2024–2025
Annual Report

OARnet

"OARnet is uniquely positioned to help clients save money, and deliver exceptional performance, over the most secure and reliable fiber network available in Ohio. We have more than doubled bandwidth over the past seven years while reducing costs an average of 7% each year. This is an exceptional value for our members."

— Mike Duffey, Chancellor,
   Ohio Department of Higher Education

 OARnet

Leadership. Solutions. Innovation. OARnet strives to ensure Ohio's role as a technology leader by implementing next-generation technologies in our network to meet the needs of government, education and health care communities. By teaming with our communities to develop technology solutions designed to address the demands of an ever-changing environment for the delivery of services, OARnet facilitates innovation as a competitive edge in Ohio's economic development and prominence as a leader in research and development.

Governed by the Chancellor of the Ohio Department of Higher Education (ODHE), the Ohio Technology Consortium (OH-TECH) serves as the technology and information division of ODHE. The consortium comprises a suite of widely respected member organizations collectively unsurpassed in any other state: OSC, OARnet and OhioLINK. The consortium drives efficiencies through common services provided to member organizations through the Shared Infrastructure and Consortia Services divisions.

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EXECUTIVE TEAM

Pankaj Shah
Executive Director

Mark Fullmer
Chief Technology Officer

Dave Ginn
Chief Relationship Officer

Kristen Weimar
Administrative Manager

OH-TECH LEADERSHIP

Charles See
Deputy Chief of Staff, Vice Chancellor for Strategic Partnerships and Education Technology, Ohio Department of Higher Education

Justin Costa
Senior Manager Fiscal Operations, OH-TECH

John Strawn
Communications Manager, OH-TECH

Drew White
Senior Manager Consortia Operations, OH-TECH

oar.net

OARnet holds its spring Member Meeting in conjunction with the Ohio Higher Education Computing Council (OHECC) annual conference to provide major operational, fiscal and research project updates; to spotlight how members are using its resources and services; and to allow its Business Relationship Managers and leadership (pictured above) to connect with OARnet's higher education members.

2024–2025 HIGHLIGHTS

Improving resiliency for Ohio broadcasting networks

The Broadcast Educational Media Commission (BEMC) has upgraded its statewide broadcast network, enhancing its ability to deliver critical news and information to Ohio citizens. Supported by OARnet, the upgrade includes a shift from 1 Gbps to 10 Gbps connectivity, a new data center and improved network resiliency. This effort ensures uninterrupted service, crucial for emergency alerts and public broadcasting. BEMC's Joint Master Control in Columbus, a central hub since 2015, continues to oversee one of the largest public broadcasting operations in the nation, maintaining a 99.981% uptime.

oar.net/2024BEMC

First established quantum key distribution link

Researchers at The Ohio State University have successfully demonstrated quantum key distribution between two buildings on campus, marking a significant advancement in cybersecurity through quantum information science. This setup utilizes optical fiber to connect a receiver and a transmitter located at OARnet, allowing secure key sharing while ensuring that any eavesdropping attempts are detectable. Collaboration with OARnet has brought quantum technology into the orbit of real-world operators that ensure classical internet connectivity today.

oar.net/ quantum

Using Esri's ArcGIS for infrastructure management

The University of Mount Union has significantly improved its infrastructure management by utilizing Esri's ArcGIS platform, a service available to OARnet's higher education institutions at a substantial discount. IT staff mapped utilities and surface structures digitally, which has resulted in time savings during construction and maintenance projects, enhanced emergency response capabilities and better planning for future property uses. The university also uses ArcGIS for mapping practice fields for sports teams and high school marching band camps, and more faculty are using it in the classroom.

oar.net/EsriUMU

FROM THE DIRECTOR

As I look back over the last year, I'm proud of what OARnet has contributed to Ohio. OARnet continues to build infrastructure, offer in-demand programs at affordable prices and provide excellent customer service with our highly trained staff.

We have made progress in our efforts to bolster the physical infrastructure relied on by thousands of our clients. Over the past year, OARnet has completed portions of its new 400 Gigabits per second (Gbps) service on the statewide fiber-optic backbone, and we are developing a new statewide system dedicated to supporting emergency communications. In addition, OARnet is growing its peering service, which will offer a more direct connection to providers while reducing the cost of internet service.

Another area where OARnet strives for excellence is enhancing the skillsets of our own staff members, from engineering to client services. As you will read about in this edition of our annual report, OARnet has prioritized training to ensure that we cultivate dynamic leaders and cross-train employees to empower them with the latest technologies and tools. Training strengthens our organization's inherent culture of innovation, which translates into exceptional morale and service to our clients.

OARnet continues to undertake many large projects that impact our partners, members and clients in the education and government sectors. We have highlighted two such projects in this report that represent a sampling of the wide spectrum of entities and citizens that benefit from OARnet's statewide reach:

- OARnet connectivity empowers research at The Ohio State University's Molly Caren Agricultural Center in London, Ohio
- A collaboration with public and private partners that improved connectivity at more than 100 lodges and campgrounds across Ohio

Since 2008 OARnet has leveraged its aggregate purchasing power to acquire VMware licenses at heavily discounted prices for our client communities. In 2024, OARnet and Broadcom entered into a new contract that has helped

OARnet Executive Director Pankaj Shah connects with higher education members at OARnet's spring Member Meeting, held in May 2025 at the University of Cincinnati.

clients navigate the transition to VMware's new licensing models and cloud services. As a result, we are currently serving approximately 350 clients across State and Local Government, Higher Education, and K–12 institutions. In the first year of our contract, we sold over 104,000 licenses, generating an estimated $50 million in cost savings over five years. Customers benefit from significantly discounted pricing, whether acquiring new licenses or transitioning from OARnet's perpetual licensing to subscription licensing. Due to ongoing demand, OARnet can continue to offer additional licenses to customers upon request.

I am once again grateful to all of you—our members, partners and collaborators —for your trust in and steadfast support of OARnet over the past 38 years. We will continue to strive to deliver the same experience as we continue to innovate, while always looking to provide best-in-class service.

Pankaj Shah
Executive Director

Connecting Ohio to the World

OARnet has delivered innovative, technology-based solutions to reduce costs, increase productivity and improve customer service since 1987. Through strategic partnerships, we provide service to our education, research, health care, libraries, public broadcasting and government clients by connecting them to the digital world through ultra-high-speed fiber across the state.

KEY

△ State
◻ K12
⬠ Broadcast
⬡ Higher Ed
◆ Medical & Research
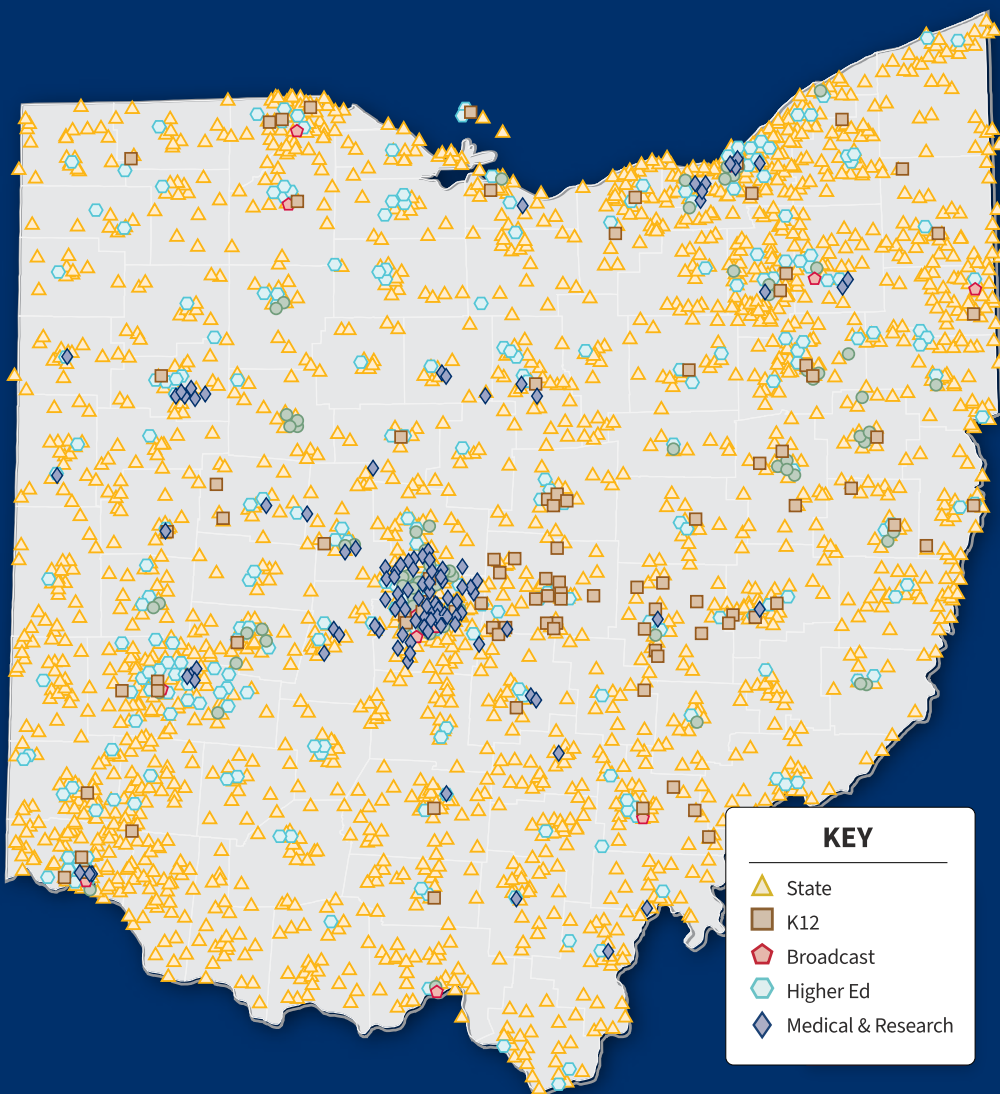
5,500+
MILES OF FIBER-OPTIC BACKBONE

513
HIGHER ED SITES

977+
K–12 ENTITIES

3,360+
STATE GOVT SITES

164
LOCAL GOVT SITES

728
LIBRARY SITES

105
HEALTH CARE FACILITIES

27
RESEARCH SITES

10
PUBLIC BROADCASTING SITES

225
EMERGENCY COMMUNICATIONS

OhioLINK

Supercomputer Center

OARnet connects OhioLINK and the Ohio Supercomputer Center, fellow members of the Ohio Technology Consortium.

OARnet Services

OARnet's state-of-the-art network serves as the foundation for the delivery of current and future services that meet the needs of Ohio's education and research communities, state and local governments and related health care entities. OARnet's centralized network architecture enables Ohio's communities to aggregate their demand for services and share those services across the state. As a result, OARnet can reduce the overall cost of services while expanding its service portfolio.

Integrated Network Services

OARnet's integrated network services are designed to help our communities meet the challenges of the digital transformation impacting every aspect of education, research, government and health care. Our services offer the flexibility and scalability required for this new environment, as well as for future technology needs.

- MPLS L3VPN & L2 Circuits
- IPV4 & IPV6
- Domain Name Service (DNS)
- Co-Location
- Last Mile Access Coordination
- Internet Access
- Optical Transport
- On-Net (IntraOhio)

Support Services

OARnet clients have access to solutions through an around-the-clock network operations center that offers troubleshooting, ticketing and engineering support. OARnet engineers also provide consulting services and can remotely configure and manage environments, as well as provide onsite support when necessary. In addition, OARnet assigns a dedicated Business Relationship Manager to clients to provide personalized support.

- Support Center (NOC)
- Network Design and Engineering Consulting
- Quality of Service (QoS)
- Personalized Client Engagement Services

Application Services

OARnet works with trusted partners to provide clients with reliable services to enhance their communications and operations. Members can connect securely through public and private cloud services, VoIP, discounted software licensing and server virtualization.

- VMware by Broadcom
- Esri ArcGIS
- Voice Over IP (VoIP)
- Emergency Web Hosting
- Omnissa Virtual Desktop and Applications

Cybersecurity Services

OARnet's portfolio of cybersecurity services mitigates and prevents attacks and ensures that information and infrastructure remain safe. Services include preconfigured filtering, on-demand DDoS mitigation and vulnerability management. Additionally, OARnet participates in the REN-ISAC program that tracks emerging threats.

- DDoS Mitigation
- Eduroam
- InCommon Federation
- Vulnerability Management
- Custom Configurations

Network Peering

OARnet is Ohio's Internet2 connector, with two 500 Gbps connections located in Cleveland and Cincinnati. OARnet also has 10 Gbps connections to NASA Glenn Research Center and to Wright-Patterson Air Force Base. These services help facilitate and advance research collaboration and enable research funding.

- Research Network Peers
- Commercial Network Peers

Dedicated Content Service

OARnet can provide transport to leading commercial cloud providers including Amazon, Azure, Google and Oracle. Dedicated cloud access provides private connectivity between your campus and the cloud provider, which enables campus and cloud network service integrations.

OARnet Supported Networks

OARnet's statewide fiber-optic backbone supports several networks that serve specialized needs and audiences, such as technology services for school districts, public television and radio services, and emergency communications.
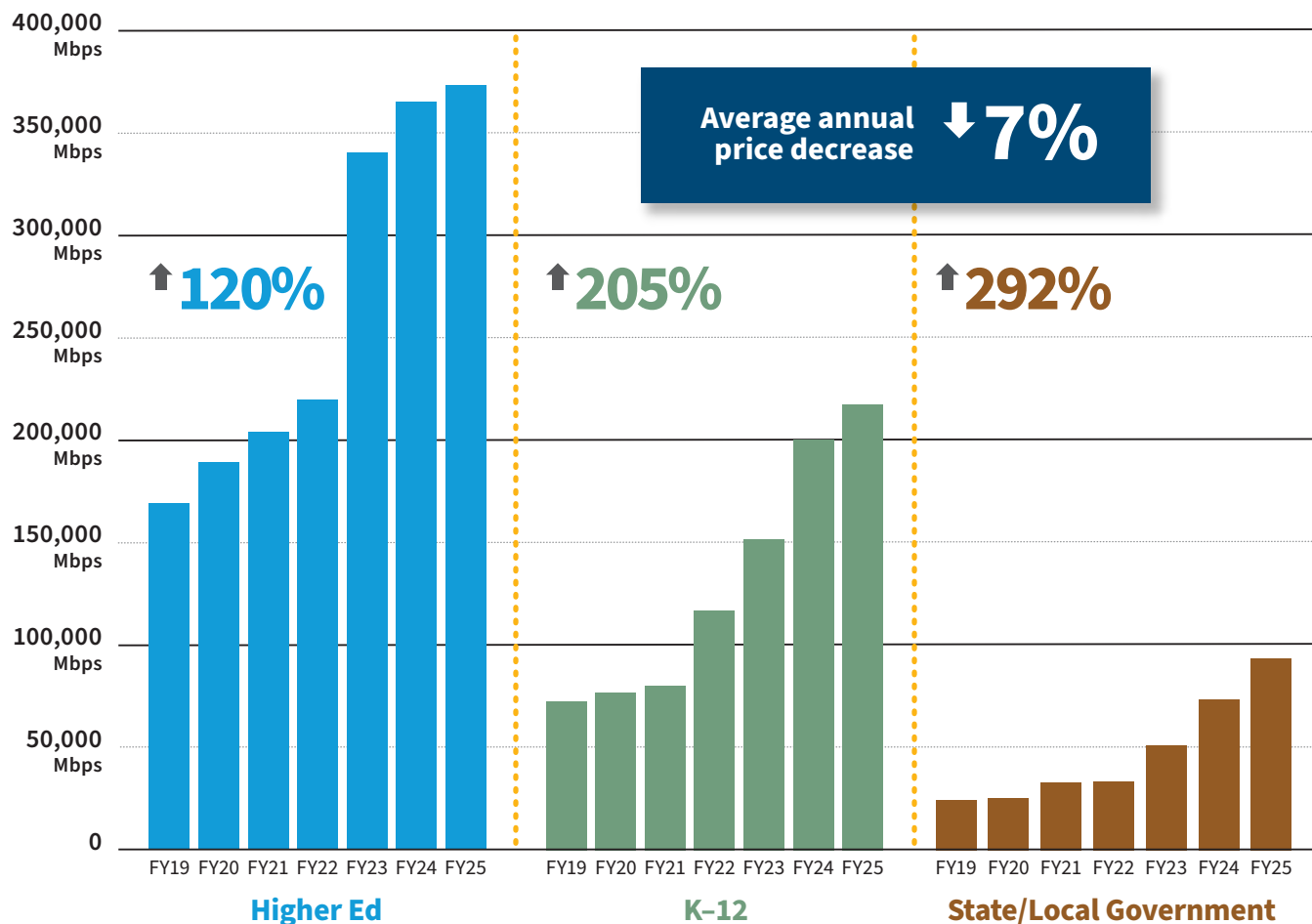
- One Network (State of Ohio)
- Ohio Education Computer Network (Information Technology Centers and Large Urban Aggregation for PreK–12)
- Broadcast Educational Media Commission (Public Broadcasting Stations)
- Emergency Communications Network (State of Ohio NG911 and MARCS)

Financial Impact

Our driving principles are to:

- Increase access to affordable broadband service. OARnet's fiber-optic backbone stretches more than 5,500 miles, which lowers broadband access cost.

- Reduce the cost of technology through aggregate purchasing. On behalf of its members and clients, OARnet negotiates volume purchase prices for software, hardware and/or network services.

- Maximize shared services opportunities. By centralizing technology hardware, software and network requirements needed to support the overall community, OARnet reduces the cost of service delivery. Offerings include a network operations center, co-location, emergency web hosting and cloud computing.

- Enable research in Ohio through high-performance networking.

7-Year Bandwidth Increases

Average annual price decrease ⬇ **7%**

↑ **120%**   ↑ **205%**   ↑ **292%**

400,000 Mbps							
350,000 Mbps							
300,000 Mbps							
250,000 Mbps							
200,000 Mbps							
150,000 Mbps							
100,000 Mbps							
50,000 Mbps							
0	FY19 FY20 FY21 FY22 FY23 FY24 FY25						

Higher Ed   **K–12**   **State/Local Government**

Savings

In Fiscal Year 2025

$40+ million
total network
savings for all clients

$13+ million
savings for higher education

$15+ million
savings for K–12 schools

$12+ million
savings for state agencies

$50+ million
VMware savings

$2+ million
other aggregate savings
*Tenable, Esri ArcGIS, Omnissa
Virtual Desktop and Apps*

LOOKING FORWARD

Over the next year, OARnet will make
significant strides in enhancing its network
development and services for communities
across Ohio. Key initiatives include:

- Entering the final phase of upgrading the
  statewide fiber-optic backbone from 100
  Gbps to 400 Gbps, laying the groundwork for
  the Next Generation OARnet Terabit Network
  to support Ohio's growing needs in research,
  education and public service.

- Strengthening our cybersecurity posture
  through a Network Security Operations
  Center (N-SOC) while continuing to explore
  expanded service offerings and strategic
  collaborations with CyberOhio, state
  agencies and education entities.

- Developing a faster, more resilient
  emergency communication network in
  collaboration with public and private
  partners—including the State of Ohio,
  NG911 and MARCS—to improve emergency
  response capabilities statewide.

- Supporting BroadbandOhio and
  InnovateOhio initiatives to help close the
  digital divide for underserved and unserved
  regions of the state.

- Cultivating the next generation of
  technology leaders and engineers through
  strategic workforce development initiatives,
  including our student internship program—
  now in its third year—that provides hands-on
  experience in network operations and
  IT service delivery, along with expanded
  professional training opportunities for staff.

- Evaluating artificial intelligence (AI) tools
  and vendor roadmaps to enhance network
  operations, analytics and service delivery,
  while supporting responsible AI adoption
  across OARnet communities.

- Continuing to explore, test and enhance
  quantum networking technologies in
  collaboration with researchers and
  practitioners across the state, region
  and country.

The Cisco Optical Training program, which OARnet offered at its Columbus facility, introduces Tier 2 engineering staff to optical transport technology fundamentals.

Building skills to benefit Ohio

"**MOR leadership training facilitated a more strategic approach to supporting OARnet while also expanding capabilities and services of the business office.**"

Justin Costa, senior manager for fiscal operations

Investing in a culture of continuous learning and development, OARnet ensures that its staff are well prepared to handle complex situations and make informed decisions that benefit both the organization and its clients. This holistic approach to staff development not only enhances individual growth but also contributes to the overall success and efficiency of OARnet.

OARnet sponsors training for its employees throughout the year, developing and strengthening staff who serve in management roles and cross-training staff in new technologies.

"OARnet is more than a network. We cultivate well-rounded leaders and subject matter experts, while ensuring succession planning at all levels," said Pankaj Shah, OARnet executive director.

Growing Leaders

Since 2020, seven members of the OARnet management team have participated in the MOR Leaders Program to enhance their skills at

Sixteen staff members learned the Cisco optical hardware platform and Cisco Evolved Programmable Network Manager (EPNM) software during the recent training program.

leading engineering, technical, client services and administrative support staff. The Quilt, a national consortium of regional research and education networks across the United States, encouraged participation in the program, a 10-month leadership development experience that has been held at institutions around the country since 2004.

"I have supported our managers' participation in the MOR program because it has been shown to help staff develop a greater understanding of the context of our work, as well as maturity in handling situations that arise in leadership positions," Shah said.

Rebecca Dolan, interface and applications director, enrolled in the MOR Leaders Program during a time of great change for OARnet. The staff was working fully remotely during the COVID pandemic, and the organization had decided to combine several departments under Dolan's leadership. During the MOR program sessions with fellow managers, Dolan was able to discuss and listen to ideas about how to encourage staff collaboration and feedback in remote work environments.

"I took some of these topics to the systems manager and we came up with ideas on how to support our young and growing team as well as staff with new

responsibilities," Dolan said. "We also wanted to make sure that our staff knew we were accessible to them, even with our busy schedules."

Based on staff input about their needs for training and teamwork, Dolan started two weekly workshops on a messaging platform for staff to get help, share projects, or discuss new ideas.

"This has helped ensure that our staff have our support for their projects and also has kept projects on track if they hit roadblocks," Dolan said. "While we have evolved to a hybrid work model, we still find the online workshop preferable for code reviews and troubleshooting via screensharing."

As Dolan works alongside other OARnet managers and a supervisor who have participated in the MOR Leaders Program, she has observed how the program has positively impacted the overall organization—and has benefited OARnet clients.

"Our systems and software development team have created more efficient processes and encouraged open collaboration within our team to keep things running smoothly for our customers and staff," Dolan said. "We are equipped to support our team and customers 24x7x365."

Staff members in OARnet's Network Operations Center (NOC) meet with OARnet leadership to learn about new developments in the organization and industry.

Kristen Weimar, OARnet administrative manager, also has seen the broader impact of the MOR Leaders Program on the organization. Key lessons of the program included how to better delegate tasks to direct reports and manage a blend of leadership and individual contributor work. This benefits OARnet by giving managers tools to strike a balance between strategic planning efforts and the day-to-day execution of tasks, Weimar said.

The program also allowed participants to discuss common issues with peers in small groups, cultivate public speaking skills through presentations and glean feedback from managers, peers and direct reports through a 360 evaluation. In addition to sharing insights into how to better coach direct reports, the program focused on how to build relationships with peers and use persuasive communication with leadership, regardless of what position staff hold within the organization, Weimar said.

"The program was very thoughtfully created. The 'MOR-isms,' such as 'lead from where you are,' stick with you," Weimar said. "I'm grateful to work for an organization like OARnet that values professional development and feels it is important for us to grow."

Deepening Technical Skillsets

Engineering and technology skills are critical for several OARnet teams that oversee the Network Operations Center, field equipment installations, network management and optical engineering functions. OARnet also ensures that these teams receive regular training opportunities to enhance and advance their skill sets.

Over the past year, OARnet has participated in the Cisco Optical Training program to introduce Tier 2 engineering staff to optical transport technology fundamentals, including Dense Wavelength Division Multiplexing, amplification and signal flow. Sixteen staff members learned the Cisco optical hardware platform and Cisco Evolved Programmable Network Manager (EPNM) software, said Vincent Gerardi, OARnet optical engineering manager.

"The Tier 2 staff will be able to assist the optical engineering team in identifying common network issues for faster response times and ultimately less down time for our clients," Gerardi said. "Initial feedback has been positive. The students of the course seem excited to learn about the optical layer of the network."
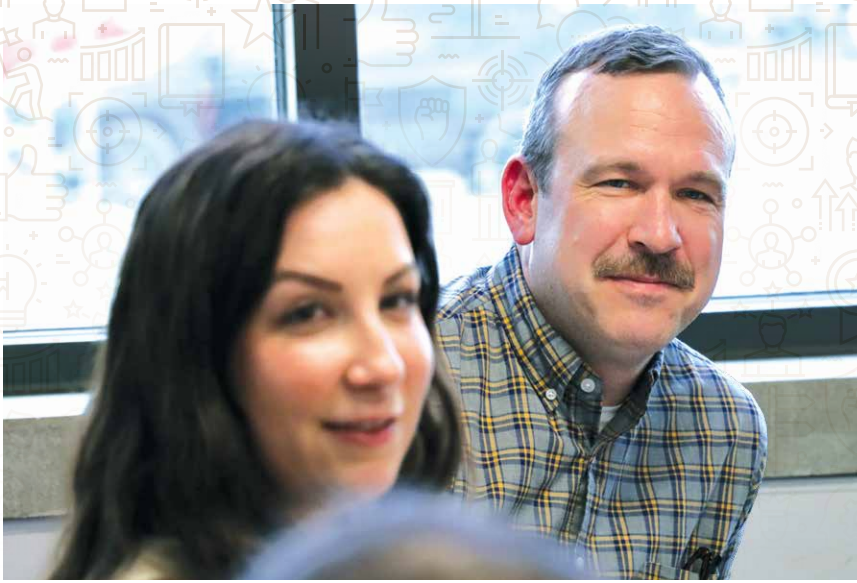
Members of the OARnet management team have participated in the MOR Leaders Program to enhance their skills at leading engineering, technical, client services and administrative support staff.

Moving forward, OARnet employees will lead the curriculum in-house to ensure continuous training as the staff grows and experiences turnover.

In addition to the optical training, OARnet is in the process of implementing other internal development programs that will benefit the organization, such as an asset management project and a ticketing project in ServiceNow that will help the client services team manage and organize client requests.

"We are interested in creating similar learning environments with vendor partners to further develop our engineers and staff," said Mark Fullmer, chief technology officer.

"It's critical to develop staff so they can continue to make valuable contributions to OARnet operations and our support and participation in national organizations like The Quilt and Internet2," Shah said. "At the end of the day, investing in our people ensures that we can provide exemplary service to our clients in the state of Ohio and keep staff morale high."

> ## "Programs like this should be introduced to new leaders early on in their careers."
>
> Mark Fullmer, chief technology officer

OARnet increases connectivity to help boost tourism at state lodges, campgrounds

To support tourism and economic development, OARnet has collaborated with public and private partners to enhance connectivity at more than 100 lodges and campgrounds across Ohio.

As part of the Ohio One Network partnership between OARnet and the Department of Administrative Services, OARnet worked with the Ohio Department of Natural Resources (ODNR) and network service providers Spectrum, Frontier and Lumen to extend the state fiber-optic network and increase internet speeds at a number of tourism sites. The project benefited facilities across Ohio, ranging from the Maumee Bay Lodge and Conference Center in northern Ohio to the Burr

The new Hocking Hills State Park Lodge, which opened in fall 2022, is one of many tourism sites that benefits from increased connectivity through OARnet's collaboration with public and private partners.
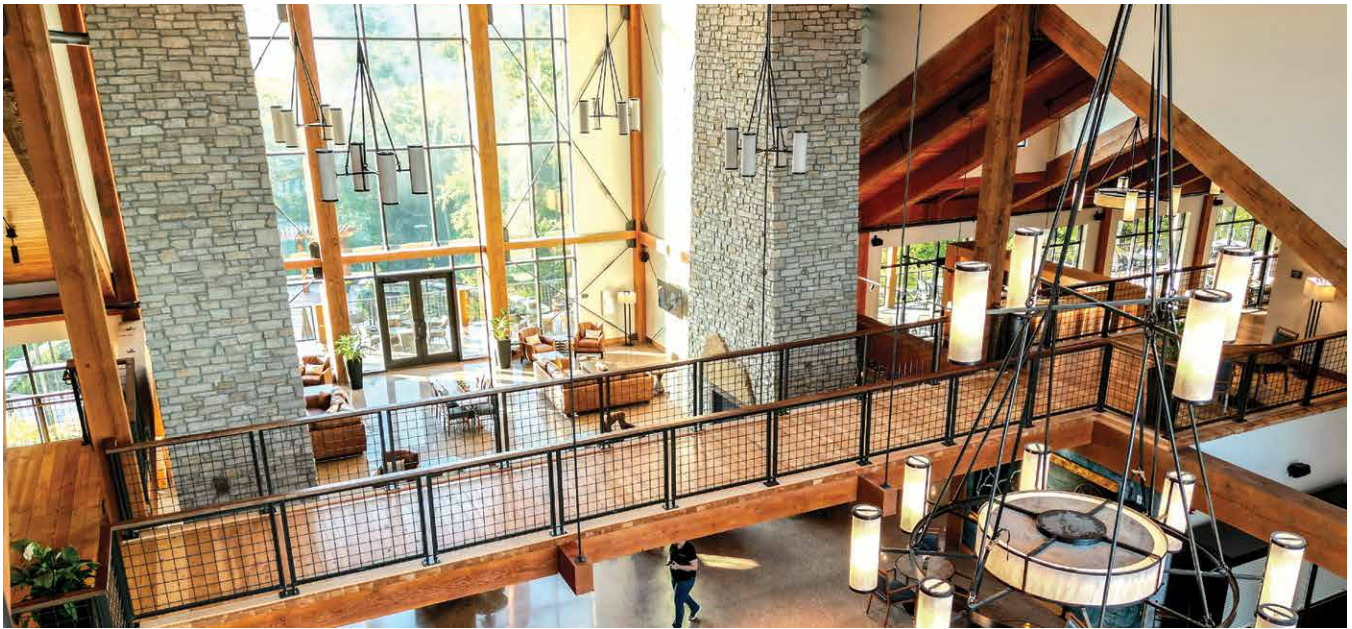
Expanded connectivity at sites such as the Hocking Hills State Park Lodge support overnight stays, business conferences and special events.

Oak Lodge and Conference Center in southern Ohio. Nine lodges were upgraded to 1 Gbps and more than 100 campgrounds and park offices were boosted to 100 Mbps.

The expanded connectivity was designed to support cashless transactions, expand service offerings and enhance customer experiences at the state lodges and campgrounds to increase overnight stays, conferences and business meetings and special events such as weddings and parties.

"Years ago, people wanted to get away from it all, but nowadays they need to stay connected, and without adequate internet service people will look for other places to vacation or plan a business event," said Dave Ginn, OARnet chief relationship officer.

In addition to boosting connectivity at existing sites, the project also supported the development of the new Hocking Hills State Park Lodge. The facility, which opened in fall 2022, includes 81 guest rooms, a pool and event space for up to 200 people.

Visitors to Ohio's lodges, parks and campgrounds during the April 2024 solar eclipse also enjoyed a boost in internet connectivity thanks to a partnership between OARnet, ODNR and BroadbandOhio.

As Ohio was in the path of totality for the eclipse, the state entities temporarily increased bandwidth to maximum capacity to accommodate the anticipated large influx of visitors seeking optimal views of the solar event. ODNR hosted a variety of programs in its 28 locations in the path of totality, including a citizen science research project that encouraged visitors to observe and report on wildlife responses to the eclipse through a website and app.

"This connectivity project has positioned rural areas for tremendous tourism and economic development opportunities with the increase in visitors to these areas," Ginn said.

> ## "Years ago, people wanted to get away from it all, but nowadays they need to stay connected."
>
> Dave Ginn, chief relationship officer

OARnet connectivity empowers Ohio State agricultural center's exploration of autonomous farming

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With a $125,000 grant from BroadbandOhio, The Ohio State University's College of Food, Agricultural and Environmental Sciences worked with OARnet to enhance internet connectivity at its Molly Caren Agricultural Center in London, Ohio. Serving as a central hub for agricultural field research and home to the renowned Farm Science Review, this facility plays a critical

role in developing and showcasing industry advancements in the use of artificial intelligence for autonomous farming.

The Farm Science Review, a yearly three-day farm show uniting farmers nationwide, serves as a platform for sharing insights on agricultural technologies and practices. To spotlight these

The Ohio State University's Molly Caren Agriculture Center in London, Ohio, uses OARnet connectivity to support the development of advanced farming technologies and student learning experiences.

The center hosts the annual Farm Science Review to showcase new technologies, including those that rely on artificial intelligence, designed to benefit the agricultural industry.

technological advancements, it was important for the Molly Caren Agricultural Center to have reliable high-speed internet access on-site.

With the help of commercial broadband provider partners, OARnet has connected the center to its fiber-optic backbone. A private 4G LTE connection supports research on autonomous farming and other agricultural technologies, said Nicole Six, senior relationship manager at Ohio State's Office of Technology and Digital Innovation.

The adoption of automation in the agriculture industry ranges from self-driving tractors to drones for crop health monitoring and artificial intelligence to guide spray application and is already revolutionizing all types of agriculture.

"The shift towards automation within the industry is happening very rapidly, which is why we needed to make sure the Molly Caren Agricultural Center was set up to be one of the premier places in the country where these technologies can be demonstrated," said Scott Shearer, chair of the Department of Food, Agricultural and Biological Engineering at Ohio State. "It is our goal to lead the nation in thinking about the digitization of agriculture."

While a high-speed internet connection may not be the first thing that comes to mind in relation to farming, technologies leveraging artificial intelligence require the transfer of massive amounts of data to and from devices, not only to operate but to be trained, improving their functionality.

"Before we can deploy fully autonomous machines, we are going to have what's called supervised autonomy, where an operator monitors one or more machines from a remote location. To be able to do this, we need enough bandwidth for multiple

live video streams," Shearer said. "Additionally, most of the training of these AI-driven machines will require millions of images. The question becomes how we move that data from the field to the cloud to create intelligence, and then how do we move the intelligence back to the machine in the field."

Although self-driving pedestrian vehicles are in development, the agricultural industry can't directly translate that technology into the field due to the range of conditions farmers face. To facilitate autonomous agriculture, researchers must collect a substantial amount of data from real farms.

"When you look at agricultural settings, they're all over the map, so when you think about deploying artificial intelligence for an automated car versus an automated tractor, they are two totally different scenarios," Shearer said. "The crop mix is never the same and crops are actively growing all the time."

As agriculture embraces digital advancements, the industry will see a growing demand for workers with expertise in computer science and related fields. With the enhanced network connectivity at the center, Ohio State can allow students off-site to actively participate in agricultural research at the center, Shearer said.

Supporting workforce development and research advancements in the state are major goals for OARnet, which is part of the Ohio Department of Higher Education's Ohio Technology Consortium.

"Efforts to establish enhanced connectivity at the Molly Caren Agricultural Center align with OARnet's greater mission to support research and provide Ohio with the evolving tools to excel in education and industry on a national scale," said Pankaj Shah, executive director of OARnet.

The agricultural industry uses drones for crop health monitoring.

"It is our goal to lead the nation in thinking about the digitization of agriculture."

Scott Shearer, chair of the Department of Food, Agricultural and Biological Engineering at Ohio State

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**Department of
Higher Education**

Ohio Technology Consortium