OARnet

PRIORITIZING CLIENT NEEDS FOR OVER 35 YEARS

HIGHER EDUCATION | K-12 | STATE GOVERNMENT | LOCAL GOVERNMENT | LIBRARIES

HEALTH CARE | RESEARCH | PUBLIC BROADCASTING | NEXT GEN-911

"Ohio's history of investing in OARnet's ultra-fast fiber optic network infrastructure has led to a statewide connectivity of exceptional caliber and national renown. Digital technology underlies or enables nearly every public service in Ohio and OARnet keeps 'The Heart of It All' connected."

— Mike Duffey, Chancellor,
 Ohio Department of Higher Education

Ohio 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

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OARnet leadership, staff and members gathered to celebrate the organization's 35th anniversary in fall 2023. The event was held during OARnet's biannual Member Meeting in conjunction with the national meetings of The Quilt and the National Science Foundation's Campus Cyberinfrastructure (CC*) program, all held in downtown Columbus.

2023–2024 HIGHLIGHTS

Advancing aviation technology innovation

OARnet expanded the fiber-optic backbone that serves Springfield, Ohio, to support the new National Advanced Air Mobility Center of Excellence (NAAMCE) at the Springfield-Beckley Municipal Airport. NAAMCE will allow public and private partners to advance technologies such as electric vertical take-off and landing vehicles (eVTOLs).

Development of a quantum test bed in Ohio

The Ohio State University and OARnet have partnered on a project, funded by a $1 million federal appropriation and a $750,000 grant from the Ohio Department of Higher Education's Third Frontier Research Initiative, to build long-distance quantum test networks. As organizations in Ohio strive to advance their work in quantum computing and networking, technology experts are seeking to remove any transmission vulnerabilities in the network to strengthen cybersecurity.

Building the broadband workforce

OARnet's partnership with Ohio State's 5G-OH project served as a pilot internship program during its first year, offering students hands-on experience in broadband, networking and telecommunications technologies. Building on the success and insights gained from this pilot, OARnet is now continuing the internship program using its own resources. The program aims to provide even more real-world experience while addressing the growing need for skilled network engineers at OARnet in the rapidly expanding broadband sector across the U.S. This effort will create a strong pipeline of future talent, supporting national broadband deployment goals.

On the Cover

OARnet relies on a strong Client Services team to help connect our Ohio communities to the technical resources and solutions they need to succeed.
(See page 11 for the full story)

FROM THE DIRECTOR

Over the last year, OARnet has advanced several initiatives that represent major core capabilities of our organization: strengthening the state infrastructure for current and future needs, providing affordable technology solutions, and offering excellent, personalized service to our thousands of customers, collaborators and partners across Ohio.

We have made great progress on our multi-year project to update Ohio's 5,500-mile fiber-optic backbone from 100 Gigabits per second (Gbps) to 400 Gbps capacity, while also migrating to new optical fiber rings. Our engineers and business relationship managers have been working with communities across the state to carefully coordinate the hardware upgrades without loss of essential services. We anticipate completion of the entire project by 2026.

OARnet continues to listen to the needs of our communities, which have identified cybersecurity as a top concern. We are working with the state's CyberOhio initiative to enable aggregate purchasing agreements that will support all OARnet customers and members. We also are evaluating responses from a Request for Proposals for in-demand cybersecurity services that our clients have prioritized. In addition, OARnet is collaborating with The Ohio State University on a quantum research network test bed that will strengthen and protect information exchange.

For more than 15 years, many OARnet clients have relied on our aggregate purchasing agreement with VMware, which provides a platform for cloud computing and virtualization. These agreements offered extremely competitive pricing throughout this time. After Broadcom purchased VMware at the end of 2023, OARnet's executive team worked closely with the vendor to develop a new five-year agreement that features predictable costs and discount pricing on the suite of products offered. We have about 300 customers that have proactively signed up for this updated program.

Meanwhile, we also continue to support and partner with BroadbandOhio and InnovateOhio

Pankaj Shah, OARnet executive director (right), and Charles See, deputy chief of staff and vice chancellor for strategic partnerships and education technology at the Ohio Department of Higher Education (left).

teams to enhance broadband connectivity while leveraging our strong connections with anchor institutions across all 88 counties in Ohio.

Nationally our team members continue to engage in various forums, events, working groups and boards within Internet2, The Quilt and the Schools, Health, Libraries and Broadband (SHLB) Coalition.

In this year's annual report, we share more about the work of our engineering team and client services team, which are both critical to OARnet's success. They collaborate to understand the needs of our wide variety of clients in the state of Ohio and identify technology solutions that will benefit them. In the forthcoming year, our client services team will undergo a transition, as our longtime leader, Denis Walsh, chief relationship officer and past interim executive director, retired this fall. His efforts to establish a strong client services relationship with our communities will serve us well as we move forward.

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.
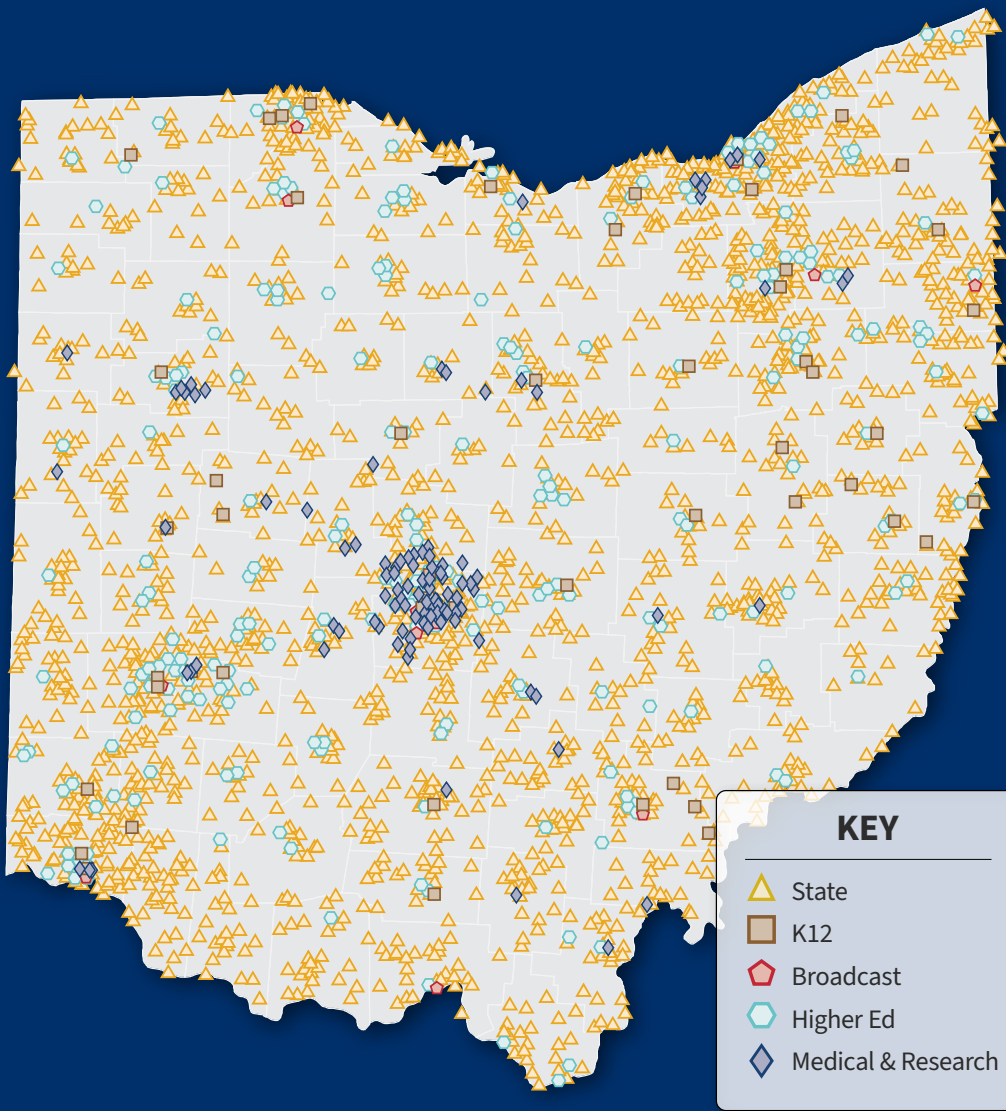
498 HIGHER ED SITES

977 K–12 SCHOOLS SITES

3,200+ STATE GOVT SITES

135 LOCAL GOVT SITES

730+ LIBRARY SITES

471 HEALTH CARE FACILITIES

27 RESEARCH SITES

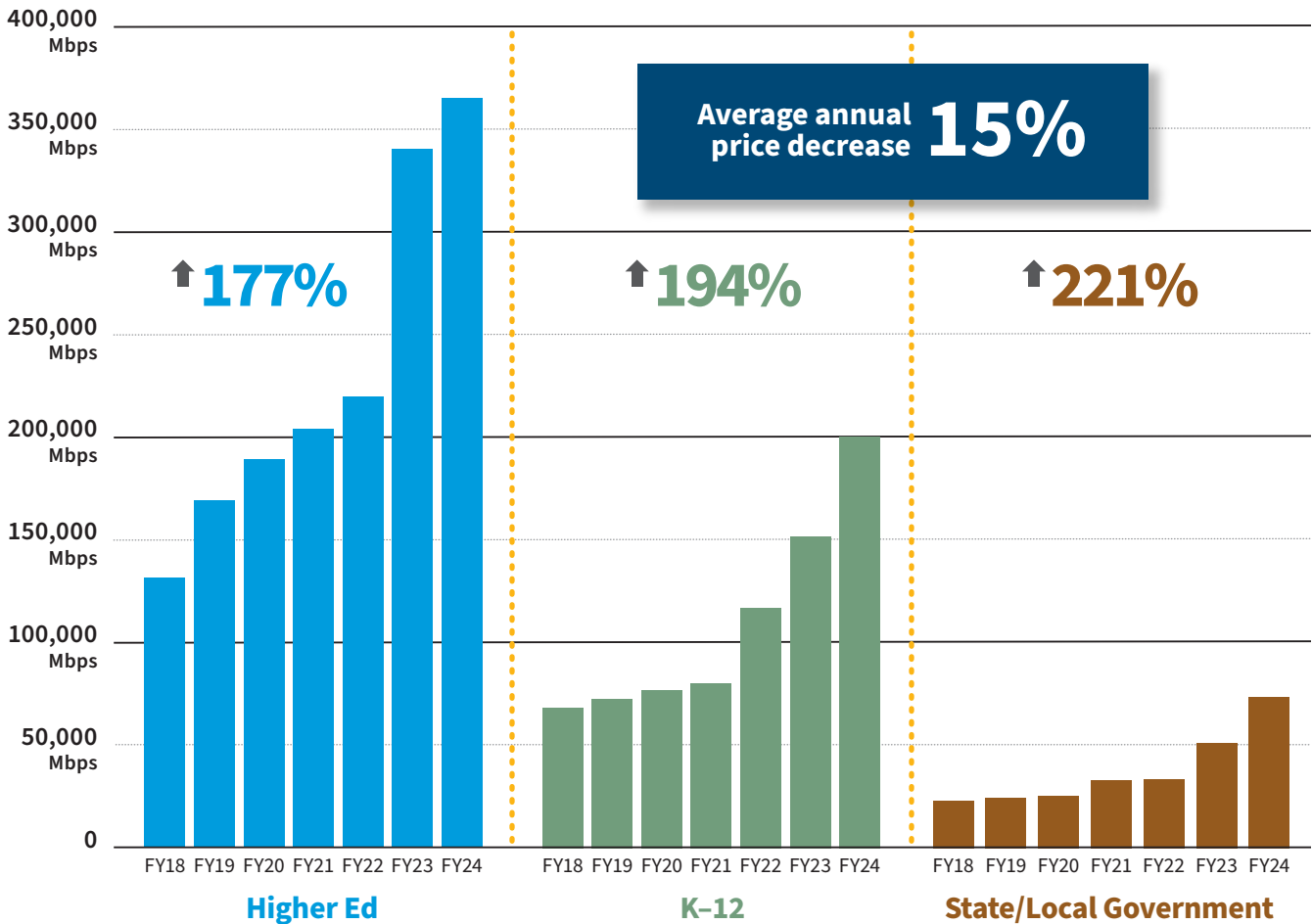**10** PUBLIC BROADCASTING SITES

6 NG911 SITES

5,500+ MILES OF FIBER-OPTIC BACKBONE

KEY

△ State
◻ K12
⬠ Broadcast
⬡ Higher Ed
◆ Medical & Research

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 15%

↑**177%** ↑**194%** ↑**221%**

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

Savings

In Fiscal Year 2024

$41+ million
savings for all clients
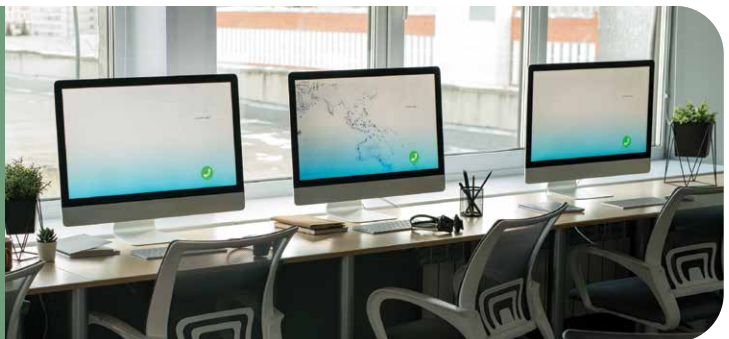
$13+ million
savings for higher education
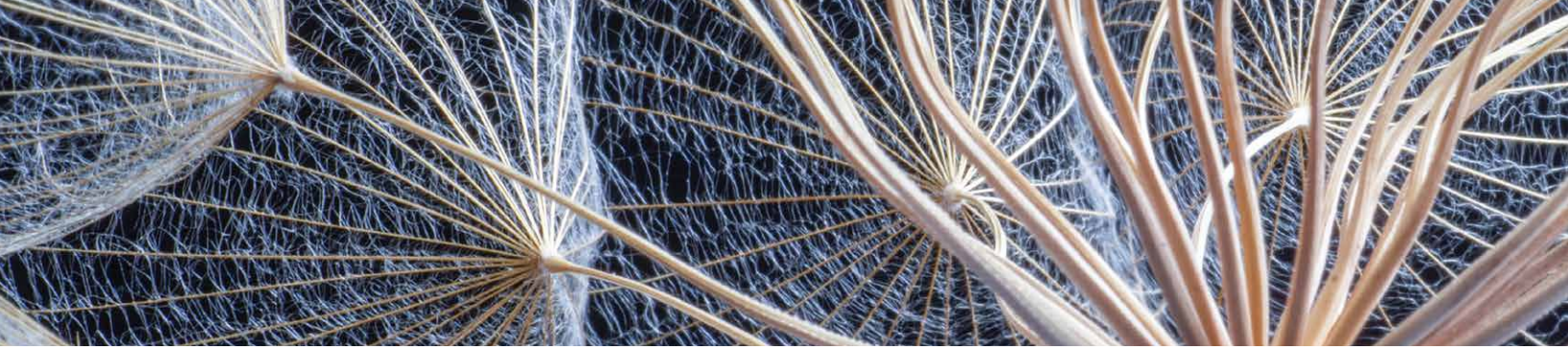

$15+ million
savings for K–12 schools

$12+ million
savings for State of Ohio agencies

$8+ million
savings through purchase aggregation
(VMware, Tenable and ESRI)

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**
- **Commodity Internet Access**
- **Optical Transport**
- **On-Net (IntraOhio)**

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**
- **Voice Over IP (VoIP)**
- **Emergency Web Hosting**

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**

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**

LOOKING FORWARD

Over the next year, OARnet will make major strides in enhancing its services for various communities in Ohio. Our current and ongoing projects include:

- Continuing to upgrade the statewide fiber-optic backbone from 100 Gbps to 400 Gbps to support the Next Generation OARnet Terabit Network that will increase capacity for technology utilization, research and innovation.

- Enhancing our cybersecurity services and expanding offerings for our clients, as well as collaborating with state government to ensure enhanced security of Ohio's broader infrastructure and systems.

- Working with public and private partners to develop the Next Generation 911 (NG911) Network, a faster, more resilient system for digital information transmission to first responders.

- Supporting CyberOhio, BroadbandOhio and InnovateOhio initiatives to help close the digital divide for underserved and unserved regions of Ohio, while keeping focus on enhancing cybersecurity.

- Educating students about career opportunities in network engineering through workforce development and our internship program, now in its second year.

saving $250+ million
through aggregate purchasing, such as the VMware program,
for Ohio over 15 years

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.

Ohio's Terabit Network takes shape as OARnet moves to 400 Gbps

OARnet is transitioning its statewide, fiber-optic backbone from 100 Gigabits per second (Gbps) to 400 Gbps connectivity—a significant milestone on the path to 1 Terabit (1,000 Gbps)—to accommodate the rising demand for broadband services in Ohio and to position the state for further technology innovation and economic growth.

The 400 Gbps upgrade, part of a long-term project called the Next Generation OARnet Terabit Network, is slated for completion in 2026 and will make a significant impact on Ohio. Outcomes will include:

- Integration of new technology, such as artificial intelligence and expanded automation, to streamline government service delivery.
- A robust blended in-person and online learning environment that ensures a successful student experience throughout the state.
- Facilitation of training, certifications and internships to support workforce development.

> **"OARnet is one of the nation's leaders in statewide delivery of broadband networks that advance the goals of government and education."**
>
> Mike Duffey, chancellor of the Ohio Department of Higher Education

- Increased availability of healthcare and expanded services as broadband creates links between urban and rural healthcare centers.
- Promotion of research and workforce development at higher education institutions, which also supports JobsOhio initiatives in recruiting new businesses and retaining and expanding existing businesses to advance economic development.

The State of Ohio has committed $20 million in capital improvement funds to date to support the Next Generation OARnet Terabit Network, under the direction of Mike Duffey, chancellor of the Ohio Department of Higher Education (ODHE). This project is critical for Ohio's future success, laying the groundwork for a Terabit-capable network beyond 2026, as soon as the technology becomes available.
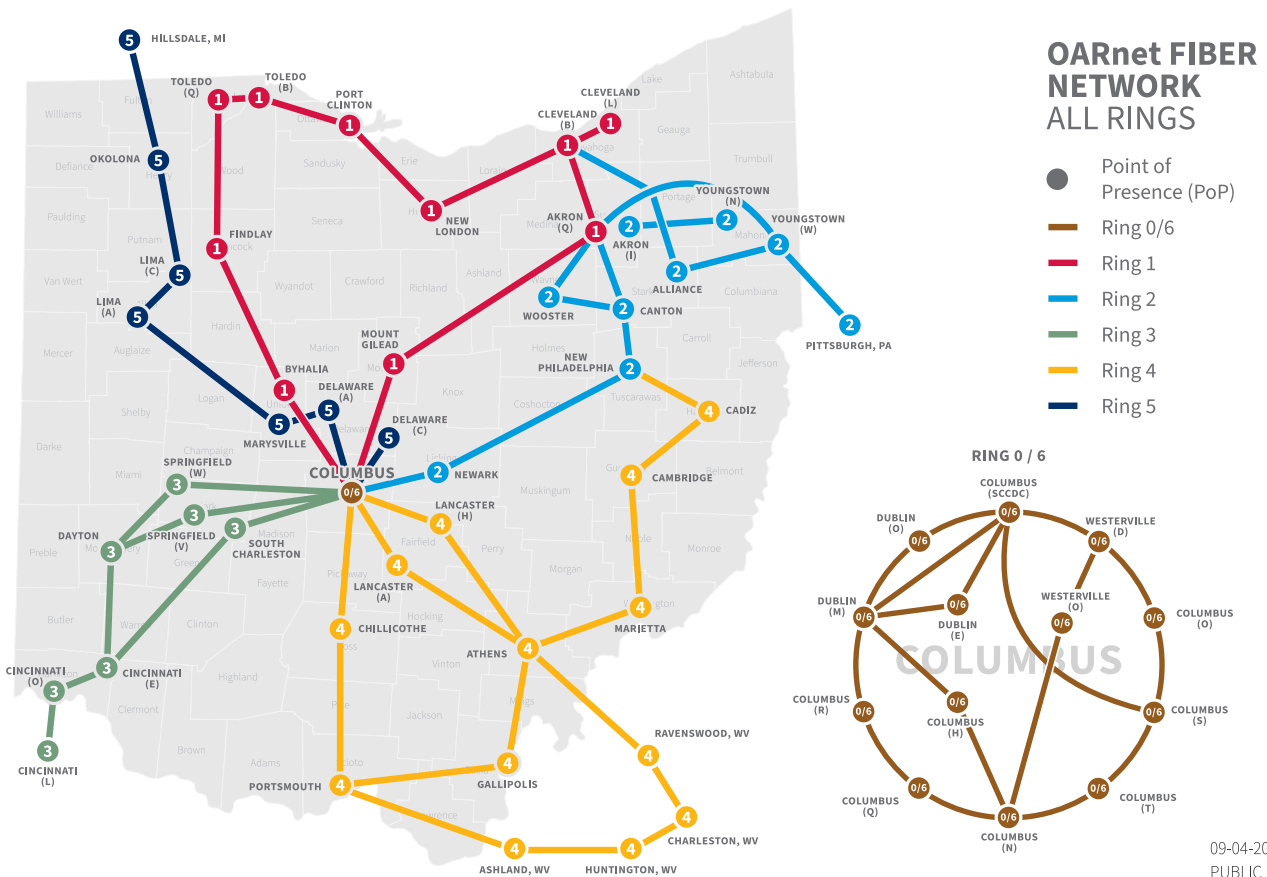
"OARnet is one of the nation's leaders in statewide delivery of broadband networks that advance the goals of government and education," Duffey said. "The Next Generation OARnet Terabit Network will allow Ohio to remain competitive with other states for economic development and research grant opportunities and support workforce retention."

Over the last few years, OARnet has strategically upgraded portions of its statewide fiber-optic backbone to 400 Gbps capacity and has now completed the greater Columbus area and southern Ohio regions of the project.

In addition, OARnet has upgraded its connectivity to Internet2, which links Ohio to national resources, to 500 Gbps. Internet2 connections in Cincinnati and Cleveland provide dedicated circuits for peering, research traffic and cloud computing services. This allows Ohio to participate in national university research collaborations on critical issues such as health, cybersecurity and artificial intelligence, as well as educational

OARnet FIBER NETWORK
ALL RINGS

- Point of Presence (PoP)
- Ring 0/6
- Ring 1
- Ring 2
- Ring 3
- Ring 4
- Ring 5

RING 0 / 6

COLUMBUS

09-04-2024
PUBLIC

The OARnet statewide backbone is comprised of six rings, defined by the path of the underlying fiber-optic infrastructure, which are powered by state-of-the-art optical transport and routing equipment. The backbone provides clients with high-capacity, redundant connectivity to cloud providers and high-speed internet service. Implementation of the Next Generation OARnet Terabit Network ensures that the backbone will continue to exceed the performance demands of OARnet customers.

cloud computing and access to providers such as Amazon, Microsoft and Google.

The project has required OARnet's engineering team to upgrade fiber as well as optical, routing and switching equipment in each of the six rings of the statewide backbone. (See accompanying diagram.) Working collaboratively with clients and vendors, OARnet has overseen delivery of new fiber, construction to support new infrastructure, and field testing to verify the performance of the equipment.

Ensuring seamless internet connectivity and other technology services for clients during the transition to 400 Gbps has been a top priority for OARnet. Engineers and business relationship managers work closely with OARnet's various client communities, such as higher education

institutions, state and local government entities, K–12 districts and healthcare organizations to carefully coordinate the equipment transition and leverage the redundancy in the system to avoid interruptions in service for the millions of Ohioans who rely on the OARnet backbone for education, research and government services.

"OARnet must continue to develop its capacity for enhancements to meet the challenges and opportunities presented by the rapid pace of the digital transformation in Ohio," said Pankaj Shah, executive director of OARnet. "This initiative also complements the state's overall strategy, under the offices of BroadbandOhio and InnovateOhio, to provide high-speed internet to every citizen and enhance digital literacy to develop the next-generation workforce."

OARnet's Client Services team celebrated the organization's 35th anniversary in a meeting with members, colleagues and stakeholders in Columbus in fall 2023. The team includes (clockwise from top left) Denis Walsh, Mary Ann Zbydnowski, Intisar Bashir, Toni Capocciama, David Ginn, Letha Butcher, Kathy Sochor and Andrea Carrier.

OARnet celebrates decades of client service excellence

OARnet's Business Relationship Managers (BRM) provide personalized and professional services to a large and diverse range of clients across the state of Ohio.

Launched in 1987 to provide higher education institutions connection to the Ohio Supercomputer Center, OARnet has since grown exponentially over the years to also serve K–12 schools, health care facilities, public broadcasting sites, research facilities and thousands of local and state government sites, including public safety, NG-911 and the Multi-Agency Radio Communications System (MARCS).

To support these communities, under the leadership of longtime Chief Relationship Officer Denis Walsh, OARnet established two distinct market segments within the Client Services team, under government and education, to develop expertise and strong relationships in each market.

These relationships allowed the BRMs to develop a deep understanding of clients' unique issues, concerns and objectives, and identify the appropriate resources and services to support their success.

Today the Client Services team is responsible for consulting with clients, vendors and OARnet's technical resources to identify technology solutions and develop project plans and timelines to achieve desired outcomes. During this process, the team is responsible for monitoring progress and scheduling meetings to discuss any issues and identify contingencies to ensure the project's success.

> ## "Client Services represents the front door into the wealth of resources at OARnet."
>
> David Ginn,
> chief relationship officer

"We bridge the gap between our clients, vendors and OARnet's technical resources to ensure the development of quality solutions that address customer's needs," said Walsh, who supported OARnet clients in his role for more than 20 years before his retirement in October 2024 *(see page 13)*.

Client Services also escalates potential issues to OARnet's team of engineers and communicates relevant information to its clients on the status of issues. With a 24/7/365 Network Operations Center (NOC), OARnet is constantly surveilling its network connections to eliminate issues before they impact clients.

"Client Services represents the front door into the wealth of resources at OARnet," said David Ginn, newly appointed chief relationship officer.

When unusual challenges arise, the Client Services team works with clients and engineering resources to develop unique and timely solutions.

"During the pandemic OARnet was required to be flexible and responsive to the rapidly changing requirements of that unique environment," Walsh said. "For example, on short notice we worked with our public broadcasting clients to enable Governor DeWine to share important information with the public from his home."

OARnet also rapidly stood up new network connections at the Ohio Department of Health's Strategic National Stockpile warehouse and at the Columbus Convention Center to prepare

Members of OARnet's client services, engineering and leadership teams gathered during the 35th anniversary celebration. From left to right: Angela Nixson, Kristen Weimar, Denis Walsh, Pankaj Shah, Mark Fullmer, Justin Costa.

the site as a potential overflow hospital during the COVID-19 outbreak. Working with The Ohio State University's Wexner Medical Center, OARnet expedited a circuit to support a mass testing site at the Ohio Expo Center and State Fairgrounds and supported a mass vaccination center at the Jerome Schottenstein Center.

In September 2020, OARnet was tapped again for its technical expertise for a 2020 presidential debate at the Health Education Campus of Case Western Reserve University and the Cleveland Clinic. Engineers worked to prepare network connectivity for the demands of event staff, national broadcasters and the Secret Service, including a configuration freeze and enhanced NOC monitoring and escalation leading up to and during the debate.

OARnet's mission is to provide clients with a personalized experience; they are never a faceless number.

"For our clients, it is not about calling a number and getting put in a queue. Each client has a dedicated

OARnet representative who understands their environment in detail," said Letha Butcher, senior business relationship manager. "They do not have to try to explain their issue; that relationship is already built."

In addition to building personal relationships with individual clients, OARnet brings together large groups of clients to address specific needs and then develops vendor contracts to gain significantly lower prices as a result of large aggregate purchases.

"Coordinating the purchasing power of 90+ colleges, for example, gets discounts far greater than what any school could achieve on its own," Ginn said.

One prominent example of the power of aggregate purchasing is the availability of VMware, a technology that provides a platform for cloud computing and virtualization, delivered at a significant savings through OARnet since 2008.

In addition, the Client Services team identifies what services clients may need in the future and

works to proactively develop a statewide strategy to obtain the resources and services needed in the most cost-effective manner.

"In recent years OARnet has been focused on expanding security services, as a result of an increase in cyber attacks," Walsh said. "One example of these efforts was the inclusion of DDoS protection with our internet service to protect clients from volumetric attacks. OARnet also hired a cybersecurity architect to help develop our security portfolio and expand the services that the Client Services team can offer to protect our clients from these threats."

META Solutions, an information technology center (ITC) that worked closely with OARnet to upgrade its 200-plus K–12 school districts to 100 gigabits per second (Gbps) connectivity, benefits from OARnet services such as DDoS mitigation for network security as well as its aggregate pricing on VMware, which provides cloud infrastructure and digital workspace technology. Since 2020, bandwidth needs have grown by 76 percent as districts have adopted more online technologies for the modern learning environment, said Jim Sotlar, CEO of META Solutions.

"It's a great partnership between the ITCs and OARnet," Sotlar said. "It's all about taking care of our school districts and providing them with services they need to operate efficiently and effectively every day."

In 2012, when OARnet upgraded its fiber-optic backbone to 100 Gbps, the level of service provided was unprecedented, exceeding the current needs of clients. Today OARnet is once more in the process of upgrading its backbone, this time to 400 Gbps to ensure it can accommodate the future technology needs of clients and to ensure Ohio's role as a technology leader.

"Client Services allows OARnet to deliver the benefits of advanced broadband technology to our clients and respond to their needs as effectively as possible," said Pankaj Shah, executive director of OARnet. "By remaining accessible and in constant touch, our Client Services team members convert the technological capabilities of our state-of-the-art network into a top-notch experience for our clients' staff who keep Ohio connected."

Walsh recognized for 20 years of service to OARnet

After more than two decades of dedicated service to OARnet and the State of Ohio, Denis Walsh retired at the end of October 2024. Walsh was instrumental in creating and nurturing OARnet's modern-day Client Services team and is recognized as one of the most knowledgeable telecommunications subject matter experts in Ohio and the region.

Walsh's contributions were pivotal in the success of many OARnet initiatives. His involvement in strategy development on the OARnet executive team has led to numerous successful projects, including the BTOP-ARRA federal funds initiative, which established the current OARnet model serving all anchor institutions in Ohio. Other notable achievements include the 100 Gbps backbone upgrades that paved the way for future terabit networking; partnerships with the State of Ohio, the Management Council (K–12 statewide) and the Broadcast Education Media Commission (public broadcasters statewide); and VMware/Broadcom aggregate purchasing.

Walsh's legacy of contributions and forward-looking plans have laid a robust foundation for OARnet's future. OARnet is deeply grateful for his many years of service and dedication.

Effective Nov. 1, 2024, David Ginn, formerly the deputy chief relationship officer at OARnet, assumed the role of chief relationship officer.

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Ohio Technology Consortium

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