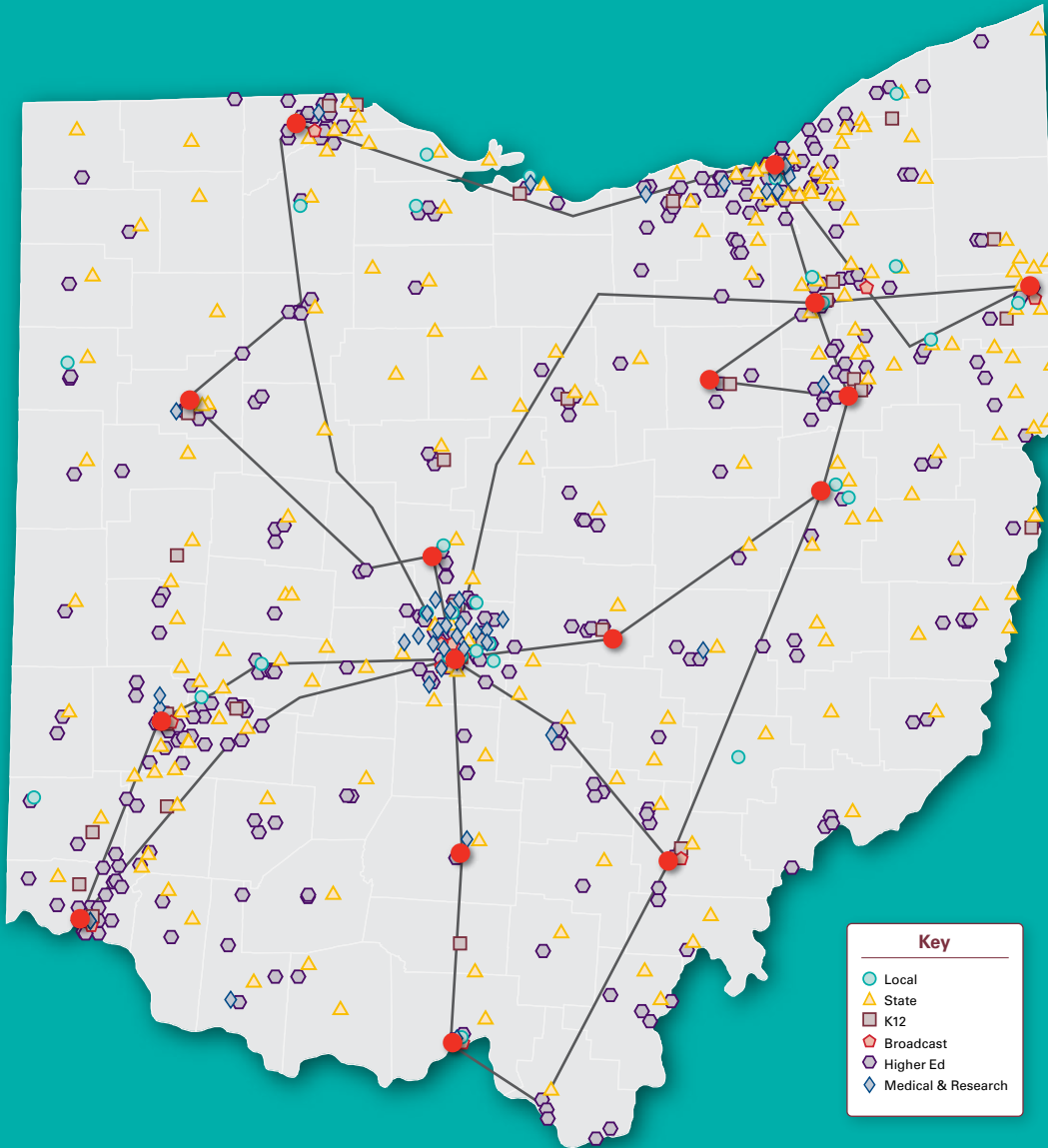
Key

- ○ Local
- △ State
- ▢ K12
- ⬠ Broadcast
- ⬡ Higher Ed
- ◇ Medical & Research

26
K–12 Schools
6 Large Urbans
19 Information
Technology Centers

91
Higher Education
+ 143 Remote sites

66
Healthcare Facilities
9 Institutions
56 Sites

6
Research Facilities

15
Broadcast Stations
Broadcast Educational
Media Commission
(BEMC)

35
Local Entities
(Cities, Counties,
Libraries, County
Emergency
departments,
public entities)

**543** sites
State of Ohio Agency Sites

Financial Impact

Through OARnet's flagship shared service, the network and an ever-increasing catalog of services, OARnet promotes community and economic development by expanding access to affordable technology.

As the state embraces technology for its communities and schools, the demand for bandwidth increases substantially each year. This year, Ohio saw 30 percent increased bandwidth, and K–12 schools alone increased bandwidth by 42 percent. By closely evaluating and considering client needs, OARnet has developed a new subscription-based pricing and service model that keeps commodity internet competitive, aligns the business model with the cost to provide services and allows customers an affordable way to meet the demand for bandwidth—which is estimated to increase by 40 percent each year.

OARnet also increased the affordability of establishing disaster recovery sites throughout the state, providing connectivity to approximately 15 data centers throughout Ohio. This provides geographical diversity required for cost-effective disaster recovery.

Consider these additional data points:

per gigabit cost

$4/Mb
in FY2017

75 Gb/second
in FY2017

total purchased bandwidth
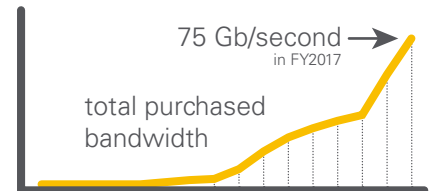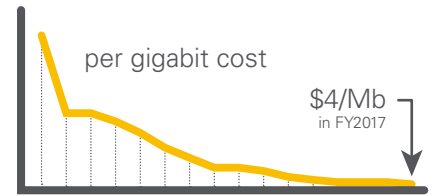
► Economies of scale have allowed OARnet's Internet pricing to decrease 98.7 percent since 2002, while aggregated subscriptions have increased more than 18,735 percent over the same period.

43% bandwidth increase by state gov customers (2015–16)

42% average bandwidth increase by higher education customers (2015–16)

99% average bandwidth increase by K–12 system customers (2015–16)

$60,000 savings for state agencies & commissions (2015–16)

$608,000 savings for colleges & universities (2015–16)

$152,000 savings for K–12 school systems (2015–16)

$257,987 savings from Esri ArcGIS software aggregation program for higher education (2015–16)

50–84% expected savings when buying more bandwidth thru new IntraOhio Content subscription service

$19,000,000 savings from current virtualization software aggregation program (2013–16)

OARnet Services

OARnet delivers high-speed solutions throughout Ohio by way of its 100-gigabit-per-second backbone. Transport service connects eligible members to other OARnet sites, resources offered by providers such as the Ohio Supercomputer Center and OhioLINK, as well as services such as Voice-over-IP, business continuity and high-speed data transfers. Ohio's education, healthcare, public broadcasting and government communities participate in OARnet's shared services programs because of the benefits and value-added services they receive, such as 24/7 support, Domain Name System (DNS), emergency web hosting and Quality of Service prioritizing.

Internet

The OARnet finance committee working in conjunction and collaboration with the OARnet staff created a new fee structure for OARnet members. OARnet's new model for fiscal year 2017 will reduce internet rates and align user tiers with current usage and demand, with the addition of a 10-gigabit tier. OARnet aggregates many upstream internet providers and connectivity to public internet exchange points to optimize internet costs while maintaining the highest standard of reliability.

IntraOhio Content Subscription

As part of a new fee structure instituted in 2017, OARnet will debut a new shared subscription service for IntraOhio, offering content services (Netflix, Google, Akamai) at $1 per megabit, resulting in a savings between 50 to 84 percent per Mb from the previous year. This service will move content items off of commodity internet, providing customers with more bandwidth for every dollar spent and positioning our clients to be better able to meet an ever-increasing demand. OARnet will work with each institution to determine the correct IntraOhio content subscription.

Internet2

OARnet is Ohio's Internet2 Connector, with two 100 Gbps connections, one in Cleveland and one in Cincinnati. Services include fostering collaboration possibilities for researchers among institutions assisting in the identification and application to funding sources for research such as the National Science Foundation (NSF). Aggregate purchase of Internet2 reduces the cost of connector fees, eliminating the need for schools to purchase individual connections. The Internet2 backbone is transitioning to MPLS and moving away from Openflow to support domain science. OARnet's Paul Schopis participated in the service review of the transition.

NG911

Next Generation 911 takes emergency response operations from analog to digital, providing faster, more reliable service when communities need it most. OARnet, in conjunction with the NG911 administration office, is expanding a two-phase pilot program trial to bring Ohio counties on NG911 to improve emergency communications and mapping. Phase one is pre-ESInet and is currently underway.

Data Center Services

OARnet supports an array of co-location options, designed to support the recommendations of the Ohio Task Force on Affordability & Efficiency in Higher Education, as well as to meet the needs of our clients for geographical diversity. OARnet provides cost-effective connections back to your organization via OARnet's high-speed network. Other options of co-location, depending on the site, may include space, cabinets and power.

Value-added Services

Virtualization allows IT departments to create a virtual environment at the workstation, server or data center level. Virtualization technology can reduce the number of physical servers or computers needed while still maintaining performance levels. OARnet's aggregate purchase of VMware results in license cost reduction of 63 percent off list price (38 percent off academic price) and maintenance reduction of 35 percent off list price. An expansion of VMware products now includes Airwatch and vCloud Air for on-demand storage and servers.

Gateway Service

OARnet recently added a client portal protected by two-factor authentication, enabling clients to self-administer their contacts and provide easy access to statistics on their use of OARnet services. OARnet will use the self-administered contacts to keep a client's organization up to date with important maintenance and outage communications.

Security/DDoS

OARnet offers proactive DDoS static filters and policies upon request from clients, as well as real-time Border Gateway Protocol-signaled black hole route service to mitigate these attacks.

Identity Management Offerings

Currently, 15 Ohio colleges and universities participate in eduroam, which provides secure, global wireless access for education. Through this service, students of eduroam member colleges or universities can access the wireless network at other member schools with the same login credentials. OARnet has completed legal framework for a consortia purchase of In-Common certificates.

OPLIN reaches new areas, new savings with OARnet
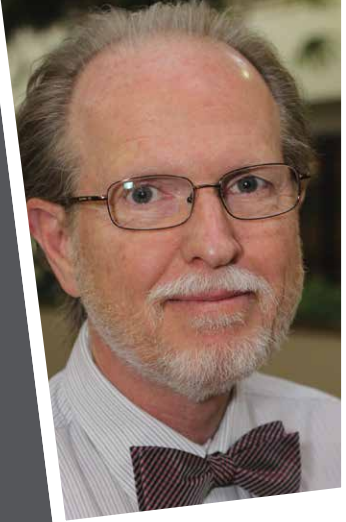
WHO:
The Ohio Public Library Network (OPLIN)

WHAT:
OARnet's Middle Mile Consortium boasts OPLIN's ability to provide broadband internet connections and related information services to Ohio public libraries.

IMPACT:
Access to OARnet's powerful, high speed broadband network is crucial to the 12,000 public internet computers in Ohio's libraries, not only because internet usage increases dramatically each year, but also because money saved each month is in the thousands of dollars.

Sometimes the biggest successes surface in calm waters.

In other words: No one is complaining. There aren't any problems.

See also: Zero disruption and/or annoyed faces.

Case in point, some people visiting the library in Bellefontaine or, say, Cadiz, can use the internet and experience a smooth, seamless connection.

But that simple, fast connection hasn't always been the case, nor has it come at a decent price. At least not until OARnet's Middle Mile Consortium began in 2010, boosting the Ohio Public Library Network's (OPLIN) ability to provide broadband internet connections and related information services to Ohio public libraries.

"If you ask any of the library members, they probably wouldn't know what you're talking about—if they have enough bandwidth, they're happy," said Stephen Hedges, OPLIN's director. "But it's made a big difference to us."

OPLIN primarily is responsible for two things: Providing an internet connection to each of the library systems in Ohio; along with buying content in conjunction with OhioLINK, InfoOhio and the State Library and making it available at no cost to anyone who lives in Ohio.

With regard to the former, having access to OARnet's powerful high-speed broadband network is crucial.

"That's very important, the bandwidth that comes out of the public library; there are about 12,000 public internet computers in the libraries in Ohio now, and the bandwidth they're pulling down from the internet increases by about 30 percent a year," Hedges said. "So it's very important to have state broadband out to the libraries and plenty of it, because they just keep using more and more."

"They have a willingness to look at the alternatives, discuss and find ways to work out solutions."
— *Stephen Hedges, OPLIN Director*

▶ Left: Stephen Hedges, OPLIN Director

Center: The interior of the recently renovated Columbus Metropolitan Library. Photos courtesy of Columbus Metropolitan Library.

Right: The Columbus Metropolitan Library is one of many libraries throughout Ohio to benefit from both the OARnet connection and OPLIN.

Where OARnet has made a major impact for the state's public libraries goes back to the Middle Mile Consortium. "Middle Mile" projects complement OARnet's statewide network by increasing connection points—points of presence, or "PoPs." The consortium project raised the total from 14 to the current 68.

"Where we were before was in areas where the major (telecommunications companies) did not have a presence, and we had libraries we needed to serve. We put in a T1 line; that's all we had," Hedges said. "For a while we had a couple of libraries where we had four or five T1 lines trying to keep up with the demand. And that technology was never meant to work that way anyway.

"The middle mile has opened up the process with putting Ethernet in all the libraries. And once you've broken down that barrier and gone to fiber instead of the copper, it's really easy to upgrade to whatever size you need and stay on top of the needs of the libraries. You're not restricted by the technology."

Another big benefit for OPLIN has simply been saving money. The expanded distribution of PoPs dramatically reduces "last mile" costs for connectors throughout the state, which in turn reduced "last mile" costs of broadband services to community anchor institutions throughout the state. That means organizations, such OPLIN, have to pay only for the side of the circuit that goes from the OARnet PoP to the remote site. The State pays for the side of the circuit that goes back to Columbus.

Another reason the prices are lower for OPLIN is because the State purchases in bulk, which allows for more buying power.

Hedges said OPLIN used to pay a transport fee from a telephone company prior to the middle mile, which resulted in charges of more than $1,000 per month for that fee alone.

But along with better service and a better bottom line, Hedges is a fan of how OARnet goes about its business.

"I really like the attitude and approach of OARnet," Hedges said. "It's more of an approach of doing whatever it takes to solve the problem rather than just instantly saying, 'No, we can't do that' because of policy or whatever. They have a willingness to look at the alternatives, discuss and find ways to work out solutions." •

Technology upgrades allow Zane State to maintain its 'personal touch'

"They're a part of our team."

— *Bryan Baker, Director of Network and Security Services at Zane State College*

WHO:
Zane State College

WHAT:
OARnet helped Zane State bring affordable, effective connectivity to its Cambridge campus 30 miles away.

IMPACT:
The technology upgrades not only helped Zane State save money, but also created a disaster recovery network at Cambridge and helped both campuses improve their reach to a broad-range student population.

From the time Terry Herman arrived at Zane State College four years ago, she's noticed an underlying tone on campus.

"They call it the personal touch," said Herman, Ph.D., the chief information officer at Zane State. "That was very compelling to me, in that everyone's thoughts and opinions and needs were considered, from students to all employees."

This level of personalized dedication is also evident in Zane State's technology plan. As a college that serves high school, traditional and non-traditional students at two locations, both in-person and online, Zane State has a lot of needs to consider—and with the help of OARnet's services, they seem to have met them all. It was one of the first community colleges to connect to OARnet's backbone in 1995 when it was known as the Muskingum Area Technical College, using a fractional T1 line. A little more than 10 years later, as bandwidth requirements increased, they had trouble bringing connectivity to the Cambridge campus 30 miles away.

"Cambridge at that time was kind of treated as the one-off from a technology perspective," said Bryan Baker, director of network and security services at Zane State. "We just could not reach them effectively and cheaply."

As OARnet negotiated highly competitive, aggregate state contracts, the last-mile cost to connect to Zanesville and Cambridge dropped significantly. So in 2010, Zane State purchased a fiber-optic connection to the Cambridge branch. In 2016, both connections were upgraded to 1 gigabit per second, providing a reliable, redundant connection to OARnet for the Zanesville campus, disaster recovery and an increase in bandwidth.

Redundancy for Zanesville, Cambridge

The Zanesville campus is at a point in its technical life when systems and servers need to be operating in the cloud. While the long-term benefits—such as decreased hardware, energy efficiency and ease of access—are clear, redundant systems and internet are necessary before the

college moves critical systems to cloud-based operations. Upgrading the Cambridge connection to 1 Gbps at the same time as the Zanesville connection ensured that if data needed to travel on the backup circuit from Cambridge, it could do so smoothly. As a member of OARnet, Zane State was able to use lower IntraOhio rates for this redundant connection, providing a huge cost savings.

The redundant connection at Cambridge sets up a convenient disaster recovery site for Zane State as well. Previously, the college had servers at Wright State University in Dayton for disaster recovery, but with a significant increase in bandwidth back home, Zane State was able to relocate its disaster recovery site to Cambridge and attach systems to existing infrastructure and equipment.

Serving students in the classroom and in the cloud

Serving students effectively in the Appalachian area often means meeting them where they are—literally. With the capability provided by increased bandwidth, Zane State is expanding its distance-learning programs and creating state-of-the-art classrooms accessible both at the Zanesville campus and virtually at Cambridge.

"Serving that broad-range population with complex life situations, the lecture capture becomes important, the access that we provide to the video conferencing becomes important," Herman said.

Additionally, Zane State was an early adopter of VMware, implementing server virtualization in 2009. OARnet's Virtualization with VMware contract allowed the college to collapse hardware, saving time, energy and maintenance. A reliable, secure, high-speed network enables Zane State to continue providing high-quality education for its students no matter where they come from or what they want to accomplish.

"The relationship that we have with the personnel at OARnet is critically important," Baker said. "They're a part of our team." •

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