

Issue Brief

The Cornerstone of a Digital Classroom

Reliable, secure wide-area networks improve the learning experience for K-12 students.

If anyone still wonders if wide-area networks (WANs) are essential for modern K-12 education, the latest technology assessment by the U.S. Department of Education (DoE) clears up the confusion. One of the report's overarching conclusions is that equitable, high-speed broadband access and wireless connectivity should be a top action item for school districts.

The DoE isn't alone in placing a high value on reliable networks. The EducationSuperHighway, a nonprofit organization funded in part by Mark Zuckerberg's Startup: Education and the Gates Foundation, says high-speed broadband is the key to improving U.S. schools' ranking in technological readiness, which is currently 16th compared to other developed nations.

The importance of WANs is clear, yet administrators face significant hurdles, including network reliability. Today's digital classrooms can't access the Internet and cloud-based applications if WANs aren't working effectively, which can bring learning to a halt.

What's the answer? School districts need a comprehensive strategy to ensure their WANs achieve the highest levels of performance, reliability and security for modern educational goals.

Network Planning as the First Step to an Effective Strategy

For Grossmont Union High School District (GUHSD) in California, launching and maintaining reliable, high-speed networks starts with a series of careful and practical upgrades that will occur over time. "We take a methodical approach by perfecting what we have in place," says Rick Roberts, executive director of educational technology services. "We make sure our network services will be available 24/7."

His technology department supports 9 high schools that serve 18,000 students in eastern San Diego County. A WAN interconnects the schools and gives students and faculty high-speed Internet access.

School leaders implemented their strategy about four years ago as part of a long-term objective to change the district's approach to education. "We decided to totally flip education on its head," Roberts says.

To make that happen, the district launched its Future Forward program, which will be fully implemented two years from now, but is already delivering benefits. Students predominantly use Chromebooks and the WAN to connect with Google Apps for Education and other digital resources. "We encourage teachers to innovate to create exciting learning experiences," says Dan McDowell, director of instructional technology. "Our instructors are moving from teacher-



The Demand for Reliable WANs

- **The U.S. Department of Education's** latest technology assessment says equitable, high-speed broadband access and wireless connectivity should be a top action item for school districts.
- **The EducationSuperHighway**, a nonprofit organization funded in part by Mark Zuckerberg's Startup: Education and the Gates Foundation, says high-speed broadband is the key to improving U.S. schools' ranking in technological readiness.

centered to student-centered classrooms. Digital tools are opening up these possibilities."

For example, as students in science classes gather data from their lab experiments, they quickly assimilate and graph the information in sophisticated charts that were difficult to create without digital tools. They also videoconference with outside experts and peers in other districts, including one in Russia.

To support these efforts, the IT department is systematically increasing networking capabilities by contracting for new WAN services, as well as expanding its local area networks (LANs) and Wi-Fi resources. Currently, the district uses 2Gbps Internet and WAN connections, which are on track to double next year.

Defending Against WAN Downtime

A number of factors can bring down school district networks, but cyberattacks are an evolving threat for which network administrators must be prepared. Distributed denial-of-service (DDoS) attacks, in particular, overwhelm a targeted school's networks with high volumes of traffic, threatening uptime and reliability.

To combat this issue, some upfront planning and a close relationship with its WAN services provider helped GUHSD contain the fallout from a DDoS attack a couple years ago. "It started on a Thursday, and for a while, nothing could get into or out of our connection," says Roberts.

The district worked with the service provider to shunt the rogue traffic away from the school. "We opened up school on Monday with a solution in place," Roberts says. "Now, whenever there's an attack, we use that remediation and support from additional DDoS attack prevention services to keep functioning. We're good enough at it now that our users are often not even aware we're under attack."

Outside of these cyberattacks, less threatening activities — such as online testing — can also bring the network to a halt. It is often difficult for a school or district to anticipate bandwidth needs during these instances when hundreds or even thousands of students access the network simultaneously. One option to prevent this network downtime is burstable Internet. Burstable Internet connectivity allows a district to go beyond its allowed bandwidth for a small percentage of time over the course of a billing cycle. That way, in those rarer moments when usage far exceeds bandwidth restrictions, they are adjusted accordingly without it costing the district an exorbitant amount of money.

Other considerations in preventing downtime include network redundancy. WAN service providers should deliver more than one connection to schools, so if a construction crew severs a fiber cable, for example, educational activities stay up and running.

Finally, in addition to evaluating cybersecurity expertise, IT administrators should also review uptime statistics for their provider's network architecture. Providers may maintain network operations centers throughout the country to continuously monitor the status of local and national services and deploy local staff day or night whenever downtime risks arise.

A Foundation for the Future

As education continues down a digital path, the importance of reliable, secure WANs increases. With a clearly defined network plan mapped to educational goals, a solid defense against downtime and an understanding of the latest network innovations, school administrators can build a WAN foundation to support education transformation.

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Know the Latest Network Innovations

Metro Ethernet. With network speeds of 256Kbps to 1Gbps and beyond, this option balances price and performance considerations important to school districts. Metro Ethernet also supports data, Voice over IP and video over one network, rather than multiple links which can be costly. In addition, it lets IT staffs efficiently connect their LANs to WAN services without complicated conversion solutions.

The availability of Metro Ethernet appealed to GUHSD. "We felt this option was the most cost effective, and provided redundancy and the ability to load balance traffic across different sites," says Joe Conyers, systems and network analyst.

Ethernet over multi-protocol label switching (MPLS).

MPLS provides a scalable platform for voice, Internet and video running over Ethernet. Together, Ethernet and MPLS can support high-speed traffic while also meeting stringent reliability and quality-of-service requirements.

Metro Ethernet over hybrid fiber coaxial (HFC) cable.

This solution allows districts to tap into Metro Ethernet using their coaxial cables to link up with fiber backbones, which offers self-healing and high-availability capabilities. Metro Ethernet over HFC also delivers fast performance, with upload and download speeds up to 3Mbps.

Point-to-point Ethernet private line network services.

These high-speed connections create private networks for stand-alone or integrated voice, data and TV communications. Leading services use a fiber-based SONET self-healing ring network for 99.99 percent network availability, digital-quality sound and hardened security.

Managed Wi-Fi services. These suites of services support the wireless devices running in classrooms and administrative offices with hardware, software and specialists provided by service providers. Managed Wi-Fi services are a good option for schools looking to reduce costs and network management overhead. As wireless needs grow, schools aren't pressured to make additional capital investments or hire expensive technicians to handle the increased usage demands.