



OARnet

An **OH·TECH** Consortium Member

ANNUAL REPORT

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OARNET LEADERSHIP

Pankaj Shah

Executive Director

Denis Walsh

Chief Relationship Officer

Mark Fullmer

Chief Technology Officer

Letha Butcher

Client Services Manager,
State and Local Government

Rebecca Dolan

Interface and Applications Director

Gary Goettel

Network Operations Manager

Steffan Pease

Network Systems Engineering Manager

Alison Scott

Administrative Manager

Stephen Sizemore

Tier 3 Provisioning Manager

Aaron Wise

Director of Networking

Ann Zimmerman

Client Services Manager,
Higher Education and K-12

OH-TECH LEADERSHIP

Charles See

Vice Chancellor, External Relations
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



“When the world shut down, OARnet was prepared. The research and education demands on the network meant that ample bandwidth was already in place as life moved online due to COVID-19. When Governor DeWine, BroadbandOhio, InnovateOhio and others came calling, OARnet was ready to assist.”

— *Randy Gardner, Chancellor, Ohio Department of Higher Education*

OARnet: Leadership. Solutions. Innovation. The Ohio Academic Resources Network (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.

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

ON THE COVERS

Institutions featured on the covers are among the 40 colleges and universities upgraded from 1 Gigabit per second (Gbps) to 10 as part of the Chancellor’s Last Mile Enhancement Program funded by the Governor’s Emergency Education Relief program. All photos are courtesy and copyright the respective institutions. See page 9 for the full list of institutions pictured.

Above: Chancellor Randy Gardner 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.

FROM THE DIRECTOR



Pankaj Shah
Executive Director

As the COVID-19 pandemic unfolded, years of strategic investment meant that OARnet was fully prepared to respond as broadband became a critical lifeline for Ohio's education, research, health care, public broadcasting and government communities. Even as new unexpected needs arose, OARnet maintained and even

increased network capacities quickly to keep the state running.

Our field engineers adapted to COVID-19 protocols to safely continue their critical work. For example, in September 2020, OARnet worked with Case Western Reserve University and the Cleveland Clinic to prepare for a presidential debate at their shared Health Education Campus. Our staff ensured the network was able to support national broadcasters, event staff and the Secret Service.

Ohio remains fertile ground for public-private partnerships. Just look to East Cleveland and Logan County's Riverside Local Schools, where a diverse set of partners connected underserved

families with affordable wireless broadband. Led by InnovateOhio and BroadbandOhio under the direction of Lt. Governor Jon Husted, these innovative projects rely on OARnet infrastructure.

Governor Mike DeWine and Chancellor Randy Gardner raised Ohio to national prominence by creating the Last Mile Enhancement Program. Funded by the Governor's Emergency Education Relief program, we worked with private-sector last-mile partners to improve low-speed infrastructure at 40 colleges and universities. As a result, no higher education institution in Ohio will connect to OARnet at less than 10 Gigabits per second.

We will continue searching for partnership opportunities this year as we maintain and improve Ohio's ultra-fast broadband network. The next strategic investment is already underway as we upgrade our fiber-optic backbone to 400 Gigabits per second. As a leading research and education network, OARnet is proud to help Ohio maintain its leadership role in the innovation economy.

Pankaj Shah
Executive Director

HIGHLIGHTS

Last Mile Enhancement

With a \$12.1 million award from the Governor's Emergency Education Relief Fund, OARnet established the Last Mile Enhancement Program to increase broadband speeds by 1,000% at 40 Ohio colleges and universities and double the internet subscriptions at all 87 connected member institutions throughout the state for two years.

Accessible Broadband

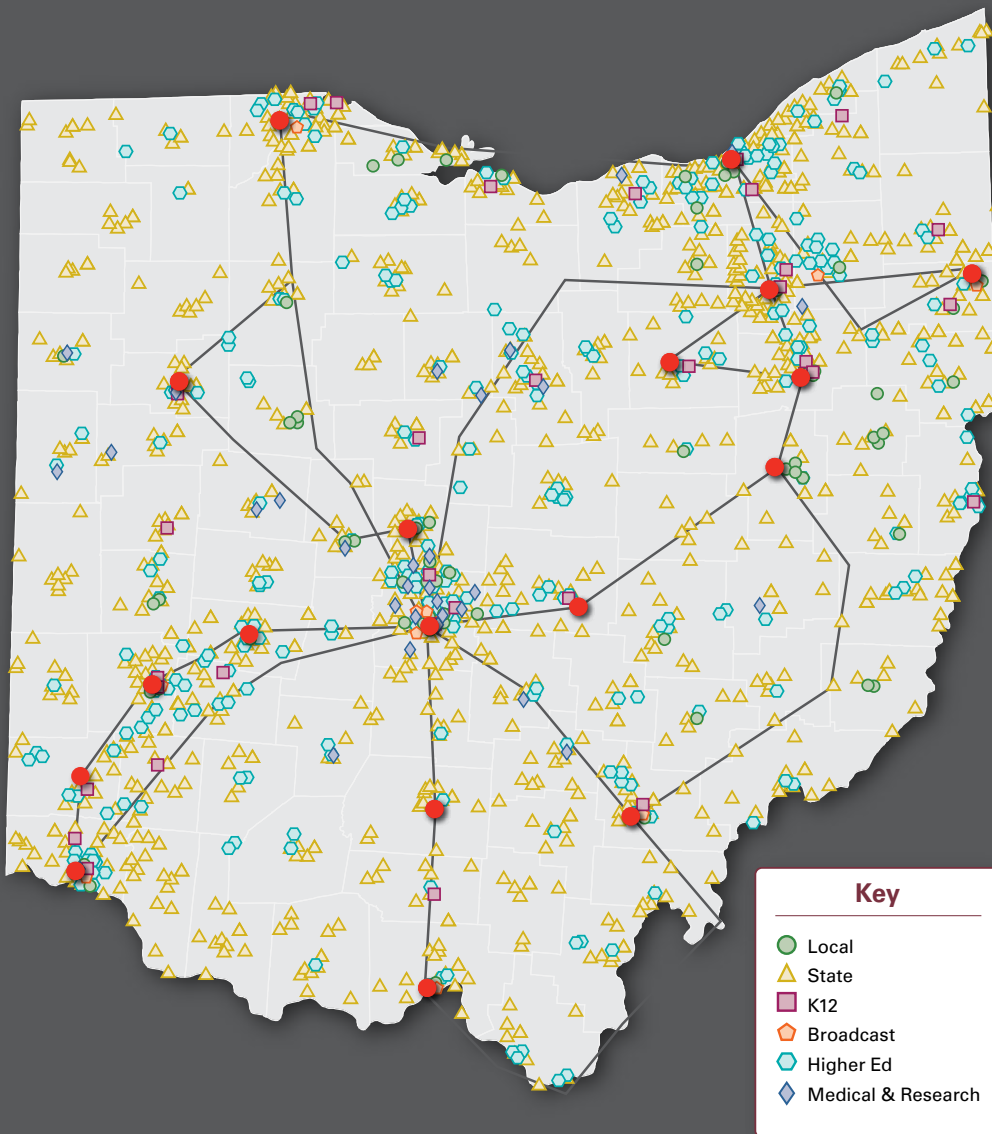
East Cleveland City Schools and Logan County's Riverside Local Schools collaborated with InnovateOhio, BroadbandOhio and other public and private partners to expand broadband access. Leveraging the districts' existing OARnet connections, a new fixed wireless technology mounted to school buildings broadcasts wireless signal to surrounding communities.

Governor's Briefings

When Governor Mike DeWine's office needed technical support for its daily COVID-19 press conferences, OARnet bolstered the Ohio Statehouse's network capacity to handle the high demand. Citizens watching learned about the status of coronavirus spread across the state as well as new public health regulations and initiatives to combat the virus.

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, health care, public broadcasting and government clients by connecting them to the digital world through ultra-high-speed fiber across the state.



 **625+**
K-12 Schools Sites

 **469**
Higher Education Sites

 **102**
Health Care Facilities

 **13**
Research Sites

 **27**
Public Broadcasting Sites

 **98**
Local Government Sites

 **2,879**
State Government Sites

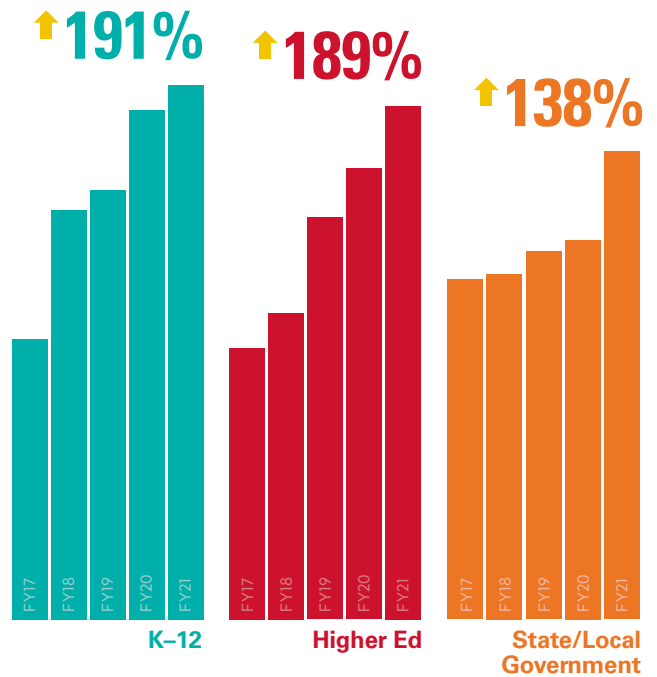
FINANCIAL IMPACT

OARnet’s network connects Ohio’s education, state and local government and health care communities to a single entity for the purpose of aggregating demand for services to generate the best possible discounts. This promotes collaboration between and within these communities to develop innovative solutions to meet the ever-changing needs of today’s technology environment. This is based on three driving principles:

- Increase access to affordable broadband service
- Reduce the cost of technology through aggregate purchasing
- Maximize shared services opportunities

OARnet continues to provide value-added services to clients through the development of the network to ensure the newest technology is available to meet the needs of our communities. The OARnet network can deliver the next generation of service, including VMware, internet, Internet2 and cloud services, as well as support the demand for collaboration required for grant-funded research. This research, in conjunction with the private-public partnership, is the basis for Ohio’s economic future.

5-YEAR BANDWIDTH INCREASES



SAVINGS

\$45+ MILLION
savings for all clients



\$15 MILLION

savings for K-12 schools



\$14 MILLION

savings for higher education



\$16 MILLION

savings for State of Ohio agencies

OARNET SERVICES

By centralizing hardware, software and network technology requirements to support its client communities, OARnet reduces the cost of delivery of services such as a network operations center, co-location, emergency web hosting and cloud computing.



INTEGRATED NETWORK SERVICES

With more than 5,500 miles of fiber, OARnet's network backbone extends into the education, health care, public broadcasting and government communities and results in lowered cost to broadband access for clients. OARnet aggregates internet providers and connectivity to public internet exchange points to optimize these costs and provide a high standard of reliability.

- 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.

OARnet also encourages and supports members in pursuing research funding through federal grant programs, enabling research and education in Ohio.

- VMWARE
- ESRI
- VOICE OVER IP (VOIP)
- EMERGENCY WEB HOSTING
- GRANT DEVELOPMENT



SUPPORT SERVICES

OARnet clients have access to solutions through an around-the-clock network operations center with Tier I and Tier II support that includes troubleshooting, ticketing and engineering support. Additionally, OARnet engineers provide consulting services for areas such as fiber and access circuit planning, optical support and routing design, including developing failover plans. OARnet’s engineering team can remotely configure and manage environments as well as provide onsite support when necessary.

SUPPORT CENTER (NOC)
CONSULTING
QUALITY OF SERVICE (QOS)



CYBERSECURITY SERVICES

Avoiding DDoS attacks and security breaches requires being vigilant about emerging threats. OARnet’s portfolio of cybersecurity services mitigates and prevents attacks and ensures information and infrastructure remains safe. OARnet offers two different types of cybersecurity services, including preconfigured filtering and On-Demand DDoS mitigation. Through a layered approach, ranging from local filtering and BGP signaling to packet scrubbing, OARnet can meet your institution’s needs. Additionally, OARnet participates in the REN-ISAC program that tracks emerging threats.

DDOS MITIGATION
VULNERABILITY SCAN HOSTING
EDUROAM
INCOMMON FEDERATION



NETWORK PEERING

OARnet is Ohio’s Internet2 connector, with two 100 Gbps connections located in Cleveland and Cincinnati. These services allow researchers to collaborate across institutions and apply to funding sources such as the National Science Foundation. OARnet also has 10 Gbps connections to NASA Glenn Research Center and to Wright-Patterson Air Force Base.

RESEARCH NETWORK PEERS
COMMERCIAL NETWORK PEERS



STAYING RESILIENT DURING THE COVID-19 PANDEMIC

Over the last year, OARnet has shifted business processes in response to the COVID-19 pandemic while also continuing to provide exemplary service to clients and partners in the state of Ohio.

We quickly developed new protocols for field engineers and technicians to safely install or repair equipment on site and for pickup and delivery of materials. Tools and equipment were in place to quickly transition staff to working from home, and we successfully transitioned to virtual on-boarding and training for new staff.

Systems remained fully operational, OARnet's Network Operation Center (NOC) has been available 24/7/365 and our communities have not experienced disruptions in service due to the pandemic.

During an early virus peak, OARnet 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 the site as a potential overflow hospital. Working with Ohio State's Wexner Medical Center, we 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.

OARnet worked with specific client communities to address needs that emerged during the pandemic, such as improving virtual conferencing and evaluating options for hot spots, computers, tablets and software. As a new member of the BroadbandOhio working group, OARnet partnered with the Ohio Education Computer Network's Management Council and K-12 school districts to provide broadband in underserved areas.

OARnet bolstered network capacity in the Ohio Statehouse to support Governor Mike DeWine's daily COVID-19 press briefings. In collaboration with the state's Office of Information Technology, Legislative Service Commission, Department of Public Safety and Broadcast Educational Media Commission, this work meant Ohio's citizens learned about the spread of the virus and new public health measures without interruption.

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 in September. 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 also tackled major projects designed to advance high-speed connectivity for Ohio's major cities, educational institutions and underserved regions. That connectivity became even more critical at a time when Ohioans needed online resources to work and learn remotely.

- 1 OARnet is performing capacity upgrades and equipment modernization network-wide. The first round of upgrades targeted the replacement of 10GE router chassis with 100GE capable devices. A second round of upgrades is currently underway to add new Juniper MX-series chassis to key locations through Ohio and refresh the hardware and software in existing chassis. This will prepare OARnet to provision additional backbone capacity and support 400 Gbps capable technology.
- 2 When the Cincinnati Education and Research Fiber (CERF) ring needed a new service provider, OARnet engineers quickly stepped in to transition the system. Engineers seamlessly moved the ring—which serves the University

of Cincinnati, Xavier University and Cincinnati State—to its oversight, without any disruption in service. CERF members benefit from OARnet's existing engineering expertise and its 24/7/365 monitoring capability to manage the CERF optical fiber, DWDM nodes and customer circuits.

- 3 Bowling Green State University asked OARnet for assistance in building out fiber on its campus to take advantage of their upgrade to 40 Gbps—which has since been boosted to 100 Gbps—on the northwest Ohio ring. The project also provided critical redundancy to the university's system. OARnet performed similar infrastructure improvements for University of Toledo, upgrading its LAN connections to 40 Gbps and their OARnet backbone capacity to 100 Gbps. Backbone connectivity for The Ohio State University was also upgraded to 40 Gbps.
- 4 Engineers provided one-on-one consultations to Otterbein University and the Columbus College of Art and Design on firewalls and DNS, transitioned Kent State University to a managed DNS solution, deployed a redundant DNS system at Ohio State and assisted with a move on Ohio State's Wooster campus. OARnet engineers also completed builds for multiple redundant passive optical solutions to provide increased capacity for state government agencies at multiple locations in downtown Columbus •



Opposite page left: Ohio Statehouse; Opposite page right: Cincinnati State Technical and Community College; Above: Health Education Campus, Case Western Reserve University and the Cleveland Clinic

NEED FOR SPEED

OARNET'S LAST MILE ENHANCEMENT PROGRAM UPGRADES SPEEDS AT COLLEGES AND UNIVERSITIES ACROSS OHIO

OARnet was awarded \$12.1 million from the Governor's Emergency Education Relief (GEER) Fund through the Ohio Department of Higher Education to increase broadband and internet speeds at colleges and universities throughout Ohio.

Established by Congress as part of the federal Coronavirus Aid, Relief, and Economic Security (CARES) Act, the GEER Fund assists the K-12 and higher education institutions most impacted by the pandemic. The U.S. Department of Education awarded grants from the fund to each state's governor for further distribution.

"The pandemic has put tremendous stress on institutions of higher education, their faculty and students in the pivot to online instruction, and we're thankful to Governor Mike DeWine's office for providing assistance through GEER funds," said Randy Gardner, chancellor of the Ohio Department of Higher Education.

With its \$12.1 million award, OARnet established the Last Mile Enhancement Program to increase broadband speeds by 1,000% at 40 Ohio colleges and universities and double the internet subscriptions at all 87 connected member institutions throughout the state for two years.

OARnet has worked with commercial "last mile" providers to upgrade connections to its ultra-fast 5,500-mile fiber optic backbone at each of the 40 institutions. The connection speeds will increase from no faster than one Gigabit per second (Gbps) to 10 Gbps, an improvement that could, for example, shorten a transfer of one terabyte of data from 160 minutes to 16.

The 40 institutions include community, technical and four-year colleges and universities, both public and private, whose networks experienced unprecedented demand following the sudden shift to remote and hybrid learning models due to the coronavirus pandemic.



Top: Clark State College; Bottom: Art Academy of Cincinnati

"COVID-19 accelerated a pre-existing trend in the expansion of remote and hybrid learning," Chancellor Gardner said. "The Last Mile Enhancement Program enables Ohio's faculty and instructors to continue delivering high-quality academic experiences in this new environment." •

LOOKING AHEAD

At a time when more educational institutions and employers rely on high-speed connectivity and technology services to support a remote workforce and student population, OARnet's capabilities and expertise are becoming increasingly critical for the state of Ohio. Over the next year, OARnet will be launching or completing several major projects that will advance Ohio's connectivity:

- Through a grant from the Governors Emergency Education Relief (GEER) program, OARnet is in the process of upgrading last-mile connections at 40 higher education institutions from 1 Gigabit per second (Gbps) or less to 10 Gbps to support the digital transformation in education.
- With a planning grant from the National Science Foundation (NSF), OARnet and partners will develop new shared STEM training and research resources that capitalize on the GEER-enabled upgrades at nine smaller higher education institutions. Initial work funded by the planning grant will allow OARnet and partners to pursue future funding opportunities.
- OARnet is wrapping up a project that will help WOSU Public Media move its broadcasting facility to downtown Columbus. Engineers worked collaboratively with The Ohio State University, the city of Columbus and the

Broadcast Educational Media Commission to determine how to provide infrastructure and connectivity to the new site.

- In September 2021, OARnet will complete a 100 Gbps ring between Columbus and Cleveland for OH-TECH Shared Infrastructure to improve business continuity preparedness for the Ohio Department of Higher Education and the OH-TECH units, which include OARnet, the Ohio Supercomputer Center and OhioLINK.
- Planning is underway for the replacement of 600 Juniper switches for Ohio's departments of Public Safety and Jobs and Family Services.
- OARnet is developing the next generation of its network, upgrading the network backbone and connections to Internet2 to 400 Gbps.



WOSU public media

Institutions featured on the front cover, top to bottom, left to right: Owens Community College, Ohio Dominican University, Southern State Community College, Edison State Community College, Bluffton University, Terra State Community College, Washington State Community College, Walsh University, Methodist Theological School in Ohio, Cuyahoga Community College, University of Rio Grande, Lake Erie College, Belmont College, Wilmington College.

On the back cover, top to bottom, left to right: Tiffin University, Marion Technical College, University of Northwestern Ohio, Cleveland Institute of Music (photo by Robert Muller), Northwest State Community College, Hocking College, Capital University, Lourdes University, Hebrew Union College, Central Ohio Technical College, Franciscan University of Steubenville, Zane State College, Malone University, Antioch University Midwest, Wilberforce University, Rhodes State College.

