Merit and Juniper Deliver Michigan's First Statewide, High-Speed Network

Summary

Company:

Merit Network

Industry:

Education and Research

Business Challenge:

Build high-performance infrastructure to provide highly available, secure network services to Michigan school districts, public universities, government agencies, anchor institutions, and other nonprofits

Technology Solution:

- MX480 3D Universal Edge Router
- QFX3500 and QFX5100 switches
- EX4500, EX4600, and EX4200 Ethernet Switches

Business Results:

- Created a statewide K-12 network and a fully optical network that extends to rural areas across Michigan
- Connected 200-plus community anchor institutions to advanced network services
- Supports security and performance requirements for online testing and student assessments
- Provides secure, highly available environment for cybersecurity education, training, and testing

Merit owns and operates the longest running regional research and education network in the United States. The nonprofit, member-owned organization has delivered high-performance services to educational communities in Michigan and beyond since it was founded in 1966. Today, Merit puts its extensive experience managing advanced, high-capacity networks to work by providing more than 300 organizations with access to research, state, and national collaborative initiatives. Michigan's largest universities rely on Merit to connect to one another and to the Internet2 network to achieve their research and educational objectives.

Business Challenge

The state of Michigan is the 11th largest state in territory—covering an area larger than Tennessee, Connecticut, Delaware, Massachusetts, and Maine combined—and the 10th largest in population. The Merit network reaches from the top of Michigan's Upper Peninsula in the north to the furthest point south and all points east and west, even extending beyond the state's borders into Wisconsin, Illinois, and Ohio. In 2010, Merit developed and led the REACH-3MC project and built 2,287 miles of high-speed fiber-optic network to connect remote, rural communities throughout Michigan as well as portions of Minnesota and Wisconsin.

In 2015, Merit was tapped to deploy the Michigan Statewide Educational Network (MISEN) project, a high-speed network infrastructure to connect K-12 school districts, with the first phase interconnecting all 56 intermediate school districts. In this far-reaching project, Merit will provide reliable, secure network services to 258 districts and support the state's online testing and student assessment requirements.

As security tightens across the nation, Merit has expanded its cybersecurity expertise with the Michigan Cyber Range, a virtual training ground for security response teams, military members, investigators, and law enforcement. Training courses and exercises take place within Alphaville, a state-of-the-art virtual training environment. Cybersecurity professionals access the network to gain new skills, participate in cybersecurity certification courses, and hold training exercises that will help them protect the state's citizens.

All of these projects and programs required significant resources, and as funding was secured, Merit realized the scope of the activities had greatly outgrown its network capacity and reach. Merit needed more powerful networking gear with technically advanced features to support the much larger user groups as well as the comprehensive national and state network requirements.

"We needed more capacity to meet the evolving needs of our rural members as well as our member universities. We wanted a platform that could route traffic at higher capacity and connect every university to the Internet with a minimum of 10 gig and connect every institution at 1 gig to 10 gig," says Bob Stovall, vice president of network operations and engineering at Merit.

Merit's experience with Juniper began with REACH-3MC. From that point forward, every time Merit needed network expertise, Juniper Networks delivered. Juniper worked closely with Merit to expand and enhance the network to support MISEN and the Michigan Cyber Range.

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Bob Stovall, Vice President of Network Operations and Engineering, Merit

Technology Solution

Based on proven success, Merit now relies on Juniper for almost all of its routing requirements. It first deployed Juniper Networks® MX480 3D Universal Edge Router and Juniper Networks EX4500 Ethernet Switch platforms for REACH-3MC, which brought network services to communities in remote areas in the state.

In a separate project, MISEN, Merit chose Juniper solutions again to provide fast, reliable communication between all intermediate school districts in Michigan. This statewide education network relies on MX480 routers in the core and the Juniper Networks EX4600 Ethernet Switch at the edge. The 100GbE network core connects five data centers; two aggregation points have 100GbE access; and the school districts connect at 1GbE or 10GbE.

"Juniper's Universal Edge routing platform is a real winner. The MX480 router gives us a full suite of services and supports high-density 10, 40, or 100 Gigabit Ethernet," says Stovall. "We can also choose from a range of routing protocols, Layer 2 and Layer 2.5 services, straight VLAN tagging, pseudowires, MPLS, or full-fledged routing. Whatever we need, Juniper hits the sweet spot."

The SDN-ready MX480 3D Universal Edge Router delivers highly scalable routing, switching, security, and service features that enable network consolidation and service convergence. In addition to the wide variety of GbE interfaces, the MX480 router also supports legacy SONET/SDH, ATM, and PDH connectivity, which are critical for data interconnect. Merit also takes advantage of many advanced features of the Juniper Networks Junos® operating system. For instance, in addition to MPLS, OSPF, and BGP, Merit uses pseudowires, an MPLS-based Layer 2 circuit that transports Ethernet encapsulated traffic from the access node to the MX480 in order to efficiently partition and manage traffic from the many subscribers that share the network.

EX4500 and EX4600 switches support 10GbE deployments in the campus and data center. Merit takes advantage of Juniper's Virtual Chassis technology, which enables multiple interconnected EX Series switches to operate as a single, logical device, to reduce management complexity and operational expenses.

Merit uses Juniper Networks QFX3500 and QFX5100 switches to support its members' hosted e-mail and other cloud services. QFX Series switches are high-performance, high-density platforms designed for the most demanding data center environments, and can be deployed as 10GbE, 40GbE, or 100GbE switches.

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Business Results

For Merit, education is job #1. Twelve four-year public universities govern Merit Network, cementing the network's role as an education enabler. "Education is our mission, and we are constantly improving the network and building out the infrastructure to provide cutting-edge support for higher learning and K-12 education," says Elwood Downing, vice president of membership outreach and engagement at Merit.

With Juniper, Merit gained the capacity, performance, and reliability it needed to fulfill its REACH-3MC and MISEN project goals and connect more than 200 organizations to the high-speed Merit network. Many rural communities in Michigan have finally bridged the digital divide now that the REACH-3MC project brings them advanced network services.

For K-12 schools, being connected to Merit's network provides better security and control. MISEN is less vulnerable to outside security issues like distributed denial of service (DDoS) attacks. It also provides the fast, reliable connections that are needed for online student assessments.

"A primary goal for us is to enable online testing over the network, and we're achieving that," says Stovall. "Once completed, we expect all the school districts to have robust, reliable, secure connections to testing centers. Data hubs will securely host student information systems and other tools will be available to report to the state and federal government on student testing, population, and other collected information."

Cost is always a factor, and Juniper's ability to support optical plus Layer 2 and Layer 3 technologies contributed to overall efficiencies. "The RFP only asked about an optical network. Then we realized we could use the Layer 2 and Layer 3 technology suite that Juniper provides to get any-to-any connectivity and additional capacity while saving money," says Stovall.

Merit is also contributing to Michigan's safety by supporting ongoing security training to detect, prevent, and mitigate cyberattacks under the Michigan Cyber Range. "Everyone who is connecting to the network is experiencing high levels of availability and superior quality assurance and performance," says Stovall. "This gives them the confidence they need to successfully complete their training."

From design through deployment, Juniper technical and sales teams have been readily available to assist the Merit staff. "Our Juniper team understands that our main measurement of success is the success of our community," says Stovall. "Juniper has embraced Merit's vision and values, and we know their interaction and input are important."

Looking back on the accomplishments, Merit recognizes how much has changed since it began working with Juniper. "Our six-year journey has brought incredible innovation to Merit and our community," says Downing. "Juniper helped us achieve a big list of firsts with REACH-3MC, MISEN, and Cyber Range. It's the first time Michigan will have a fully optical statewide network infrastructure to support a K-20 network, and the first time we have virtual cybersecurity training options. For us to evolve and accomplish these innovative things over our network in such a short time is awesome."

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Next Steps

Merit will continue to add more organizations to the network and connect all of the school districts in the state to MISEN. It also expects the Michigan Cyber Range to expand with more users and a slew of applications. "Merit is ready and available to take on more programs that will enable Michigan to achieve higher education standards and provide the state with superior network services," Stovall says.

For More Information

To find out more about Juniper Networks products and solutions, please visit www.juniper.net.

About Juniper Networks

Juniper Networks is in the business of network innovation. From devices to data centers, from consumers to cloud providers, Juniper Networks delivers the software, silicon and systems that transform the experience and economics of networking. The company serves customers and partners worldwide. Additional information can be found at www.juniper.net.

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3520560-001-EN Apr 2016