Managing K-12 Technology:
Supporting Classrooms in a Digital Age

DeepBlue
A Passion for Wi-Fi

The Future of WiFi
Information Series

The Future of WiFi

Managing k-12 and eRate

Managing K-12 Technology: Supporting Classrooms in a Digital Age

With the explosion of digital curriculum, eLearning, classroom websites and other educational technologies, schools need the right IT tools and infrastructure to support teachers and students. How can school leaders, boards, administration and IT managers ensure the right construction, capacity and connectivity for their districts?

53% of American children already have their own cell phone by the time they reach seven years old.
https://www.yahoo.com/parenting/giving-a-kid-a-cell-phone-how-young-is-too-young-115938030217.html

The ABC's of Technology in Education

Once upon a time, high schools had computer labs – and that was the only technology they needed. Fast forward to today when kindergarteners come to school with iPhones and show their teachers how to download the latest app or utilize the newest educational games.

The educational system in this country and across the globe is finally catching on to the idea that technology can be used to empower students and teachers with new opportunities, methodologies and applications that will prepare kids today for the work that needs to be done in the future.

In September of 2015, a month after naming its first open educational resources advisor, the U.S. Department of Education committed to showing K-12 schools how to utilize "openly licensed education materials." OER consists of digital textbooks, lessons and videos that are licensed to be freely shared and modified. The Bring Your Own Device (BYOD) trend coupled with discounted or free hardware for schools has accelerated the pace of tech use in the classroom as well.

And that's not all. The big technology companies like Google, Apple, Microsoft and Facebook are all getting into the education technology game:

Microsoft

- Over 45 million students around the world are using Google's "Apps for Education" – a bundle of cloud-based email, calendar and document sharing apps offered free to schools. Other technologies include Google's "Classroom" – a free app teachers can use to create, collect and comment on student assignments

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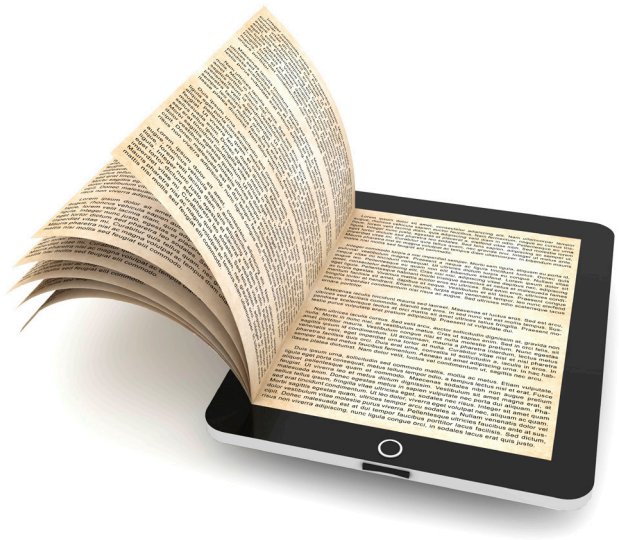
and their field trip simulation system "Expeditions" which is now being offered free to schools as part of their effort to further develop the technology.

- Facebook engineers are currently working with public schools on software to customize learning to individual students.
- There are currently 150 Microsoft Showcase Schools around the world, each with a strong passion for modernizing schools and ensuring students use technology that prepares them for their future. Microsoft also offers over 23 free classroom tools.
- Apple is working on personalizing education for students with different learning styles, and currently offers more than 85,000 educational iPad apps, more than 45,000 eBooks, and more than 10,000 courses. The newest Apple initiative "Learning at Every Level" offers a collection of digital resources for students and teachers.

With State and Federal funding incentives like The Schools and Libraries program, also known as the "E-rate" program, telecommunications and information services have become more affordable for schools and libraries in America. Mandated by Congress in 1996, implemented by the Federal Communications Commission in 1997, and funded by the Universal Service Fund (USF), E-rate provides discounted telecommunications, Internet access, and internal connections to eligible schools and libraries.

All of this is great news. Ensuring that all students have access to high-quality learning opportunities in is a priority, demonstrated by the fact that dozens of federal programs have made teaching and learning in science, technology, engineering, and math (STEM) a critical component of competitiveness for grant funding. The Department's Race to the Top-District program supports educators in providing students with more personalized learning - often supported by innovative technologies.

Many educational publishers are also promoting digital curriculum and e-Learning through dynamic audio and video that reflects events, research and data in real time, promoting a greater breadth and depth of knowledge. Classrooms are also exposing kids to collaborative learning and digital literacy by utilizing common applications like Skype for education.



With these terrific opportunities comes a sea change in the way communities and their school districts look at the infrastructure and services needed to make technology a reality for the long term. This presents a whole new wave of challenges. A school's failure to meet new Federal and State requirements can mean millions in lost funding for school districts. Students who aren't exposed to the latest and greatest technologies early on run the risk of falling behind their peers for the long term.

Meeting the Demands of a New Era

Technology creates many efficiencies and can enhance the way teachers and students approach learning, but there are numerous challenges to face.

The new Common Core Federal standard for educational outcomes contains a specific set of standards on how students will attain skills related to technology. The program has explicitly embedded the expectation that classrooms will use technology in their day to day learning in order to achieve the state standards. No longer an option, it is a requirement.

With the advent of online assessments and high stakes testing, the financial viability of school districts is at risk. These results are reported to the government and schools are rated based on their Academic Performance Indicator (API). Poor performance by a school can effect everything from home and property values to a decrease in property taxes which are a major source of funding for school districts.

Poor performance by a school can effect everything from home and property values to school funding.

Attracting students and their families, recruiting faculty and accelerating student performance are all important issues for staying competitive with other districts and are serious considerations for all schools.

Managing the IT Burden

If a district is lucky enough to have the funding for an IT department or even a director, the challenge of implementing stable, secure, reliable and scalable technology to support a school system can be overwhelming. More often than not, districts are relying on other staff to fill this role resulting in a heavy work load, missed opportunities and significant network downtime. Many don't have the expertise needed – or if they do, the time to manage - a full district's needs.

IT departments are responsible for:

- Deploying new educational tools and applications to provide teaching and learning opportunities for students
- Managing student attendance and information systems
- Updating and maintaining public websites
- Maintaining online security and wired security access systems
- Updating and maintaining digital signage and notification systems
- Providing routine maintenance, server and application updates
- Coordinating technology readiness for faculty and administrators
- Supporting faculty, campus and student network devices (laptops, smartphones, tablets, etc.)
- Advising senior leadership on primary tech challenges and solutions

Managers also need to ensure their networks are:

Scalable: Is the network designed to handle a spike in users during testing periods, sporting events, and meetings? Will the network meet the demands of the next 10-15 years?

Secure: Does the network meet the legal requirements for the district? Are mobile devices authenticated?

Compliant: Is web content adequately filtered to be complaint with e-Rate and the Child Internet Protection Act (CIPA)?

Stable: Does the network provide anytime, anywhere coverage? Are disruptions kept to a minimum, or are they a daily occurrence?

To support all of these requirements, the highest performance possible is needed for a district network. For example, even just the two-week period to get all students through a testing window causes a tremendous density of students accessing online testing. Network performance is key as students often take tests on wireless devices and are all attempting to complete tests in a given timeframe. At any given time 100-200 devices could be in use simultaneously. The user experience must be seamless, nothing should interfere with the learning environment. With limited room for error – systems must work.

The highest network performance possible is required to support the new digital learning environment.

To accommodate all of these devices, applications and bandwidth, districts need to take a hard look at their current infrastructure and upgrade their networks to support digital learning and the proliferation of all the emerging technologies that are just around the bend. It's impossible to predict what new device will be introduced in the next 5-10 years, but rest assured more devices are on the way. And there is technology to support them.

Technology to the Rescue

Can we solve the technology burden with more technology? You bet. To start with, understanding how new standards and technology enabling components will effect your infrastructure over the next 5-10 years is key to budgeting and planning for growth and sustainability.

802.11ac

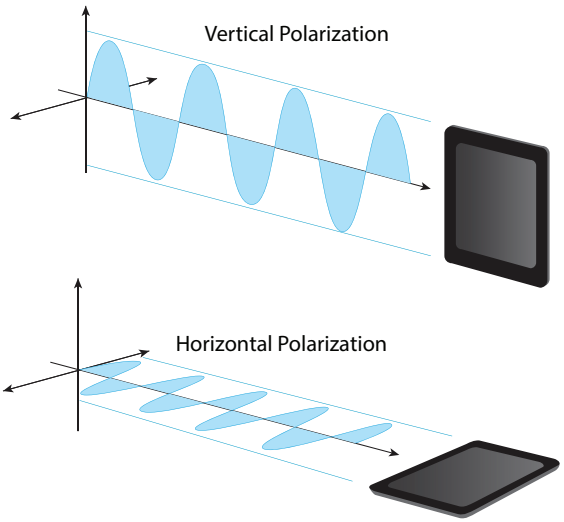
There is a new 802.11 Wi-Fi standard that promises more bandwidth, greater speeds, and support for a new generation of devices. The new standard in Wi-Fi is 802.11ac Wave 2. It is different from the first 802.11ac wireless specification in that it utilizes Multi-user Multiple Input Multiple Output (MU-MIMO) technology to help increase wireless speeds from 3.47 Gbps to 6.93 Gbps. Just like our devices have upgrades – smartphones, tablets, laptops – each iteration of these 802.11 standards makes improvements and advancements on the previous standard. 802.11ac was designed to help deliver increased bandwidth and improve wireless reliability. It is now available.

MU-MIMO

The MU-MIMO technology simply means that wireless routers can now transmit to and receive data from multiple Wi-Fi devices at the same time (as opposed to the single-user multiple-input and multiple-output (SU-MIMO) technology that only supported one). In addition to making a network faster, MU-MIMO can aid in increasing its capacity, allowing it to handle more Wi-Fi devices and faster video and voice streaming, which is excellent for all those devices that need access to data.

Beamforming

Beamforming is an adaptive antenna technology that maximizes signal coverage, throughput and network capacity. Multiple antenna elements can be combined in real-time to form unique antenna patterns and polarizaion. Software continuously learns the environment and selects the optimum antenna pattern for each communicating device. This maximizes range, increases coverage and stabilizes wireless network performance. This is great news for schools who need campus-wide fence line to fence line coverage.



These technologies can work together to provide the stability for both indoor and outdoor coverage, and the scalability to handle a much greater capacity of devices for teacher, student, administrative and guest access. In order to ensure connectivity for all, integrated onboarding tools are key for PTA, sports, activities and community based organizations to feel connected and supported as well.

These new wireless networks with optimal technology are being developed not only for coverage, but for capacity. Districts need faster application performance, increased data transfer capability and speed, and the ability to support multiple users and concurrent sessions. These new technologies deliver just that.

Onboarding

In order to simplify network management, new automated onboarding techniques can also be applied for improved security and seamless management of multiple devices on a network. Role based access control increases security in complex organizations while it reduces complexity and cost.

Onboarding Requirements

Single Sign-on

- Graceful onboarding that allows self-service authorization and device provisioning via open network
- Google and chromebook solution
- Intuitive user / device management
- Certificate-based security

Policy

- Differentiated workflow per SSID and device
- Integrated AAA server with key policy definitions
- Built-in user database with per device / user credential management
- Potential platform for advanced policy solution

Ease of Use

- Easily customizable workflows
- Onsite and remote onboarding
- Scales to multi-site and multi-controller deployments
- Unified device visibility and reporting

A self-service registration portal for all users and devices enables different access based on whether user is a visitor or student / employee. Using role-based access, devices are granted access to only the areas needed, preventing unauthorized access to secure data. With detailed logging, network administrators can monitor who is on network at all times, what they are doing, and how they are connected, allowing data consistency according to school policies and limiting liability.

Updated Security

The need for updated security is essential with all of this new technology, and students, faculty, contractors, vendors, clubs, parents and visitors bringing their own devices to school. For highest levels of security, institutions should be using certificates for authentication, not passwords. Users can sign in once and have access for a specified period of time, making it easier to utilize programs regardless of location.

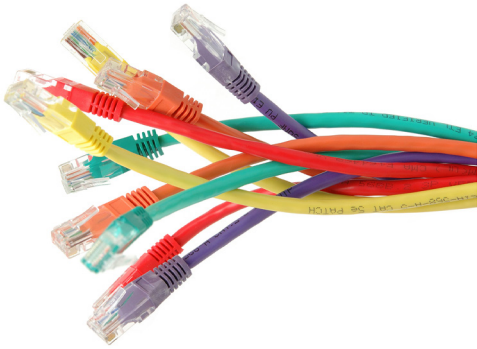
Certificates are the gold standard in modern network and web security because they are not vulnerable to mistyping, lockout, expiration, pfishing attacks, password mismanagement and the ever frustrating forgotten passwords. A certificate also provides a high degree of visibility to users/devices with a unique credential.

Use certificates for authentication

Certificates can be provisioned, revoked, or deleted on demand and each device can be controlled individually without reconfiguring. Certificates avoid user entry error and the time associated with troubleshooting – streamlining the entire process.

Solving the Integration Problem

Sounds great, so who will design, install, integrate, maintain and support all of this? As more technology is heaped on schools, there needs to be strategic long term planning and centralized oversight of such large-scale changes. When cabling, Wi-Fi and hardware are provided and supported by multiple vendors, many districts are failing to see the bigger picture and are unable to plan day to day – let alone plan the next 10 years. Outdated systems, inadequate networks and restricted access cause frustration as new technologies need to be added. But with some thoughtful planning and streamlined, phased-in implementations, however, schools can reap the benefits of a more responsive, stable Wi-Fi network.



Often the best solution for a district looking to upgrade a network or build an entirely new platform of services is a Managed Services Provider (MSP) who understands the complexities of existing infrastructure and can optimize existing systems for future performance. With a full suite of services for everything from full legacy technology analysis to network re/design and configuration, 3rd party vendor integration and ongoing support, MSPs can ensure all legacy and new networks are working in conjunction for the best performance and can provide the 24x7x365 network monitoring and support to keep it all running. MSPs can spot a potential problem before it becomes an issue and recommend

a course of action to an IT director are foreseen and recommendation made to IT Director as to how to prevent them - providing peace of mind that minimum levels of service are defined and met.

MSP solutions can alleviate having to manage multiple systems and vendors, and can guarantee an extremely reliable, properly optimized Wi-Fi experience. District IT managers essentially "flip the switch" and the system is on with confidence. There are alternatives to an MSP like an on-premises controller or even Cloud-based solutions that seem to offer stability and control. But in both cases the IT Director is still responsible for all support and management– and not all directors have the time or resources for this, particularly when updates need to be made after hours.

MSPs offer a much lower Total Cost of Ownership (TCO) when you compare the improved performance and overall maintenance – MSPs can manage all of that for you and reduce the reliance on multiple vendors for support. There is also the question of when the right time is to implement new technologies. We all know summer break isn't long enough. With one vendor managing the scalability and overseeing all the moving parts of a project, a phased in deployment over a number of months or years can ensure stability and security when changing over to new technology.

Budgeting New Technology

There are a number of incentives for schools looking to implement new Wi-Fi technology. In addition to numerous grants for classrooms, the E-Rate program provides technology funding.

e-Rate

Funding may be requested under two categories of service:

- Category One services include Data Transmission Services and Internet Access, and Voice Services.
- Category Two services include Internal Connections, Managed Internal Broadband Services, and Basic Maintenance of Internal Connections.

Discounts for support depend on the category of service requested - and discounts range from 20 percent to 90 percent of the costs of eligible services.

Over 3.9 billion dollars has been made available to the e-Rate program to fund technology in schools and libraries.

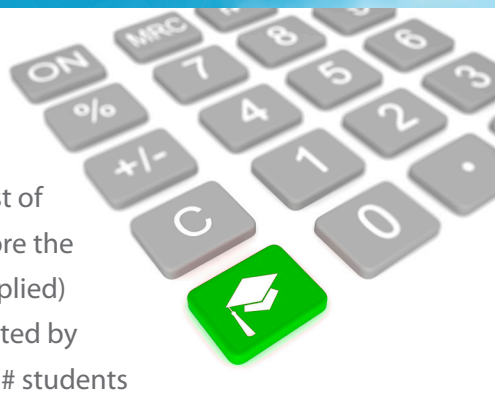
The FCC began updating E-rate in 2010 and on July 11, 2014, adopted the E-rate Modernization Order (PDF), expanding Wi-Fi networks in schools and libraries across America while ensuring support continues to be available for broadband connectivity to schools and libraries.

The program increases focus on the largest and most urgent need—

closing the Wi-Fi gap—while transitioning support away from legacy technologies to 21st Century broadband connectivity. The reform will expand Wi-Fi to more than 10 million students in 2015 alone.

As of FY2015, LANs/WLANs for schools and libraries can be obtained as a service for a period of three to five years from a third party who manages the entire system (MSP), providing operations and maintenance for the life of the contract. Eligible equipment and services can be included like:

- Management and operation of the LAN/WLAN
- Installation
- Activation
- Initial configuration of eligible components
- Onsite training on the use of eligible equipment



To calculate how much a school will qualify for, a pre-discount budget (cost of the total project before the E-Rate discount is applied) for a school is calculated by multiplying the total # students at the school by $150, with a minimum of $9,200 if the school has fewer than 62 students.

As of FY2014 over 3.9 billion dollars was made available to the program to fund technology access in schools, maximizing the options schools and libraries have for purchasing affordable high-speed broadband connectivity.

Moving Ahead with Deep Blue Communications

When planning for any new technology, think at least 10 years out and focus on not one – but all components of your network. Consider the time and cost associated with updating current Wi-Fi networks by seeking out experts who can provide a comprehensive design for all of your integrated systems – both present and down the road. With the right strategy, your entire network can be designed for efficiency and scalability, enabling districts to add new services and functionality in a more cost effective way.

Network performance can be configured and monitored from a single common infrastructure– onsite, or off –streamlining management and making it easier to identify and address issues before they become a larger problem.

The good news is Deep Blue Communications is a certified, qualified and committed technology company eager to help schools navigate the technology systems and services needed to accommodate this generation of teachers and learners, and prepare them for what lies ahead.

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About Deep Blue Communications:

Deep Blue Communications is a leading national managed Wi-Fi Provider engineering, installing, supporting custom Wi-Fi networks in higher education and k-12 across the United States. Deep Blue's technology enables campuses of all sizes to enhance the learning experience. We build on the power of Wi-Fi to unleash the ability of mobility to optimize the student and teacher relationship.

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