Wireless Networks for K-12 & Libraries

Technology Challenges & Solutions for Evolving Connectivity Needs

WHAT YOU’LL GET:

+ Change drivers in technology in education
+ Why wireless WAN makes sense in K-12 & libraries
+ Security & CIPA compliance in education environments
+ Considerations for choosing multiple WAN connection options
OVERVIEW

Mobile devices and cloud-based applications are creating new and exciting opportunities for school and libraries to meet the needs of their students, staff, and the community. In fact, for schools and libraries, technology and Internet connectivity are no longer supplemental elements, but critical tools to help enhance and personalize learning.

Thanks to this shift, schools and libraries are looking to their IT teams to help enable the adoption of these new technologies and solve emerging challenges, including how to keep the network secure, how to provide sufficient bandwidth for all the devices accessing the network, and how to reduce or eliminate network outages. Many IT teams are finding that legacy hardware and architectures (often engineered for the connectivity requirements of the mid-1990s) simply aren’t doing the job.

Additionally, some mandated changes (like online testing for Common Core) and budget-driven changes (like the shift to cloud-based applications) means many schools and libraries are seeking new networking solutions to meet their evolving needs without complicating network management or creating additional security vulnerabilities.

Today’s IT decision makers are faced with two options: continue trying to make legacy systems work in an increasingly mobile, connected, and complex environment—or seek a new network solution that will help extend, compliment, or augment existing network infrastructure. Of course, choosing a new solution carries risk. Deploying the wrong network solutions could land an IT manager in the position of answering to frustrated teachers, administrators, board members, and the community—not to mention long-term impacts, such as reduced instructional time, potential drops in student performance, and lost funding as a result.

This white paper explores the change drivers that are prompting schools and libraries to seek new network solutions, outlines the challenges that a new network solution must be able to address, and offers guidance on choosing a solution that balances the evolving needs of schools and libraries with the time and budget constraints of the IT department.
CHANGE DRIVERS

Although the purpose of education has remained the same throughout history, the education environment has, and is, dramatically changing. There are many change drivers affecting K-12 education and libraries and consideration should be taking in how the following changes in education and technology are impacting network connectivity needs.

COMMON CORE

In states that have adopted Common Core State Standards, online testing is now a regular and critical event for schools. While such online tests offer certain benefits, uninterrupted Internet is essential and bandwidth is in high demand.

THE CLOUD

The cloud is helping reduce the costs associated with purchasing and updating software applications for students and library patrons. Library visitors use cloud-based applications and Massively Open Online Courses (MOOCs) to learn new skills like coding, or math, or a foreign language. In schools, teachers can post grades, assignments, attendance, messages, and lecture videos online through cloud-based portals. At home or on their mobile devices, parents visit the portal to access those results, while students review lessons or submit assignments—all on cloud-based platforms. Network administrators are charged with making sure those resources are available with 24/7 connectivity.

1:1 & BRING YOUR OWN DEVICE (BYOD) POLICIES

Schools and libraries are replacing computer labs with mobile devices, which are more flexible, portable, and generally less expensive. For some schools, there is enough funding to purchase a mobile device or notebook for every student—known as a 1:1 policy. Often, however, students and library patrons use a combination of their own devices and those provided to them.

ALMOST HALF (45%) OF U.S. K-12 SCHOOLS DON’T HAVE THE BROADBAND CAPACITY TO DEPLOY A 1:1 INITIATIVE.

Cloud-Based Applications & Services

Nearly 39 percent of tech leaders say their district uses the cloud for student information services, while 45 percent say they use it for learning management systems.
PERSONALIZED LEARNING

Personalized, or student-centered learning has long been a goal for educators, but many barriers hinder implementation of this instructional strategy in the classroom on a consistent basis. Today, technology advances are helping educators come closer to being able to craft personalized plans for students. Some teachers now use online solutions delivered via mobile devices to conduct real-time assessments and craft data-driven, personalized curriculum based on individual students’ interests, abilities, growth, and mastery of content—rather than just their age.

**Student Safety:** Schools are increasingly using the Internet of Things security technologies. Today, a school district can use Radio-Frequency Identification (RFID) cards to let students scan on and off buses and in and out of buildings. Parents and schools can easily track attendance and, for a multitude of safety reasons, know where children are.

Additionally, day-to-day operations also rely heavily on Internet access for everything from payroll processing to managed services like campus security systems.

CHALLENGES & SOLUTIONS

BANDWIDTH

A major barrier to providing sufficient Internet access in schools and libraries is provisioning and managing bandwidth. The network needs to be equipped to handle constant and simultaneous use of multiple devices per person, often moving across the campus throughout the day, streaming audio/video and accessing cloud applications.

IT administrators need enough network flexibility to adapt to bandwidth needs during high usage times, such as at the beginning of the day when students, teachers, and administrators are all logging on the network, or on testing days. At the same time, the school or library must keep the cost of provisioning such bandwidth low enough to be cost-effective.
Solution: Augment or replace existing connectivity solutions with a wireless Wide Area Network (WWAN) solution that uses 4G LTE connectivity. Today’s WWAN solutions can provide high-performance, dynamic connectivity at a relatively low cost. Look for a solution that offers intelligent routing and a data plan that allows for data pooling among locations to help adapt to high and low usage times.

RELIABILITY

Reliable connectivity is now mission-critical, but many schools and libraries don’t have sufficient network and device redundancy. In environments that rely heavily on the cloud and Internet access, the impacts of connectivity failures can be dramatic and far-reaching.

+ An Internet outage on an online testing day would be catastrophic, costing the school district time and resources, resulting in angry parents, teachers, administrators, and school board. For example, in 2013, schools across Indiana were forced to halt testing due to problems connecting to the online portal. The issue impacted 27,000 students in the state, caused testing to be reduced by fifty percent, and potentially reflected poorly on teachers whose performance evaluations take into account these test scores. This was the third year in a row that thousands of students in the state faced problems taking their tests online.
+ Even on a regular day, a network outage could mean a major loss in instructional time for students and working time for teachers and staff.

+ Many libraries also depend on connectivity for their most critical functions, like accessing the resource catalog. If the Internet connection goes down, the library can't serve its purpose.

+ In severe weather, wired lines can easily be affected, but that's often when Internet connectivity is needed most. For example, some schools contract with third parties to send out emergency updates or weather notifications to parents via text message. Typically, these systems sync their contact list on a nightly basis and rely on the school's network for connectivity.

**Solution:** For cost-effective network failover, seek a solution that offers value-added services and minimizes resources needed to troubleshoot the network when primary connectivity goes down. An ideal solution should include proactive alerts and Out-of-Band Management — which lets the administrator troubleshoot and repair the primary device through a redundant router or the cloud. Better yet, consider choosing a solution that offers multi-WAN Diversity with primary and failover connectivity in one converged wired and wireless platform. Because 4G LTE connectivity isn't subject to the same outage causes as wired lines, and it's less expensive than T1 or T3, it makes an ideal failover solution for libraries and schools.

**FLEXIBILITY**

Today's schools and libraries need a network that can integrate wired and wireless connectivity with failover and sometimes multiple Internet Service Providers (ISPs), but deploying such a network has in the past been resource-prohibitive and challenging to manage from both a security and performance standpoint. Additionally, technology and connectivity needs will almost certainly continue to change, and it's up to IT managers to future-proof the network.

**Solution:** Seek a connectivity solution that meets the specific flexibility needs of the intended use. If it is anticipated that the connectivity needs might change frequently, consider a Wireless Wide Area Network (WWAN) solution that uses 4G LTE connectivity. If failover is a concern, look for a device that
has dual-modems for multiple-carrier redundancy. In some cases, it may be necessary to find a solution that can converge wired and wireless connectivity in one platform.

CIPA COMPLIANCE

One of the IT team’s most serious tasks is ensuring compliance with laws enacted to protect students against obscene and dangerous content. This task becomes more difficult as students and their devices become increasingly mobile. Compliance with the Children’s Internet Protection Act (CIPA) is critical to student safety. Non-compliance with CIPA could mean not only exposing students to harmful content or even malicious people, but also exposing the district to legal and financial liabilities.

In order to qualify for E-rate funding and meet CIPA compliance benchmarks, schools and libraries must certify that they have an Internet safety policy that includes the following technology protection measures:

+ Block or filter Internet access to pictures and materials that are obscene, pornographic, or harmful to minors.
+ Provide for the safety and security of minors in direct online electronic communications.
+ Prevent “hacking” and other unlawful activities by minors online.
+ Prevent unauthorized disclosure, use, and dissemination of minors’ personal information.

Common problems with implementing CIPA compliance measures include “over-filtering” (blocking too much) and managing complex access policies for different users and sites.

Solution: Choose a centralized, cloud-managed network solution with content filtering and device visibility and control to make it easier to manage the network with limited resources. The solution should also offer robust network segmentation and multiple SSIDs.

31% of students say they are required to use the Internet to complete homework assignments outside of school daily, while 42% are required to use it every few days. The remaining 27% are required to do so less frequently: once a week or every few weeks.
NETWORK & DATA SECURITY

More devices accessing the network and the Internet mean securing the network is bound to get harder—and sensitive data could be at risk. Minors’ personal data is highly lucrative, and thus highly coveted by hackers. Because a child’s Social Security number is not associated with a credit file, there’s little chance that it’s being monitored for fraud by credit companies, making the data easy to use once obtained. Like corporations and government entities, schools must protect the data of their employees and the people they serve, but they often must face those challenges with fewer resources.

Many factors contribute to security weaknesses in K-12 and library settings:

+ Without proper education, students and employees alike can fall prey to phishing and malware scams.
+ Lack of stakeholder understanding about the potential for security breaches and lack of resources mean that districts often can’t allocate the ideal level of resources to network security.
+ Third parties like state and local education agencies, researchers, psychologists, or medical practitioners who work for or are under contract to schools may need access to student data.\(^5\)
+ Mobile devices and the Internet of Things technologies, such as IP surveillance systems, wireless printers, and security systems, create more network on-ramps that can often be easily hacked and used to pivot to other parts of the network where sensitive data is held.
+ Third parties like parents, outsourced IT, and managed service providers need on-site network access.

A network security breach could carry consequences that range from grades being erased or changed to compromising minors’ personal information, including health records, home addresses, and Social Security numbers. A breach of this type could cost the district hundreds of thousands of dollars or even millions should the school be found in violation of Family Education Rights Privacy Act (FERPA).

**Solution:** Best practices dictate educating employees and students alike about avoiding phishing and malware threats, and educating stakeholders on importance of data security. Education stakeholders and policy-makers are working to bring regulations up to speed to match the changing technology landscape.

From a technology and hardware perspective, it is critical to choose a centralized, cloud-managed, hybrid on-premises/cloud solution, which provides a layered approach to security that is scalable, intelligent, and enables optimal protection.
Parallel Networks provide an elegant and simple way to keep sensitive data completely separate from other data or guest networks, making it easier to manage the network and protect critical information.
PARALLEL NETWORKING FOR A SAFER SECURITY ARCHITECTURE AT THE NETWORK’S EDGE

In contrast to segmenting a single network, Parallel Networks are a relatively simple solution to augment security. On Parallel Networks, separate applications are assigned completely separate networks, or “air-gapped.” This physical separation of data in combination with a hybrid on-premises/cloud solution further prohibits attackers from using a compromised device to pivot to other servers and networks, including those that hold sensitive data.

Schools and libraries should consider hosting student/public WiFi, employee devices, and personal data systems on separate Parallel Networks. With Parallel Networks, schools and libraries can expect third parties such as service vendors who require Internet access to Bring Your Own Network. By expecting
third parties to provide their own Parallel Networks, the school or library can retain governance over its own network functions, while reducing the overall scope of work to maintain network security.

Parallel Networks significantly reduce the amount of time and expertise needed to segment networks based on application and reduce complexity of network management.

**WHY 4G LTE?**

4G LTE WWAN networks help meet demand for extra bandwidth and seamless failover with superior flexibility, cost-effectiveness, and manageability. Many schools and libraries are finding that converged wired and wireless networks provide the best solution to maintain a highly secure and highly available network with few IT resources, usually across many locations. The following are just a few benefits of utilizing WWAN networking:

- Wireless failover is less expensive than common wired failover solutions and not subject to the same incidents that often cause long-term outages, like a wired line breakage.
- Wireless connectivity is more flexible and scalable. A growing school district or a new library branch can quickly and inexpensively provision connectivity. As many schools turn to “portable” classrooms if they lack sufficient resources to build new facilities, provisioning connectivity for those classrooms could come at a high cost if using a wired line.
- Using cellular data may allow for better load balancing and data pooling across locations to optimize bandwidth. In some cases, it may make sense to seek a network solution that allows for load balancing and data optimization across wired and wireless WAN connections on one converged platform.
- Centralized cloud management keeps IT costs low and helps ensure top-notch security and network performance across facilities throughout the district or city.

The key to achieving maximum return on investment in wireless networks is to find a solution that allows for the convergence of different carrier and ISP services, and provides for both on-premises and cloud management, to craft the right solution for each site or district and specific use cases.

**CHOOSING INTERNAL CONNECTION SOLUTIONS & WWAN CONSIDERATIONS**

Given the challenges that school and library network administrators face, finding network solutions that can meet the evolving network needs of schools and libraries can be a complex task. To recap, the following are a few of the most important questions to ask about any potential connectivity, management, and security solutions.
SECURITY & SECURE ARCHITECTURE CONSIDERATIONS

+ Does it provide centralized cloud management? This helps significantly reduce travel costs and IT time spent to manage security, and ensures maximum network visibility and control for CIPA compliance.

+ Does it offer a combination of security services like anti-malware defense, anti-spam and mail protection, traditional Layer 3 and 4 firewall rules, VPN, and web proxy capabilities?

+ How does the solution help provide for data isolation and network segmentation? If necessary, does the solution offer a cost-effective option for Parallel Networking?

AGILITY CONSIDERATIONS

+ How does the solution integrate with existing network architectures? Does it allow for convergence of wired and wireless WAN connections in one platform?

+ How flexible is the solution? Will you need to load balance across wired and wireless WAN connectivity? Will you need to provision connectivity from multiple ISPs and carriers? If so, can the network be converged and managed on one platform?

+ How does the solution help future-proof the network? It’s likely that the network’s connectivity needs will change in scale, location, and bandwidth over coming years.

+ What is the total cost of ownership for the solution? Will the solution help reduce staff time and resources needed to manage and troubleshoot the network? Is the solution E-rate eligible?

RELIABILITY AND PERFORMANCE CONSIDERATIONS

+ What standard of continuity can you reasonably expect from the solution? Will you need to provision alternative connectivity to meet surges in bandwidth demand and ensure that connectivity doesn’t fail at critical junctures?

E-RATE 2.0

In July 2014, the Universal Service Administrative Company (the entity that administers E-rate) made sweeping changes to E-rate funding. Under the E-rate Modernization Order, more money will be made available for schools and libraries. The changes also focused on:

+ Phasing out funding for Voice over IP (VoIP) services
+ Allowing funding for managed internal broadband services (managed WiFi)
+ Elimination of legacy and other services under Category 1 funding
+ Reducing the overall eligible services list
Many schools and libraries considering investing in new networking solutions using E-rate funding are finding that wireless WAN connectivity with 4G LTE for primary, failover, and mobile connectivity provides a cost-effective and easy-to-manage solution to keep up with the changing technological landscape in schools and libraries. WWAN connections can be E-rate eligible when they can be shown to be the best and most cost-effective solution.

ABOUT CRADLEPOINT

Cradlepoint is the global leader in software-defined 4G LTE networking solutions, providing secure business-grade connectivity for schools and libraries. Cradlepoint was the first to pioneer and fully enable high-speed LTE in its solutions to maximize the potential of the cloud for organizations worldwide. Cradlepoint solutions are purpose-built to help schools and libraries seeking a comprehensive network solution address demands for greater bandwidth, flexible access, easier management, and 99.99% reliability.

CRADLEPOINT ADVANTAGES

**Cost-effectiveness:** Cradlepoint’s solutions are purpose-built for smaller/Edge Networks with little on-site IT expertise. Cradlepoint’s cloud-managed solutions are easy to deploy, manage, and maintain. Cradlepoint offers a combined cost-effective router, Ethernet switch, firewall solution that is ideal for small classroom, library, and testing facility connectivity.

**Rock-solid connectivity:** Best-in-class connection options ensures a school’s connectivity will be reliable, uninterrupted, and secure. Converged wired and wireless failover ensure reliability so that networks will be available when staff, students, and administrators most need them.

**Flexible adaptability:** Cradlepoint’s platforms are engineered to scale and adapt, whether that means implementing and updating policies from the cloud, or changing existing deployments to meet evolving needs.

**Data and network security:** Cradlepoint's devices and cloud-based management platform proactively identifies and responds to threats faster and helps reduce costs with next generation firewall protection with enhanced virus protection and anti-malware. Cradlepoint's content filtering solution helps the school maintain CIPA compliance.

IT IS PREDICTED THAT BY 2018, EVERY STUDENT IN THE US WILL HAVE ACCESS TO A MOBILE DEVICE 24/7.
CRADLEPOINT OFFERS E-RATE ELIGIBLE PRODUCT BUNDLES FOR SCHOOLS & LIBRARIES

SMALL SCHOOL & LIBRARY ROUTING SOLUTION

“Network-in-a-box” for Small Schools (90% E-rate eligible)

+ Router
+ WiFi
+ 13-port switch
+ Firewall
+ Security services (3-yrs)*
+ 3-year cloud management & warranty included

Part Number: 3100-ESOLN-3YR

*CIPA – Not E-rate eligible

CLASSROOM & SMALL FACILITIES ROUTING SOLUTION

Internal Connections for Classrooms & Small Facilities (100% E-rate eligible)

+ Router
+ WiFi
+ 4-port switch
+ Firewall
+ 3-year cloud management & warranty included

Part Number: 1600-ESOLN-3YR

TO LEARN MORE, VISIT CRADLEPOINT.COM/K-12 OR CALL 1-855-813-3385

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