

ANNUAL REPORT

2019–2020



OARnet

An OH·TECH Consortium Member

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OH-TECH LEADERSHIP

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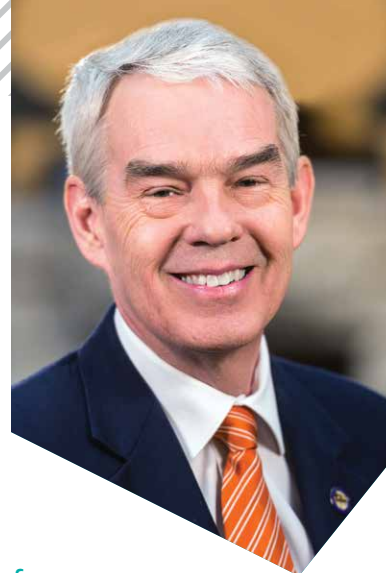
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oar.net



“The speed of OARnet's internet access is rivaled only by its response to its client communities in the face of the COVID-19 pandemic. Prompt, effective action from OARnet was critical to helping Ohio navigate through an unprecedented time.”

— 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: OSC, OARnet and OhioLINK. The consortium drives efficiencies through common services provided to member organizations through the Shared Infrastructure and Consortia Services divisions.

OFFERING SUPPORT NO MATTER THE CIRCUMSTANCES

Since OARnet's inception in 1987, it has been the organization's goal to ensure Ohio's education, research, health care, public broadcasting, and government communities have reliable and affordable access to broadband services. Ohio's investments in OARnet proved to be the right decision as we quickly reacted to the societal shift from the COVID-19 pandemic and new demands on the network.

When I returned to OARnet to serve as the executive director this year, Ohio Chancellor of Higher Education Randy Gardner reached out to OARnet to see if it would be possible to offer a subsidized bandwidth expansion to support the uptick in distance learning and teleworking. OARnet quickly responded to expand broadband to stakeholders at no additional cost temporarily.

As the pandemic continued, OARnet looked to collaborate with neighboring states in the event additional support and resources may be needed. A partnership formed with Indiana's I-Light and Michigan's Merit networks to share resources and support our members' critical needs.

While 2020 has been an eventful year thus far, the end of 2019 also presented unique opportunities. In October 2019, Otterbein University hosted the fourth Democratic primary debate. Through collaboration between OARnet and the university, the group provided the necessary bandwidth and monitoring of this widely viewed broadcast.

From supporting a national broadcast viewed by over 8.3 million people to increasing bandwidth by 125% to meet the needs of the pandemic crisis, OARnet has worked tirelessly over the last year to provide extraordinary services and network access. As one of the leading Research and Education Networks in the country, I am proud to see the continual adaptability and resilience of OARnet's nationally renowned team during these extraordinary times.



Pankaj Shah
Executive Director

HIGHLIGHTS

COVID-19 Initiatives

To ensure adequate bandwidth for our education, government and health care communities during the pandemic, OARnet increased bandwidth to its maximum at all sites at no additional cost. OARnet also implemented fiber connectivity and bandwidth to the Columbus Convention Center to support temporary Ohio State University Medical Center installation in order to handle overflow patients from the pandemic.

National Science Foundation Grant

Kent State University, in conjunction with OARnet, submitted a proposal to the National Science Foundation's (NSF) Office of Advanced Cyberinfrastructure and was awarded a grant to develop its campus ScienceDMZ, which is connected to OARnet's 100 Gbps network. The new virtual DMZ enables researchers at regional campuses to uniformly access this cyber infrastructure at 100 Gbps to promote and enhance their research environment.

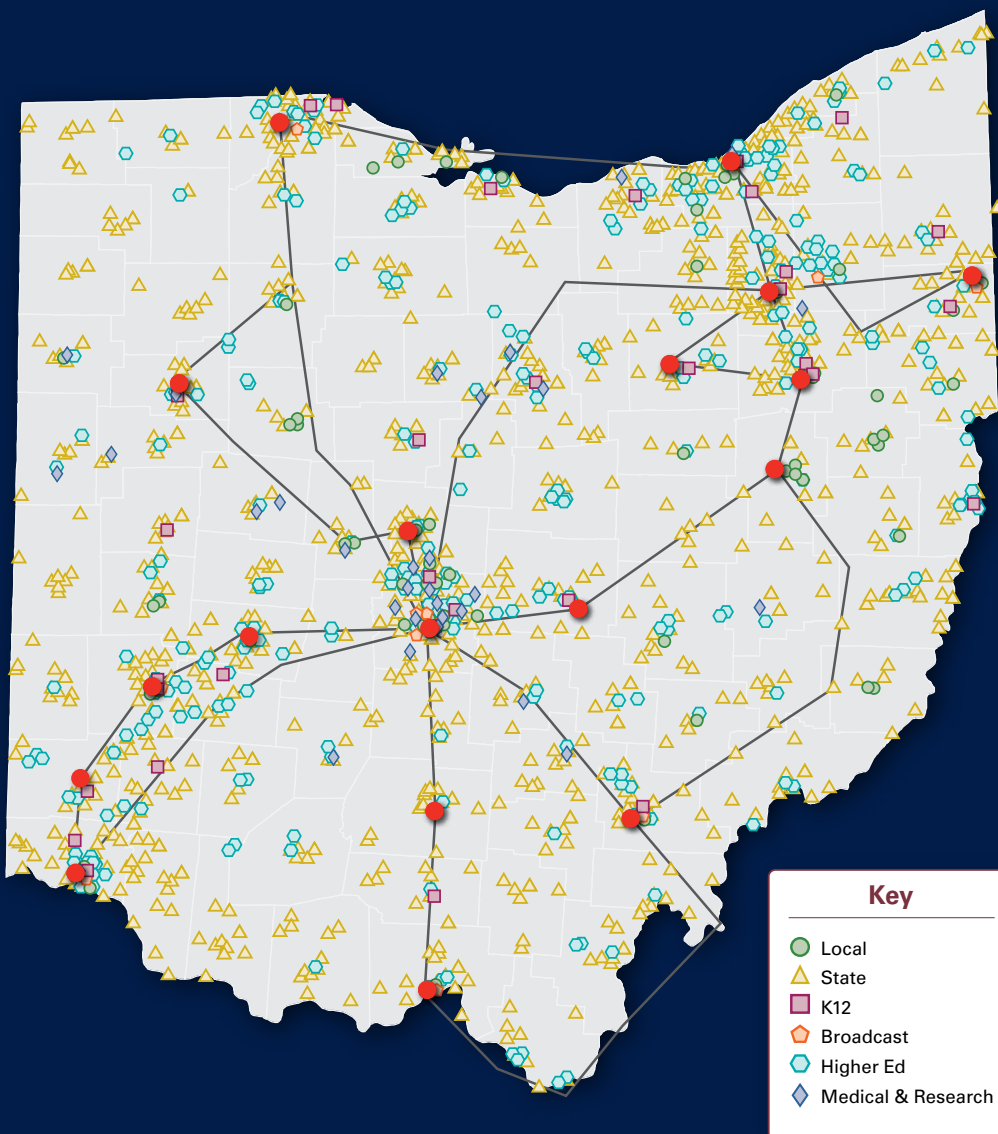
Unmanned Aircraft System (UAS)

In partnership with the Ohio Department of Transportation and City of Springfield, OARnet completed the final phase of the FlyOhio Project this year. The FlyOhio project seeks to support ongoing UAS research throughout Ohio, while identifying and pursuing future research opportunities, to make Ohio airspace among the first in the nation ready to fly beyond line of sight.



CONNECTING OHIO TO THE WORLD

Since 1987, the Ohio Academic Resources Network has supported Ohio's education, health care, public broadcasting, and government communities. Through public-private partnerships, we provide innovative, cutting-edge technology solutions to our clients by connecting them to the digital world through more than 5,000 miles of ultra-high-speed fiber across the state. These organizations participate in OARnet's shared-services programs because of the cost-savings and value-added services they receive.



 **625+**

K-12 Schools

25 Large Urbans + ITCs
600+ School Districts

 **469**

Higher Education

100 Main Campuses
324 Regional Campuses

 **102**

Healthcare Facilities

7 Institutions
7 Clients

 **13**

Research

8 Research Facilities

 **27**

Public Broadcasting

10 Stations

 **98**

Local Entities

63 Clients

 **2,879**

State Government

48 State of Ohio Agencies

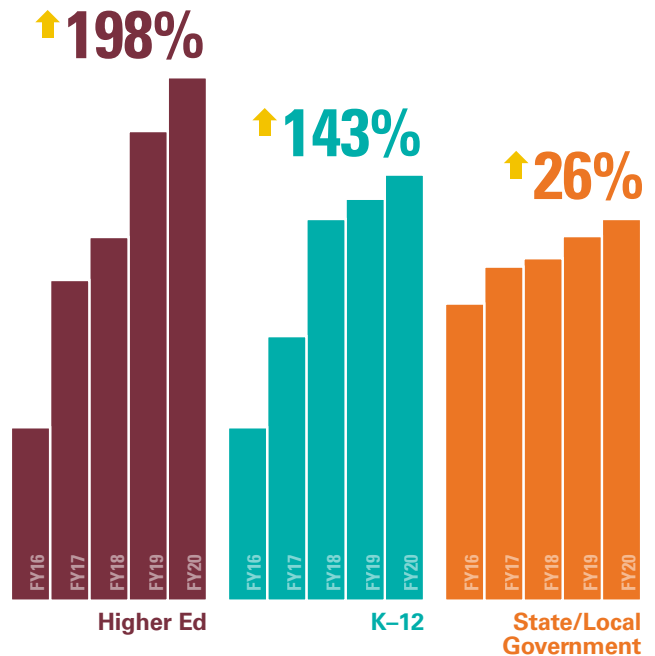
FINANCIAL IMPACT

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

- Increase access to technology through affordable broadband service
- Reduce technology costs via community aggregate purchasing
- Optimize collaboration and innovation through shared-service

OARnet continues to provide value-added services to clients through continual development of the network to ensure leading edge technology is available to meet current and future needs of our communities. By providing leading edge technology, the OARnet network is capable of delivering the next generation of services as needed, including VMware, internet, Internet2 and cloud, as well as support the demand for collaboration and innovation to drive grant programs to expand research in Ohio. This research, in conjunction with the private-public partnership, will be the basis for Ohio's economic future.

5-YEAR BANDWIDTH INCREASES



\$45+ MILLION
SAVINGS FOR ALL CLIENTS



198% bandwidth increase
for state & local government



143% increased bandwidth
for higher education



26% bandwidth increase
for K-12 schools



\$16 MILLION savings
for state of Ohio agencies



\$13 MILLION savings
for higher education



\$15 MILLION savings
for K-12 schools

OARNET SERVICES

Through the power of its 100-gigabit-per-second backbone, OARnet enables businesses, government and education to realize high-speed solutions every day. Recent value additions to the OARnet network include combined commodity internet and On-Demand DDoS Mitigation Service, as well as the addition of a 40G port connection to its current 1, 10 and 100 Gbps offerings. The extremely successful IntraOhio content service introduced in 2016 is now a standard service offering, and clients can now purchase security scanning.



INTEGRATED NETWORK SERVICES

As OARnet's flagship service, the more than 5,580 miles of fiber that create the network backbone extends into the education, health care, public broadcasting, and government communities, lowering their broadband access cost. OARnet aggregates upstream internet providers and connectivity to public internet exchange points to optimize costs while maintaining the highest standard of reliability.

OARnet's communities participate in its shared services programs because of the benefits and value-added services they receive over the 100 Gbps backbone.

MPLS L3VPN &
L2 CIRCUITS
IPV4 & IPV6
DOMAIN NAME
SERVICE (DNS)
CONTENT DELIVERY
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. From supporting a media repository for educational institutions to VOIP services, and discounted software licensing to server virtualization, our members can connect securely with students and employees.

VMWARE
ESRI
VOICE OVER IP (VOIP)
EMERGENCY WEB
HOSTING



SUPPORT SERVICES

OARnet clients have access to outstanding engineering solutions through an around-the-clock network operations center with Tier I and Tier II support. Additionally, OARnet engineers provide technical input for areas including fiber and access circuit planning, optical support, and routing design, including developing Border Gateway Protocol or failover plans. OARnet's engineering team can remotely configure and manage your environment 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 ever-vigilant about emerging threats. OARnet's portfolio of cybersecurity services mitigates and prevents attacks and ensures your information and infrastructure remains safe. OARnet offers three different types of DDoS services: response to requests, preconfigured filtering, and fully monitored network traffic. 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



NETWORK PEERING

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

RESEARCH
NETWORK PEERS
COMMERCIAL
NETWORK PEERS



OARNET FIGHTS COVID-19

On March 11, 2020, shortly after cases of the COVID-19 virus were officially detected in Ohio, Ohio Department of Higher Education Chancellor Randy Gardner and OARnet staff reached out to our communities to offer subsidized expansion of network bandwidth. This was done in an effort to better serve what was expected to be a dramatically increased need for online learning and teleworking arrangements.

"The Governor has asked the Department of Higher Education to be as flexible and supportive as possible in assisting our colleges and universities during this difficult time," Chancellor Gardner said in his offer letter to college and university officials. "To that end, I want to make you aware that OARnet, part of our OH-TECH consortium, is offering temporary services upon request at no additional cost."

OARnet was one of the first statewide networks to offer stakeholders access to expanded bandwidth at no additional cost during this crisis. As of late July, OARnet received 65 upgrade requests for bandwidth increases, ranging from 23 percent to 3,233 percent. These upgrades are installed by network engineers that are required to work in the field, observing safe practices such as social distancing, while nearly all of the remaining OARnet staff is servicing member-organization needs remotely.

Over the course of the pandemic, OARnet's offer to expand bandwidth has allowed for many institutions to contribute positively to the fight against COVID-19. Below are just several examples of how OARnet's rapid response allowed for innovative solutions and developments during this time.

OUTFITTING THE GREATER COLUMBUS CONVENTION CENTER

During the COVID-19 pandemic, OARnet was approached by The Ohio State University Wexner Medical Center to help outfit the Greater Columbus Convention Center with a reliable broadband connection. Due to the original projections by the Ohio Department of Health that there could be up to 10,000 new COVID-19 cases a day within the state, the convention center was deemed a location where patients could be treated if the hospitals became overcrowded.

The Ohio State University Wexner Medical Center developed and finalized plans to set up a 200-bed inpatient facility, with the ability to expand to 400 beds, in Exhibit Hall A at the convention center. This area was to be co-located with other hospitals in the community. The execution of this surge plan would be triggered if existing beds were 90% full with more than 250 COVID-positive patients. The plan would need to be executed within three days of declaration.

Wexner Medical Center Manager of Network Services Jeff Fike reached out to OARnet on

March 31 to see if it could help build the network infrastructure. OARnet immediately responded and provided two redundant dedicated WAN circuits in eight days. The Wexner Medical Center Network Services department was able to begin installing the required network infrastructure within days after the OARnet circuits were complete.

Thanks to the partnership between OARnet and Wexner Medical Center, the network was tested and ready, thus reducing complications and allowing for a quick fit-up and turnaround of the entire facility.

Pre-existing fiber that had been procured during OARnet's support of the 2020 Ohio Educational Technology Conference, which also took place at the convention center, was cleaned up and equipment enabled to re-create a 10Gbps emergency network.

"Preparing the convention center to handle an upswing in COVID-19 cases was of the utmost priority to us at OARnet," said Pankaj Shah, OARnet's executive director. "We were pleased to work with the Wexner Medical Center to make this possible and to grant peace of mind to health care workers that there would be adequate resources provided should the situation worsen." •

Located in downtown Columbus, the Greater Columbus Convention Center's Exhibit Hall A is 98,000 square feet.

PARTNERING WITH RESEARCH AND EDUCATION NETWORKS IN INDIANA AND MICHIGAN

In the midst of the COVID-19 crisis, after already witnessing the critical needs of its clients in terms of internet and network connectivity, OARnet sought a partnership with other statewide Research and Education Networks (RENs). Working with I-Light in Indiana and Merit in Michigan, the trio of organizations teamed up to provide internet access and broadband expertise to support higher education, research, K–12 schools, and state and local governments.

The partnership between these three networks recognized that having reliable network availability is a necessity to students and workers alike. With the shift to remote working and distance learning in the face of the pandemic, the reliable connectivity was not something that many could rely on as they could at their workplace or school.

In the health sciences specifically, the partnership enables an increase in network traffic and reduces barriers to network sharing in support of medical and epidemiological researchers developing treatment protocols and cures against COVID-19. It also encourages greater collaboration between researchers who are out of state.

“From opening up internet bandwidth at no additional cost during the pandemic emergency to securing vendors and private sector partners who can architect and extend Wi-Fi at public buildings and school buses to provide internet for Ohioans at home, we understand that acting quickly and collaboratively in the face of the

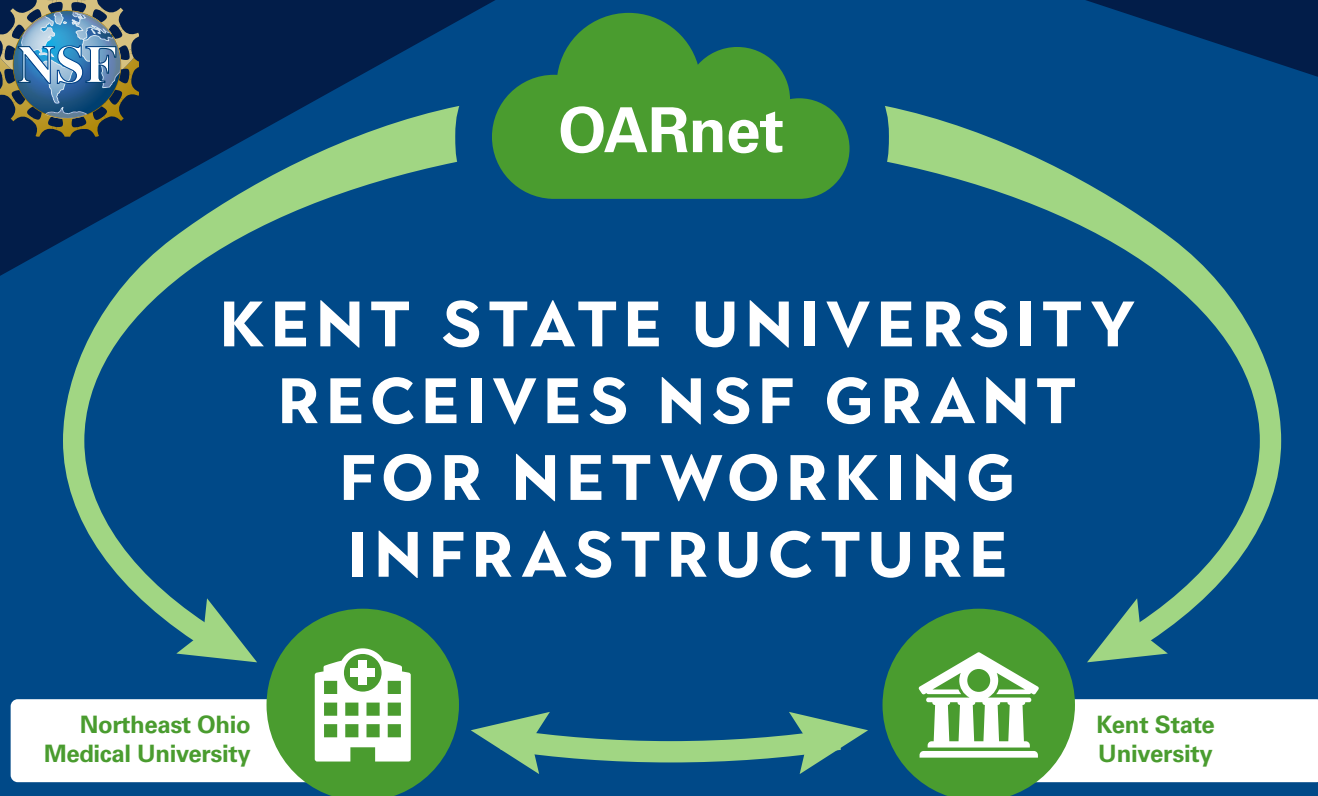
COVID-19 pandemic is imperative,” said Pankaj Shah, OARnet's executive director. “In the spirit of innovation and joining together, we are excited to form this timely partnership with Indiana and Michigan to continue to support our imperative higher education and K–12 communities, as well as state and local governments through the current emergency and beyond.”

In addition, I-Light, Merit and OARnet are offering to collaborate with other neighboring states and educational communities such as the Big Ten Academic Alliance to win the fight against COVID-19.

OARnet's support dates back to March, shortly after COVID-19 cases were officially detected in Ohio. Ohio Department of Higher Education Chancellor Randy Gardner and OARnet staff reached out to their communities to offer subsidized expansion of network bandwidth to better serve what was expected to be a dramatically increased need for online learning and teleworking arrangements.

“When it became clear that COVID-19 was going to disrupt the spring semester at our colleges and universities, Governor DeWine asked the Department of Higher Education to be as flexible and supportive as possible in assisting them,” Chancellor Gardner said. “As part of that, OARnet—part of our OH-TECH consortium—stepped up to offer a temporary bandwidth increase at no additional cost to those campuses requesting it.” •

When the coronavirus hit the United States, no one fully understood the impact that it would have on the country, including school, work and everyday life. Due to OARnet's involvement with ensuring that clients have the resources they need to continue on and serve their role during the pandemic, entities across the state of Ohio have had the ability to contribute positively in an uncertain time. OARnet will continue to offer additional assistance to clients in the education, health care, public broadcasting and government communities for as long as this unprecedented time persists.



Kent State and OARnet successfully partnered on a \$383,734 grant submission to the National Science Foundation's (NSF) Office of Advanced Cyberinfrastructure (NSF Award #1925678). Kent State University (KSU) now has a ScienceDMZ connected to OARnet's optical exchange, enabling 100 Gbps of uninterrupted transfer rate capacity. The teams at KSU and OARnet worked to construct a virtual DMZ perimeter over a highly responsive regional WAN. This implementation allows for researchers at regional campuses in Ohio to uniformly access this cyber infrastructure.

One of the NSF's overall goals is to create and establish more scalable approaches to expand the reach of cyber infrastructure for data-driven science and research. This ScienceDMZ allows for terabyte-sized data to be easily transferred to support research initiatives at all of KSU's campuses. Located in northeastern Ohio along the Rust Belt, Kent State has a large percentage of students who are first-generation college students. These students will now have the ability to conduct data-heavy research.

"The project enables Kent State researchers to enter a new era of big-data science. It will be available to all faculty and researchers across its eight-campus system to transfer very large data sets across other big-data sites," said Javed Khan,

professor and chair of computer science at Kent State University. "This national scale advanced next generation network could be implemented on schedule—thanks to the readiness of OARnet as one of world's most sophisticated Research and Education Networks."

The ScienceDMZ also leverages a broad set of compelling big-data projects. The project launches outdoor ultra-high speed wireless access infrastructure in campuses connected to the ScienceDMZ to facilitate big-data-driven dense sensor and IoT research projects. The project brings the world of data-driven STEM research closer to this mass of students, a large percentage of whom are Pell Grant-eligible and/or first-generation college students.

"Equipping students in our state with the necessary infrastructure to conduct mission-critical research during their collegiate careers is incredibly important to OARnet, particularly for those students who under different circumstances may not have access to such robust resources," said Pankaj Shah, OARnet's executive director. "This grant from the NSF allows KSU students and faculty from across their main and branch campuses to contribute to and shape the next big wave of data-driven research." •



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