2022–2023 Annual Report

35TH
1987–2022

ANNIVERSARY

Advancing Ohio's technology leadership since 1987

OARnet

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

"Through its various efforts to upgrade bandwidth in the state, OARnet ensures that communities across Ohio have the necessary connectivity for their current education, research and workforce needs, as well as the capacity to adopt and utilize new digital innovations in the coming years."
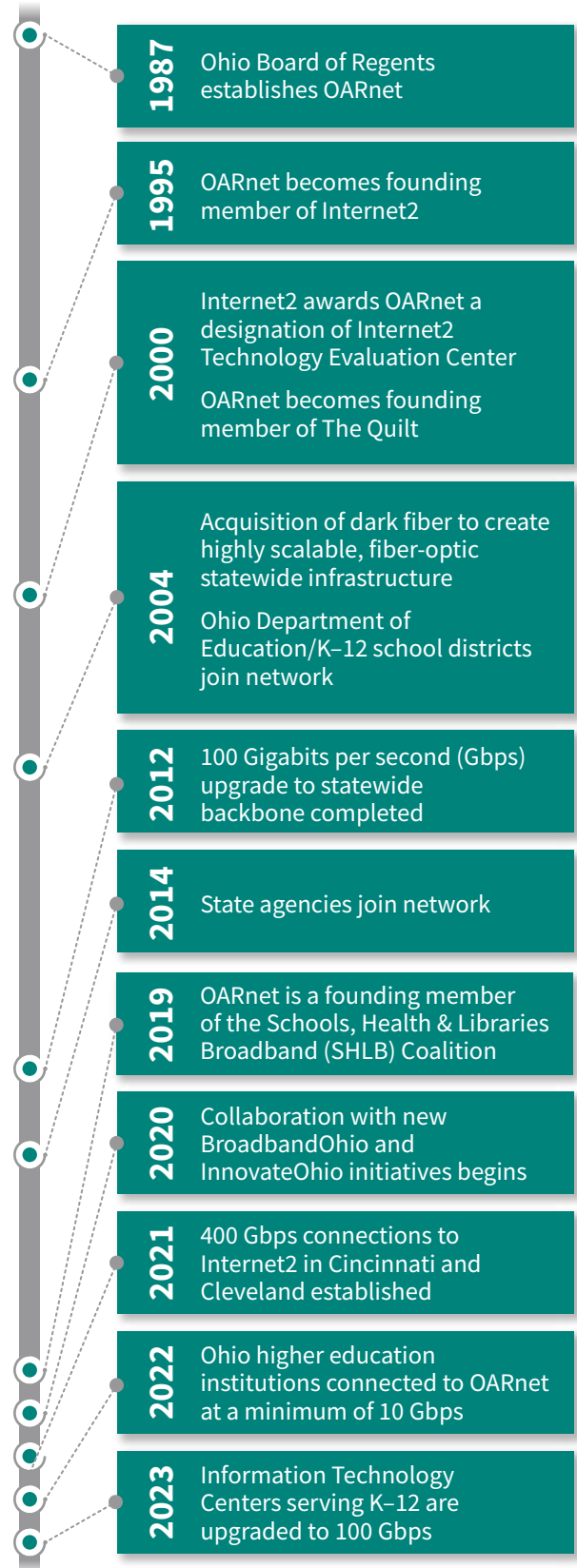
Randy Gardner
Chancellor, Ohio Department of Higher Education

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.

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.

oar.net

35 YEARS

1987 Ohio Board of Regents establishes OARnet

1995 OARnet becomes founding member of Internet2

2000 Internet2 awards OARnet a designation of Internet2 Technology Evaluation Center

OARnet becomes founding member of The Quilt

2004 Acquisition of dark fiber to create highly scalable, fiber-optic statewide infrastructure

Ohio Department of Education/K–12 school districts join network

2012 100 Gigabits per second (Gbps) upgrade to statewide backbone completed

2014 State agencies join network

2019 OARnet is a founding member of the Schools, Health & Libraries Broadband (SHLB) Coalition

2020 Collaboration with new BroadbandOhio and InnovateOhio initiatives begins

2021 400 Gbps connections to Internet2 in Cincinnati and Cleveland established

2022 Ohio higher education institutions connected to OARnet at a minimum of 10 Gbps

2023 Information Technology Centers serving K–12 are upgraded to 100 Gbps

Above: *OARnet's leadership and management team.* First row, from left to right, Aaron Wise, director of networking; Kristen Weimar, administrative manager; Faaress Parham, cybersecurity architect; Pankaj Shah, executive director; Letha Butcher, client services manager, state and local government; Rebecca Dolan, interface and applications director. Second row, from left to right, Justin Costa, senior manager, fiscal operations; Mark Fullmer, chief technology officer; Denis Walsh, chief relationship officer; Dave Ginn, deputy chief relationship officer; Steffan Pease, network systems engineering manager. Not Pictured: Gary Goettel, network operations manager; Stephen Sizemore, Tier 3 provisioning manager; Andrew Boggs, Tier 2 engineering manager; Vincent Gerardi, optical engineering manager; and Austin McCoy, operations install team manager.

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2022–2023 Highlights

Intelligent State Award

The Intelligent Community Forum has named the State of Ohio the world's first "Intelligent State" for its focus on improving broadband access and infrastructure to support economic growth. OARnet was highlighted as a key partner in the state's broadband initiatives.

Ohio Broadband Strategy

OARnet supported BroadbandOhio's efforts this year to gather public feedback on the state's broadband strategy to close the digital divide in Ohio. Stakeholder input will help BroadbandOhio access a full allocation of federal funds from the Infrastructure Investment and Jobs Act.

Supporting Public Safety

The State of Ohio established two new Ohio Narcotics Intelligence Center offices in Toledo and Cincinnati in 2022 to expand the use of computer forensics to combat drug trafficking. OARnet worked with the sites to support the bandwidth needed for law enforcement to process and analyze the large volume of digital data uncovered in criminal investigations.

From the Director

As we celebrate 35 years of OARnet, access to strong, reliable broadband internet service has never been more critical. The COVID-19 pandemic ushered in new developments in the online education, research and workforce landscape that institutions are embracing to better serve their clients and communities. State and federal measures designed to help society weather the pandemic have set the stage for even greater technology innovations.

One key example is the initiatives developed by Ohio Department of Higher Education Chancellor Randy Gardner in response to the COVID-19 pandemic, the Last Mile Enhancement Program and the Internet Enhancement Program. These programs, funded by Governor Mike DeWine's Emergency Education Relief Fund (GEER), enabled Ohio higher education institutions to enhance their broadband capacity and double their internet bandwidth subscriptions at no additional cost to support hybrid learning environments.

This spring the Chancellor introduced a new OARnet pricing plan to continue the momentum of these programs and keep internet costs affordable for colleges and universities. As of Fiscal Year 2024, OARnet has reduced fees for internet service by an average of 56% for all higher education institutions, thanks to our organization-wide efforts to increase aggregate purchasing, expand shared services and streamline engineering requirements that reduce overhead costs. This plan will allow institutions to continue to invest in new and expanded digital services that have become essential to their operations.

The GEER program also allowed OARnet to explore enhancements to higher education cybersecurity, such as implementing new firewalls on campus and offering vulnerability management and penetration testing as pilot programs. We are expanding those programs to all OARnet member colleges and universities this year, thereby further reducing the licensing costs through aggregate purchasing.

Cybersecurity is not only a concern for higher education, of course, but all of the communities served by OARnet. We are working closely with the state's CyberOhio initiative to provide more cybersecurity services to all OARnet stakeholders and local governments.

Enhancing services to our K–12 education sector also continues to be a major focus for OARnet over the next two years. Several Information Technology Centers (ITCs) that serve K–12 districts have been upgraded to 100 Gigabits per second (Gbps) capabilities since the launch of our major statewide upgrade program in 2022. The project, supported through U.S. Department of Education Elementary and Secondary School Emergency Relief (ESSER) funds, is slated for completion in 2024.

To provide valuable technology consultation to BroadbandOhio about infrastructure and services, it is important for OARnet to engage in national conversation on these issues. We are members of Internet2 and The Quilt, which support Research and Education Networks such as OARnet across the country. We are pleased to welcome The Quilt and National Science Foundation to Columbus, Ohio, for their 2023 annual conference and PI workshops, where OARnet's members can participate in focused discussions about cybersecurity, broadband programs, infrastructure and more. We are holding our annual fall meeting on September 26, 2023, in conjunction with The Quilt's conference to capitalize on and support the synergies between our state efforts and these national initiatives, while also formally celebrating our 35th birthday (delayed due to the pandemic in 2022).

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.
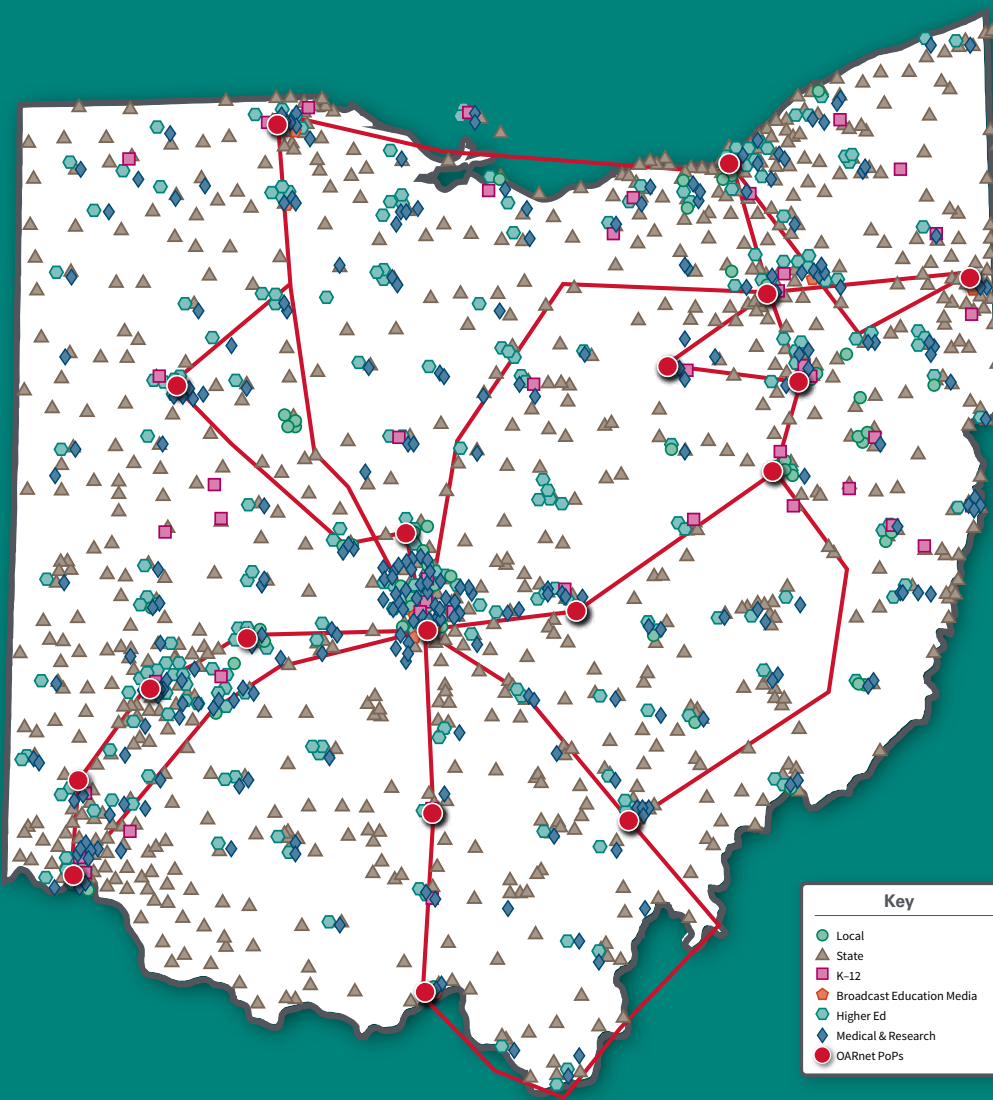
972
K–12 Schools Sites

471
Higher Education Sites

91
Health Care Facilities

26
Research Sites

14
Public Broadcasting Sites

51
Local Government Sites

3,200+
State Government Sites

Key
- Local
- State
- K–12
- Broadcast Education Media
- Higher Ed
- Medical & Research
- OARnet PoPs

Financial Impact

OARnet aggregates demand for services to generate the best possible discounts for our statewide clients. 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.

5-YEAR BANDWIDTH INCREASES

Average annual price decrease **21%**

↑**108%** State/Local Government

↑**111%** K–12
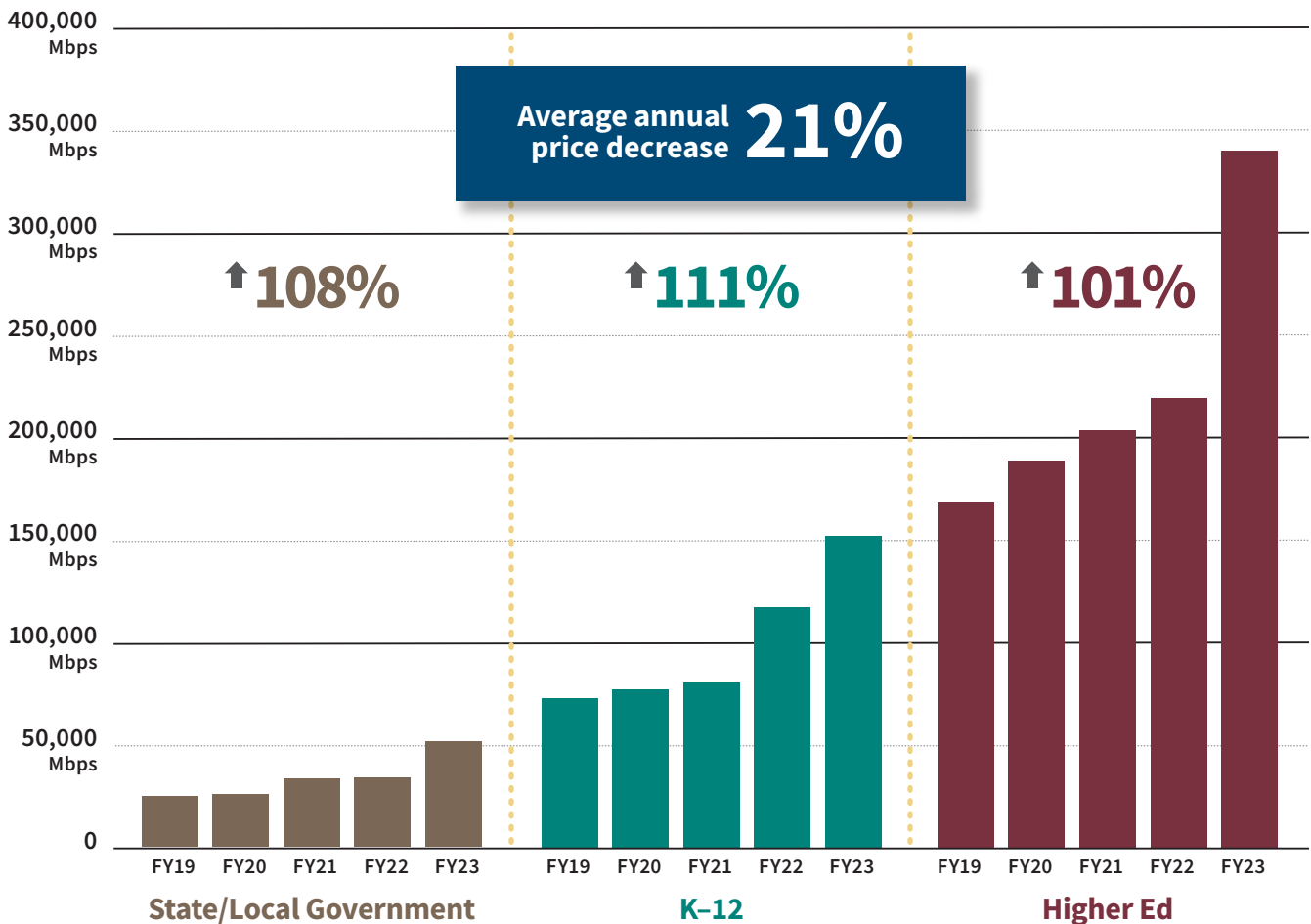
↑**101%** Higher Ed

Savings

In Fiscal Year 2023

$41+ million
savings for all clients

$15+ million
savings for K–12 schools

$12+ million
savings for State of Ohio agencies

$13+ million
savings for higher education

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

Looking Ahead

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 increase capacity for technology utilization, research and innovation.

- Completing a technology update for K–12 school districts and ITCs that will bring them to 100 Gbps capacity.

- Expanding our statewide aggregation program by enhancing our cybersecurity services and offerings for our clients and collaborating with state government to ensure the security of Ohio's broader infrastructure and systems.

- Working closely with BroadbandOhio and InnovateOhio to identify opportunities to close the digital divide for the underserved and unserved regions of Ohio.

- Educating students about career opportunities in network engineering through our new internship program and by participating in outreach events with our colleagues in the Ohio Technology Consortium and Ohio Department of Higher Education.

BroadbandOhio

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)

NETWORK PEERING

OARnet is Ohio's Internet2 connector, with two 400 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
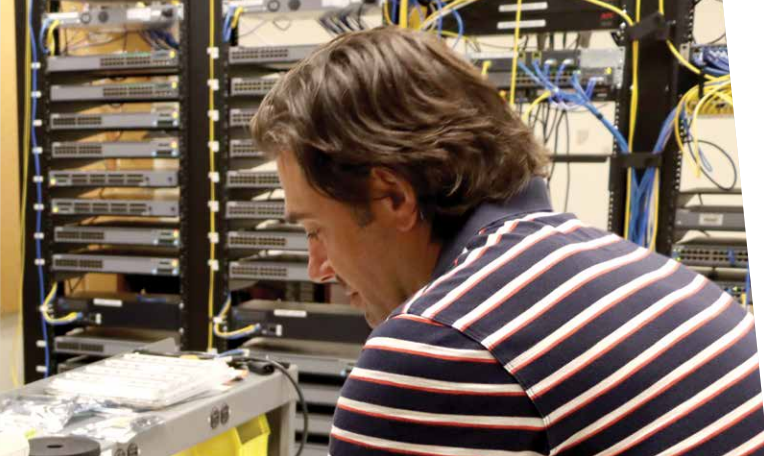
CYBERSECURITY SERVICES

Avoiding cyberattacks and security breaches requires being vigilant about emerging threats. OARnet's portfolio of cybersecurity services mitigates and prevents attacks and ensures that information and infrastructure remain safe. OARnet offers multiple types of cybersecurity services, from preconfigured filtering and on-demand DDoS mitigation to programs for penetration testing and vulnerability management. Through a defense-in-depth 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
- PENETRATION TESTING
- VULNERABILITY MANAGEMENT

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
- 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 support when necessary.

- SUPPORT CENTER (NOC)
- NETWORK DESIGN AND ENGINEERING CONSULTING
- QUALITY OF SERVICE (QOS)

saving $250+ million
through aggregate purchasing, such as the VMware program, **for Ohio over 14 years**

Above left: Andy Boggs monitors the OARnet network for any potential challenges, ensuring that clients are provided reliable, 24/7 service.

Above center: Austin McCoy (left) and Gary Goettel (right) test the functionality of new hardware before deploying it in the field.

Above right: Nola Valerian, a participant in the 5G-OH OARnet internship program, drafts designs for future work on the network.

Left: Kirk Herath, the State of Ohio's cybersecurity strategic advisor (left), with Pankaj Shah, OARnet executive director (center), and Peter Voderberg, chief of BroadbandOhio (right).

OARnet collaborates with state on cybersecurity initiatives, enhances client services

OARnet is offering new cybersecurity tools to its clients while contributing to efforts to strengthen the state infrastructure against attacks on critical systems.

OARnet led a community-wide effort to evaluate the cybersecurity needs of its clientele, which include state and local government entities, K–12 and higher education institutions, as well as health care, research and public broadcasting organizations. Over the last year, OARnet piloted new penetration testing and vulnerability management programs for its higher education members that it will expand to more clients in 2023.

"Cybersecurity is a top concern for the various Ohio communities that we serve," said Pankaj Shah, OARnet executive director. "OARnet is committed to offering cost-effective solutions that will maintain the safety and security of our ecosystems."

OARnet also is collaborating with the State of Ohio's new cybersecurity strategic advisor, Kirk Herath, on multiple initiatives. Herath, who serves as chairman of the advisory board CyberOhio, assessed the state's current cybersecurity infrastructure and is working with entities such as OARnet to enhance capabilities at state agencies, expand services to local government and boost workforce training as part of the Ohio Comprehensive Cybersecurity Plan.

With funding from a new federal Cybersecurity and Infrastructure Security Agency grant, OARnet will help the state build centralized capacity to allow local governments to better protect, defend and recover from a cyberattack.

"As OARnet has such wonderful connectivity to so many public sector entities, it is working with CyberOhio on aggregate purchasing of security software and services

to help drive down the cost," Herath said. "We plan to provide highly subsidized affordable security software and applications to local governments that want it."

The state also is evaluating its physical infrastructure, including transportation, emergency communications and utility services, to assess risks and determine needs. One major project will be the development of a new statewide cyber fusion unit under the Department of Public Safety, for which OARnet will provide aggregate purchasing.

Another area in which OARnet provides key support is ensuring the integrity of Ohio elections.

"The Ohio Secretary of State Office works closely with OARnet to proactively monitor Ohio's infrastructure and plan additional security measures during elections," said Chief Information Security Officer Jillian Burner. "The state has developed a strong pre-election incident response process to protect Ohioans' ability to participate in elections and democracy."

The state's cybersecurity strategy is focused not only on identifying and implementing new initiatives, but even more critically, sustaining strong cybersecurity infrastructure and practices over the long term, Herath said.

"It's not a 'once and done' approach—we need to keep investing in the infrastructure," Herath said. "It's the foundation, plumbing and wiring that keeps everything going."

"As OARnet has such wonderful connectivity to so many public sector entities, it is working with CyberOhio on aggregate purchasing of security software and services to help drive down the cost."
— Kirk Herath, the State of Ohio's cybersecurity strategic advisor

New project helps K–12 school districts meet rising technology needs

Hundreds of K–12 school districts across Ohio are benefitting from a boost in bandwidth as OARnet and its partners upgrade their connectivity from 10 Gigabits per second (Gbps) to 100 Gbps this

100 Gbps connectivity will not only help districts meet these ongoing digital needs but provide room to grow in a fast-changing technology landscape, Battrell said.

OARnet supports **972** K–12 sites

3,763 K–12 buildings

1.4 million students

year, with up to 200 Gbps capability available for future expansion.

The project, supported by a U.S. Department of Education Elementary and Secondary School Emergency Relief (ESSER) Fund grant to the Management Council, will update the infrastructure for six large urban school districts and 18 Information Technology Centers (ITCs) that serve Ohio districts through 2024. In the first half of 2023, OARnet completed the technical evaluation and architectural work for districts covered by several ITCs, including the Northeast Ohio Management Information Network, the Lake Geauga Computer Association and META Solutions.

META Solutions has worked closely with OARnet this year to upgrade its 200-plus school districts to 100 Gbps. This large ITC serves districts in Columbus, Dayton, Athens, Marion and Piketon and can attest to the need for better bandwidth. 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. Without its connection to OARnet's state network backbone, supporting such an increase would have been costly for META Solutions' member school districts, he said.

The COVID-19 pandemic quickly strained school districts' 10 Gbps capacities, prompting META Solutions to shift traffic across its network while several school districts paid to increase bandwidth to accommodate online instruction, said Jimmy Battrell, CIO for META Solutions Athens. The new

"Education should consider how to embrace emerging technologies like virtual reality and artificial intelligence to engage kids in learning opportunities," Sotlar added. "This is their future."

META Solutions also benefits from OARnet services such as its distributed denial-of-service (DDoS) mitigation for network security as well as its aggregate pricing on VMware, which provides cloud infrastructure and digital workspace technology.

"It's all about taking care of our school districts and providing them with services they need to operate efficiently and effectively every day."
—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."

"Since we were first able to bring Ohio's K–12 constituents as partners onto the OARnet backbone in 2004, we have launched many infrastructure enhancement projects together with the Management Council and Ohio Department of Education, thereby reducing the total cost of ownership (TCO) for all the OARnet stakeholders," said Denis Walsh, chief relationship officer of OARnet. "The ESSER funded project is a win-win for all OARnet members and partners."

Higher education institutions receive major bandwidth, security upgrades through GEER funding

When the COVID-19 pandemic prompted a rapid move to online instruction, research and administration, OARnet realized that many colleges and universities would need technology upgrades to meet the demand. The Ohio Department of Higher Education (ODHE) awarded more than $10 million in Ohio Governor's Emergency Education Relief (GEER) funds to OARnet to increase broadband capacity to 41 institutions.

Between 2020 and 2022, OARnet, working with private sector partners, upgraded last mile connections to these colleges and universities from 1 Gigabits per second (Gbps) or less bandwidth to 10 Gbps to accommodate current and future needs of the virtual academic environment. Many institutions also received upgraded firewalls and new vulnerability scanning and penetration testing services to bolster their campus cybersecurity.

In addition, ODHE Chancellor Randy Gardner worked with OARnet to create a program that doubled the internet bandwidth at 76 institutions at no additional cost.

OARnet relied on public-private partnerships with last mile providers such as AT&T, Spectrum, Horizon, Crown Castle, Everstream, Buckeye Telesys and CNI (COMNET) and others to realize this major upgrade.

Not only did the GEER project address immediate pandemic-related needs, but it established the technology infrastructure critical for maintaining and growing the new hybrid academic environment.

"This increase in capacity will allow our higher education institutions to remain competitive in instruction, research, grant applications and workforce development," said Pankaj Shah, executive director of OARnet. "The GEER program has aided the transition to a cloud environment to support advanced learning management systems, innovative educational program delivery, new industry partnerships, large interdisciplinary research projects and economic development initiatives."

The GEER program's technology initiatives have had positive, far-ranging impacts.

"These initiatives have provided us with enhanced security visibility within our environments, more capacity for our multisite learner focused initiatives, compliance with modern standards and cyber insurance requirements, and room to expand our digital presence with updated technology services," said Allen Hudson, chief information/technology officer for the University of Rio Grande and Rio Grande Community College.

The boost in bandwidth offered Lourdes University several benefits, said Michael McCormick, chief information officer.

"Before our bandwidth and firewall upgrades, we were restricted to hosting key systems on-site, such as our file servers, ERP and data warehouse," McCormick said. "By leveraging the GEER grant to expand our bandwidth and supporting infrastructure, we were able to migrate these critical resources to the cloud, increasing availability and scalability for our students, faculty and staff. Ultimately, this supports our university's initiatives to enhance the quality of teaching and learning through the effective use of technology resources."

Ginger Breon, chief technology officer at The Ohio State University, also emphasized the value of the GEER program.

"OARnet is central to the needs of colleges and universities in Ohio, irrespective of the size of their student population or whether they are public or private," Breon said. "Through OARnet's efforts during the pandemic, Ohio State was able to double our bandwidth while keeping our expenses constant. This helped us focus on various other IT-related, unexpected spending during the pandemic. OARnet is one of the most critical elements of our technology ecosystem."

$1.9 million
cost avoidance for institutions taking advantage of double bandwidth

$8.7 million
cost avoidance for last mile upgrades, including equipment

OH-TECH LEADERSHIP

Pankaj Shah
Executive Director, OARnet

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,
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