An eSCHOOL NEWS special report sponsored by Cisco

SPECIAL REPORT

Supporting a Digital Transformation in Schools

How to build a network infrastructure that will have you poised for ed-tech success

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eSCHOOL NEWS

In 2014, the **Wayne Highlands School District** in Wayne County, Pa., embarked on a journey to transform instruction by giving every high school student an iPad and empowering students at all grade levels to learn through digital creation and investigation.

"We were able to find resources that drove our curriculum forward to a whole new level that teachers and students hadn't seen before," said Scott Miller, director of technology and information systems for the 2,600-student district. "The doodlers in the classroom are now engaged, and putting a device in each student's hands has leveled the playing field for them."

To support this shift in teaching and learning, Wayne Highlands had to upgrade its network infrastructure, including the wireless access points in its buildings.

"Our old system was a conventional wireless 802.11g setup, with access points in the hallways," Miller said. "It provided basic coverage for the 10 or so years it was in place. But as we started looking at our needs for on-demand video, we realized our network wasn't going to support much more. So, we began building a network that would support us not only today, but also five or 10 years down the road."

As it turned out, the timing was right for Wayne Highlands to move forward with its digital transformation. The Federal Communications Commission's overhaul of the **E-rate program** in 2014 enabled Wayne Highlands to use E-rate discounts to pay for much of its network project, something that wouldn't have been possible under the program's old rules.

"The doodlers in the classroom are now engaged, and putting a device in each student's hands has leveled the playing field for them."

The Time Is Now

Under the old E-rate rules, Wi-Fi and other internal broadband connections were considered "Priority 2" services and were funded only after all requests for telecommunications services and internet access were satisfied. Though nearly half of Wayne Highlands students qualify for free or reduced-price lunches, the district's average E-rate discount is just shy of 70 percent, which was never high enough to garner discounts on internal connections.

E-rate 2.0 features a number of rule changes designed to fund network upgrades for all schools. (See "How E-rate 2.0 Can Help with Digital Transformation.") As a result, Wayne Highlands received about $400,000 in E-rate discounts to defray the cost of upgrading the wireless infrastructure in all six of its buildings.

California's **El Centro Elementary School District** had started on a digital transformation of its own before the E-rate rules changed. During the first phase of a three-year project, El Centro had used some of its one-time state funding intended to help schools implement the Common Core standards to install wireless access points in every classroom, a new network core at the district office, and new edge switches.

But when the FCC revamped the E-rate program to open up more funding for internal connections, El Centro was able to use E-rate discounts to upgrade its fiber backbone as well. The district also installed new intermediate switches and cabinets in the schools that hadn't been eligible for Priority 2 funding before.

"We hadn't upgraded our fiber backbone (in years)," said Antonio Romayor, director of technology for the

Without sufficient bandwidth, students and teachers will quickly get frustrated and will stop using their devices for teaching and learning—undermining your efforts before they can pay off.

5,000-student district. "Our fiber backbone was multimode; it couldn't run 10 gigabit-per-second speeds. Along with that, we had different size network enclosures across our district, depending on whether the school was funded through E-rate or not. We were able to take advantage of the new E-rate 2.0 rules in the final phase of the project to put in new IDF switches and cabinets, and we now have single-mode fiber in our backbone."

As a result of these upgrades, El Centro's network has 10 Gbps capacity from the internet to its IDF enclosures—enough to support digital instruction for all students.

As these two examples demonstrate, the new E-rate rules have created an unprecedented opportunity for K-12 districts to upgrade their network infrastructure so they can take advantage of the digital revolution. The opportunity is there for the taking; here is some advice to help you get started.

Robust Infrastructure Is Critical

A successful digital transformation is about much more than technology. It involves making the shift to powerful new ways of teaching and learning.

Irfan Ali, director of Global Industry IoT Sales Strategy and Operations at **Cisco Systems**, describes digital transformation in K-12 schools as leveraging technology to create better access to educational experiences for students. For instance: Can students learn any time on demand, rather than having their education limited to attending a class at a particular time and place? Can they have a different level of experience that is more personalized to their needs? Can teachers deliver instruction in more innovative ways that both engage and empower students?

"It's all tied back to improving student outcomes," Ali said. Not only academically, but also experientially—such as developing important skills like communication, collaboration, critical thinking, innovation, and leadership.

Digital transformation might be about new ways of teaching and learning at its core, but technology is what enables this shift to occur. Students need devices that can access the web, as well as rich new apps and tools for creating, sharing, and discovering content. Just as importantly, they need robust networks that can support these activities. Without sufficient bandwidth, students and teachers will quickly get frustrated and will stop using their devices for teaching and learning—

undermining your efforts before they can pay off.

In planning for its digital transformation, El Centro focused on upgrading its network before rolling out devices to students. "I was adamant about not putting the cart before the horse," Romayor said. "We had some devices already: We had some laptop carts and iPad carts, and they served a specific purpose. But for the most part, our wireless infrastructure wasn't as stable or as scalable as it needed to be (to take full advantage)."

So, in the first year of El Centro's project, the district installed wireless access points in all of its classrooms. "Because of our difficult situation—we have older schools, so construction is costly—it was hard to put multiple network connections in each classroom," Romayor said. "In the rooms that only had two physical wires, we used Cisco mini switches to be able to provide those additional ports we needed."

With this infrastructure in place, El Centro then looked at how it could provide devices for all students. "We had a finite amount of money, because E-rate doesn't pay for devices," Romayor said. The district initially purchased two Chromebook carts for every school, and it took steps to extend the life of its aging computer labs.

"We had labs that were 10 years old," Romayor said. "To continue to leverage our prior investment in these computers, we converted all those endpoints to virtual desktops using VMWare View (now called **Horizon**)." When users turn on those machines, they are taken to a virtual desktop environment running Windows 8.1 in a private cloud.

"None of these investments would have been as impactful if it weren't for the infrastructure we put in place first," Romayor noted. He acknowledged that having two Chromebook carts for schools serving hundreds of students is "a drop in the bucket" to start with, but he said the district will continue to add more devices over time.

"We are moving toward piloting a full 1:1 initiative," he said—which will allow for more personalized and student-centered learning opportunities.

"Are you looking to stream video in every classroom, or support a full 1:1 initiative with digital curriculum? Decide what you want to do first, then build your plan around that."

Assess Needs

When upgrading your infrastructure, the first step is to assess your needs. This assessment should be based on your vision for teaching and learning.

"What are you looking to accomplish with your system?" Miller of Wayne Highlands said. "Are you looking to stream video in every classroom, or support a full 1:1 initiative with digital curriculum? Decide what you want to do first, then build your plan around that."

Wayne Highlands was looking to move to a "flipped classroom" model, in which students would watch short video clips introducing a concept for homework and then use class time to explore the topic more deeply. District leaders also wanted to have students create collaborative multimedia projects to demonstrate their understanding, upload their projects to a district server, and then share these with the rest of the class. The ability to stream video and collaborate in the cloud was essential to the district's vision.

With support from the new E-rate 2.0, Wayne Highlands installed **Cisco Meraki** MR32 and MR34 wireless access points throughout its schools and upgraded its network switches. The access points support the latest Wi-Fi standard, 802.11ac, enabling speeds up to several gigabits per second.

"We were shooting for the future a lit-

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How E-rate 2.0 Can Help with Digital Transformation

The Federal Communications Commission's historic overhaul of the E-rate Program in 2014 has paved the way for digital transformation by helping more schools upgrade their broadband networks.

Here's what you need to know about the modernized program.

Funding is available for network upgrades: The funding cap is $3.9 billion per year, with at least $1 billion of that pledged for network upgrades (internal connections). These funds are available to all E-rate eligible schools and libraries.

Network services have a five-year funding cap: To spread Category two funding to the broadest number of applicants possible, the FCC has taken two key steps: (1) It has limited the maximum discount on these services to 85 percent instead of 90 percent, and (2) it has capped the amount of funding that applicants can receive on these services within a five-year period.

For schools, the cap amounts to $153.47 per student per site on the pre-discount cost of Category Two services over five years. For instance, a school with 1,000 students that qualifies for a 60 percent discount could buy up to $153,470 in Wi-Fi and other network services over a five-year period, receiving $92,082 in E-rate discounts to offset the cost.

Because of this five-year cap, K-12 technology leaders will have to think strategically about their network needs—and they should look at purchasing equipment with a five-year lifecycle in mind. This is critical given that 72 percent of E-rate applicants describe Wi-Fi as an "absolute requirement" according to a **recent survey** conducted by E-rate consulting firm, **Funds for Learning**.

The redesigned E-rate program also contains changes to the kinds of services that are eligible for support.

Caching servers, which store information locally so it can be accessed more quickly, are now eligible. Support for the basic maintenance of internal connections also is available, but only if the equipment itself is eligible for E-rate support—and only if schools haven't exceeded their five-year limit on Category Two funding.

E-rate eligible services also include: "managed internal broadband services." Before, schools could apply for E-rate discounts only on the purchase of routers, switches, wireless access points, and other internal connections, or on the basic maintenance of this equipment. Now schools can enter into contracts that call for Wi-Fi providers to install and manage this equipment—and this full-service approach to wireless service is E-rate eligible.

Funding for all voice-related services is being phased out entirely by the 2019 program year. Email, voicemail, and web hosting are not eligible; also ineligible are all products and services in the categories of circuit cards and components, interfaces, gateways, antennas, and servers, storage devices, video components, and data protection components (except for firewalls, uninterruptible power supplies, and battery backups, which are still E-rate eligible).

The funding outlook for Funding Year 2018 is optimistic: There is nearly $4 billion in funds available for 2018 with approximately $1 billion estimated for Category Two network upgrades. Schools and libraries are encouraged to apply to take advantage of this critical funding source for technology. eSN

The FCC has raised the funding cap from $2.4 billion to $3.9 billion per year, with **at least $1 billion** of that pledged for network upgrades.

For more information

www.cisco.com/go/erate

Wi-Fi

https://www.fundsforlearning.com/blog/2016/10/wi-fi-is-an-absolute-requirement

E-rate survey

https://www.fundsforlearning.com/2016ErateTrends.php

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tle bit," said Miller, noting that the 802.11ac access points are also compatible with older 802.11n equipment. "In our very high-density areas, we put in MR34s, because they support high-density use. We put MR32s in all of our classrooms district-wide, to support about 30 devices in each classroom. We also have a 2 Gbps connection out to the internet."

At the high school, "we have had as many as 900 devices downloading and watching HD video at the same time," he said. "Without a solid network infrastructure, we could never do something like that."

The State Educational Technology Directors Association (SETDA) recommends that schools **provide at least 1 gigabit per second (Gbps) for every 1,000 students and staff members** by 2017 to enable rich, transformative teaching and learning experiences.

The **State Educational Technology Directors Association** (SETDA) has issued FCC-approved guidelines that could help K-12 leaders determine their network needs. SETDA **recommends** that schools have at least 1 megabit per second (Mbps) of bandwidth for every student and staff member by 2017 to enable rich, transformative teaching and learning experiences.

Another resource that could help you plan your network needs is the Consortium for School Networking's (CoSN) **Smarter Education Networks by Design** (SEND) initiative. Through this initiative, CoSN has developed guidelines for network design and a checklist for district network planning.

When evaluating your needs, your vision for instruction should come first—but it's also important to consider your capacity to support the network. Wayne Highlands is a fairly rural district with a small IT staff, and the Cisco Meraki access points were especially appropriate because they can ease the burden of network management.

The Meraki cloud-based dashboard provides visibility into bandwidth consumption and allows IT staff to shape bandwidth use and troubleshoot the network. "It takes us at least 45 minutes if we have to drive out to a school to learn whether there's a problem with a switch," Miller said. With the Cisco Meraki equipment, "we're able to be notified of an issue automatically before having to dispatch a technician to that area."

Leverage Partnerships

Upgrading your network infrastructure can be challenging. There's a lot of work involved in evaluating your network needs, designing the right infrastructure to meet those needs, securing the funding to make it happen, and then coordinating installation.

To ensure the success of your initiative, you should choose a provider who will be a full partner in your efforts, and not just a networking vendor. For both Wayne Highlands and El Centro, Cisco filled that role—guiding them every step of the way toward meeting their goals.

"The biggest compliment I have for Cisco is that they're about relationships first and foremost," Miller said. "They want to learn about your infrastructure and how your system works."

In designing Wayne Highlands' new wireless network, Miller turned to Cisco for advice. "They didn't try to sell us more stuff than we needed," he said. "Having a personal relationship with them, and being able to pick up the phone and talk to someone, was extremely helpful. It didn't matter who we talked to—they always had an answer."

Romayor said he appreciated Cisco's role in helping to finance his district's network upgrades.

"I literally spent hours with Cisco and their value-added partner, AMS, to figure out how we could fund the upgrades we needed," he said. Ultimately, Cisco came through with a seven-year lease at a very low finance rate through its Cisco Capital division. "That helped us win approval from our board and administration," he noted.

Having engineers available who understood El Centro's needs and who could help the district work through the challenges it encountered was critical to the district's success. "You're going to run into obstacles, and you have to figure out how it's going to work," Romayor explained.

El Centro serves some of the highest-poverty children in Imperial County, and Romayor said it's gratifying to be able to give them access to 21st-century tools. "These are students who enjoy technology," he said. "Some of these opportunities are things they wouldn't experience otherwise." eSN

Cisco Digital Education Platform Simplifies Your Digital Journey

The Cisco Digital Education Platform enables digital learning and collaboration by integrating solutions, services, and partner capabilities, all in a safe, productive digital environment.

"Embarking on a digital transformation can be rife with challenges, and we want to make sure that securing the right technology isn't one of them. We act as a partner with school districts, collaborating to reach a common goal: providing students with a 21st century education," said Charles Garcia, director of sales for Cisco's U.S. public sector business.

The Digital Education Platform is based on Cisco's highly secure core network, and includes a range of solutions, which simplify and enhance school IT and your digital journey.

Cisco Mobility Express

Setting up a wireless network can be challenging, especially for smaller K-12 districts with a limited IT staff. Cisco Mobility Express aims to make the process easier. Designed for a site needing up to 100 wireless access points and serving up to 2000 client devices, the solution enables non-IT personnel to build a wireless network using a simple, over-the-air configuration interface.

The Cisco WLAN Express Setup Wizard configures multiple access points simultaneously in minutes. What's more, you can access the dashboard through a web browser or Cisco's Wireless Mobile app to operate, monitor, and troubleshoot your network.

The Mobility Express technology is built into Cisco Aironet® 3800, 2800, 1850, 1830 and 1815 Series access points, which support 802.11ac Wave 2, the very latest Wi-Fi standard—enabling speeds faster than 6 gigabits per second (Gbps). With Mobility Express, experience for Apple devices is significantly improved with the new Apple-specific features for optimized Wi-Fi connectivity and the ability to prioritize business apps through Fastlane.

Cisco Meraki for K-12

"Cisco Meraki® is a cloud-based management solution that simplifies IT," said Xan Stevenson, a sales manager for Cisco's Cloud Networking Group.

Meraki includes 802.11n/ac access points, Layer 3 Ethernet switches, security appliances that provide Children's Internet Protection Act (CIPA)-compliant web caching and content filtering, VoIP phones, security cameras, and cloud-based network management functionality that also includes mobility management capabilities. All hardware and licenses are E-rate eligible, with the exception of MC Phones and MV Security Cameras (not eligible), MX Advanced Security licenses (50 percent eligible) and Systems Manager/MC Phone/MV Camera licenses (not eligible).

The Meraki cloud-based dashboard provides visibility into bandwidth consumption and allows IT staff to shape bandwidth usage and troubleshoot the network, Stevenson said, adding: "You can hotlink right to the switch and access point it's connected to." What's more, Systems Manager, the mobility management solution, allows you to create network access policies for all devices in specified groups, letting you easily manage 1:1 and bring-your-own-device (BYOD) programs—and it connects with an Active Directory server to make the onboarding process even simpler.

Meraki cloud-managed security appliances include anti-phishing and intrusion-protection capabilities, as well as a SafeSearch feature. The content filtering capabilities make it easy to give students limited access to YouTube videos for educational purposes, while blocking access to inappropriate videos. Because the Meraki platform is cloud-based, Cisco is able to push out upgrades over the Internet, so schools always have access to the latest network technologies, Stevenson said. The system scales to any size and sends automatic alerts if there is a network problem that needs addressing. Plus, remote troubleshooting capabilities allow previously time-consuming tasks, such as cable tests, to be performed anywhere. For schools with limited budget, staff, and time, the Meraki solution fits the bill.

Collaboration Solutions

Cisco also offers a number of solutions that help students and staff collaborate within or outside of school, such as:

Cisco Spark & Cisco Spark Board

Cisco Spark and Cisco Spark Board connect physical and virtual classrooms to make learning happen anytime and anywhere. Cisco Spark Board's wireless presentation, digital whiteboarding, and video conferencing capabilities enable blended learning in any classroom, library, or team space.

Cisco WebEx®

Schools can use the Cisco WebEx platform for online meetings, office hours, classes, study groups, or review sessions. Cisco WebEx allows you to meet online in real time with parents, staff, and students, without requiring everyone to gather in one physical space. Interactive features include real-time testing and grading, instant feedback, assessment tracking, breakout sessions, and hands-on labs to deliver a variety of dynamic e-learning opportunities.

Cisco Collaboration Endpoints

Cisco video conferencing devices transform the traditional learning experience, extending access beyond the classroom and campus.

For more information visit: http://www.cisco.com/go/education.

The time is now. Cisco can help.

With the opportunities offered by E-rate and Cisco, there's never been a better time to reimagine education. Seize the moment. Upgrade to equipment and platforms that promote digital learning. Your students want it. Your administration needs it. You'll love it.

Get started today! Visit www.cisco.com/go/education to learn more.

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