Build the Best K-12 Education Network for Digital Learning

Juniper High-IQ Networks Open High-Speed Internet Connections and Scale Mobile Learning
Education Solution Overview

Education in the United States is being transformed by technology, with the widespread use of interactive curricula, cloud services, and mobile devices. Digital learning helps students become more active learners and acquire the knowledge and skills to be more collaborative and competitive in a global marketplace. With digital learning, teachers also can individualize learning plans to students’ needs and schools can readily assess students’ progress.

With online resources and mobile devices replacing outdated textbooks and spiral notebooks, learning increasingly depends on fast, reliable connectivity in the classroom. And learning is being extended beyond the classroom, as distance learning is used to deliver high-quality education no matter where students are located.

Challenges

With education transformation, demands on the network are exploding. Whether school districts provide their students with laptops, netbooks, or tablets, or have adopted a bring-your-own-device (BYOD) policy, the number of mobile devices in a typical classroom is rising sharply. With a one-to-one computing program, each student can tap into the latest educational resources and applications or use collaborative tools from their mobile devices. In addition, most middle and high school students come to class with a smartphone and one or more Wi-Fi-enabled devices tucked away in their backpacks or pockets.

Learning has always depended on strong student and teacher engagement as well as high-quality materials, but in the 21st century school, learning also depends on having fast, reliable, and secure networks. The days of laptops on carts are waning. A school’s network must stand up to many classrooms filled with students, each with their own tablets, netbooks, or laptops, whether they are watching a high-definition video, collaborating on a multimedia presentation, or logging on for a Common Core online assessment.

The need for Wi-Fi also extends beyond the classroom, as students, teachers and administrators expect reliable, always-on connectivity for their smartphones, tablets, and other mobile devices from the library, administrative offices, cafeteria, hallways, and even sports fields and quads. A school site’s network may need to support hundreds or even thousands of mobile devices.

Yet most K-12 districts struggle to provide the necessary connectivity for their schools. In a survey conducted by the Consortium for School Networking (CoSN), 99 percent of school districts said that they need more Internet bandwidth and connectivity in the next 36 months. The CoSN survey also revealed that only 57 percent of elementary schools and 64 percent of secondary schools report that 100% of their classrooms have wireless Internet connectivity.

High-speed Internet connectivity is essential for successful one-to-one computing and digital learning programs. K-12 school districts should have at least 100 Mbps of Internet connectivity for every 1,000 students and staff, with that need growing to 1 Gbps per 1,000 students by 2017, according to the State Educational Technology Directors Association (SETDA). The association recommends that districts have at least 1 Gbps of WAN connectivity per 1,000 students and staff now, growing to 10 Gbps WAN capacity per 1,000 students by 2017.

Trends

One of the most important technology funding programs for schools is E-Rate. Most public schools and libraries in the U.S. depend on E-Rate for discounts on telecommunications, Internet access, and internal connections, but year after year, there is significantly more demand for funding than what’s available. In the CoSN study, only 7.5 percent of the schools felt that E-Rate funding fully met their district’s needs.

To help address these needs and pave a path to digital learning, the Federal Communications Commission (FCC) has approved the modernization of E-Rate to help E-Rate applicants increase access to high-speed broadband connectivity and expand broadband throughout schools and libraries.

Juniper Networks Solution Portfolio for K-12 Education

As school districts make the move to a digital learning model, district networks underpin the delivery of instruction, online assessments, and collaborative learning, making networks mission-critical to learning. Juniper Networks has long been a leader in education, and K-12 school districts rely on Juniper high-IQ networks as they deliver better performance, reliability, resiliency, and security than their legacy district network. With Juniper’s high-IQ networks, school districts can remove network bottlenecks to open high-speed connections to the Internet and scale mobile learning with high-density wireless in the classroom.

High-IQ networks are simpler, and because they are designed with network elements using the common Juniper Networks® Junos® operating system, they provide unmatched automation capabilities that help school districts reduce the stress of implementing and operating networks. When combined with Juniper’s Zero Touch Provisioning (ZTP) and Popup Campus automation engine and workflow, troubleshooting is easier, uptime is improved, adding capacity is straightforward, and networks are less prone to errors, all of which reduce overall OpEx.

Juniper provides school districts the products and services to build a future proof network for digital learning. Many of these components are eligible for Category 2 E-Rate discounts under Internal Connections and Basic Maintenance. Through this portfolio, Juniper Networks support school district needs in:

- Building high-performance and secure Internet connections
- Converging campus networks
- Unifying user network access
- Maintaining the health of school district networks with Juniper Care

### Building High-Performance and Secure Internet Connections

The need for speed begins with a district’s Internet connection. School districts can take advantage of Juniper Networks SRX Series Services Gateways, a high-performance platform that consolidates routing, WAN connectivity, switching, and next-generation firewall within a single easily managed family of gateways.

The SRX Series provides perimeter security, content security, application visibility, tracking and policy enforcement, role-based access control, and network-wide threat visibility and control. The SRX Series also includes wizards for firewall, IPsec VPN, Network Address Translation (NAT), and initial setup to simplify configurations out of the box. For content security, SRX Series gateways offer a complete suite of unified threat management (UTM) services, consisting of intrusion prevention system (IPS), application security (AppSecure), on-box and cloud-based antivirus, antispam, enhanced content/Web filtering, and data loss prevention to protect schools’ networks from the latest content-borne threats. Having all of this on a single gateway simplifies deployment and administration and helps lower a district’s total cost of ownership while delivering fast, consistent service quality to school sites.

But cyber threats don’t stop there. The volume, frequency, and sophistication of distributed denial of service (DDoS) attacks on school districts is increasing, and for ill-prepared districts, it does not take much to fall victim to a DDoS attack. Attacks disrupt school district Internet operations and seriously impact digital learning and online assessments. Attacks can last a few hours, can be spread across a number of days, or surface as a series of attacks over several weeks.

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**Building High-Performance and Secure Internet Connections**

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<tr>
<th>Middle Schools</th>
<th>District Office and Data Center</th>
<th>High Schools</th>
<th>Virtual School</th>
<th>Home-based Student</th>
<th>Mobile Teachers and Staff</th>
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Juniper can help districts protect themselves against the volumetric and low-and-slow application level DDoS attacks with the Juniper Hybrid DDoS Protection Solution. Juniper and Verisign have jointly developed a hybrid solution for DDoS protection that integrates network and application layer protection provided by the Juniper Networks DDoS Secure on-premises appliance and Verisign’s cloud-based DDoS Protection Service. Built on real-time adaptive mitigation technologies, the hybrid DDoS protection solution delivers effective detection and mitigation of application-layer, volumetric, and advanced, multi-vector attacks. This solution effectively detects the full spectrum of low-and-slow application-level attacks while providing support for large-scale volumetric attacks that exceed the capacity of the targeted network.

“We’re one of the leading counties in Maryland for online assessment, and we think that part of our success has been that we have a solid, reliable network.”

Todd Moats, Network Administrator, Washington County, Maryland Public Schools

Large school districts can take advantage of the industry-leading capacity, density, and performance of Juniper Networks MX Series 3D Universal Edge Routers for their Internet connections and campus backbone networks. MX Series routers are powered by Junos OS and a programmable Junos Trio chipset, and managed by Juniper Networks Junos Space Network Management platform and applications.

The MX5, MX10, MX40, and MX80 3D Universal Edge Routers are compact platforms that scale through 80 Gbps, while the versatile MX104 router supports 80 Gbps and is optimized for very large districts. In addition, the MX240 offers 1.6 Tbps of throughput for district data centers and large campus deployments.

Converged Campus Networks

Increasing high-speed Internet connections often expose bottlenecks in existing routers, firewalls, and core switches. Expanding high-density wireless into classrooms also often exposes capacity and Power over Ethernet (PoE) limitations at the access switches that are used to connect the growing number of wireless access points. For these reasons, many K-12 school districts find they need to look at their networks differently as they refresh their campus and data center network infrastructures to be ready for digital learning. Juniper’s high-IQ networks refresh district networks from a converged perspective by addressing wired and wireless networking, network management, and network access and control holistically.

Juniper Networks EX Series Ethernet Switches deliver access, aggregation, and core switching, providing fast, secure, and reliable delivery of data and applications from the data center to the school site. In the campus, EX Series Ethernet Switches address the demand for high availability, mobility, and virtualization, and they deliver operational efficiency, business continuity, and network agility. In the data center, EX Series switches and Juniper QFX Series switches are ideal for today’s highly virtualized server environments as well as multimedia applications.

Juniper Virtual Chassis technology enables multiple interconnected EX Series switches to operate as a single, logical device, consolidating switch layers and reducing management overhead while programmatically delivering the flexibility to respond to changing educational needs. Depending on how widely Juniper Virtual Chassis technology is applied in a school district, one can see a reduction of 90 percent fewer managed devices. All EX Series switches run the Junos operating system, ensuring consistent, predictable behavior across the entire infrastructure.

Most schools lack adequate Wi-Fi to support the high-density mobile environment that is increasingly typical of the classroom. A wireless LAN (WLAN) solution from Juniper or one of our wireless partners is built for this environment. Districts can

Figure 2: Juniper’s Virtual Chassis technology makes district networks simpler and easier to operate.
deploy a best-in-class high-density Wi-Fi network that is highly resilient and highly scalable to support mission-critical classroom instruction and online assessments.

“We want to move the pillar of learning from the classroom to anywhere in the building and beyond. With Juniper Networks, we have the performance and availability we need to do that. Juniper eliminated the bottlenecks.”

Rich Fiore, Director of IT Infrastructure, Naperville, Illinois Community Unit School District 203

These solutions deliver seamless mobility for indoor and outdoor deployments, with the performance and reliability required to support real-time interactive curricula, voice, and video applications even in classrooms and auditoriums filled with students and their mobile devices. Built-in security and network services allow wireless access points to forward and encrypt traffic locally. These solutions use multiple techniques, including band steering, client load balancing, dynamic authorization, quality of service, bandwidth controls, and dynamic call admission control, to ensure a consistent and flawless user experience.

Juniper or one of our wireless partners offers a broad portfolio of access points to serve needs from entry-level to very high-density environments like classrooms and auditoriums. Access points can be deployed in conjunction with WLAN controllers or in a controller-less plug-and-play model for smaller locations.

Juniper or one of our wireless partners offer solutions that deliver and manage wireless LANs with the highest level of reliability, performance, security, and management in the industry. They integrate the WLAN with the wired network to meet the demands of mobile applications and users. Schools can ensure nonstop wireless availability with a Virtual Controller Cluster™ that eliminates the need for hot-standby controllers. If the network fails, all sessions will continue without a hitch, even VoIP calls.

Schools also can deploy Juniper Networks JunosV Wireless LAN Controller, a virtualized software-based controller that is a cost-effective alternative to physical controllers.

Unifying User Network Access

Districts must protect their networks and applications against malicious attacks from outsiders, overly curious students and other insiders, as well as unintended consequences. All too often, with fragmented deployments of wired, wireless, mobile, VPN, and remote sites, network access vulnerabilities can be exposed as school districts are challenged to apply security policies consistently across these domains.

Juniper can help districts address this issue head-on. Juniper has the only complete solution that seamlessly enables policy orchestration between wired networks, wireless LAN, network access control (NAC), secure remote access through VPN, and firewalls. Through Juniper Networks Unified Access Control, district IT administrators can ensure end-to-end segmentation based on user roles (such as students, teachers, administrators, and guests) across the entire network—wireless, wired, mobile, VPN, and at remote sites. UAC is Juniper’s standards-based, scalable network access control solution that allows districts to create and enforce dynamic policies based on user identity and role, device type and integrity, and location. UAC reduces network threat exposure for schools, protecting critical applications.

Schools can provide quick, easy, and foolproof access to their wired and wireless networks for BYOD and school-owned devices with Juniper Networks SmartPass Connect. Schools can offer self-service onboarding for student, teacher, and guest mobile devices—without IT intervention. Schools can choose from either username/password-based 802.1X or certificate-based authentication. Either way, SmartPass Connect provides an exceptional user experience and reduces the cost of WPA2-

Enterprise access to wireless networks or personal devices.

Schools can support distance learning programs as well as secure access to applications for remote and mobile teachers, administrators, and students with Juniper Networks SA Series SSL VPN Appliances. The SA Series includes Juniper Networks Junos Pulse Secure Access Service for a simple, intuitive user interface for secure, authenticated access from any web-enabled devices. The SA Series combines SSL with standards-based access controls, granular policy creation, and unparalleled flexibility. Schools can also use SA Series appliances to ensure that classes continue even after a natural disaster or other emergency.

Solution Planning, Implementation, and Deployment

With Juniper, education customers can maintain the health of their networks with 24x7 support that is tailored to their needs. Juniper Networks Care is a suite of services that provides rapid response from Juniper Networks Technical Assistance Center (JTAC) engineers, and hardware replacement options that let schools choose the right timing and resources for their network needs. Juniper Care increases operational effectiveness and lowers operational costs for schools by using Juniper Networks Junos Space Service Now to reduce the time for problem identification and diagnostics. This allows school IT staff to concentrate on strategic activities, not fixing equipment.

Juniper Care Core, one of the many tiers of Juniper Care services, is eligible under E-Rate Category 2 Basic Maintenance of Internal Connections (BMIC). Juniper Care Core entitles subscribing school districts to unlimited JTAC 24x7 support, software releases, and Customer Support Center (CSC) online e-support.
Limited Lifetime Warranty
School district’s investments in Juniper Networks receive added protection with Juniper Limited Lifetime Warranty on select EX Series Switches and indoor Access Points. Models include:

Enhanced Limited Lifetime Warranty
- EX2200, EX3200, EX3300, EX4200, EX4300 and EX6200 systems

Limited Lifetime Warranty
- Wireless LAN Indoor Access Points

Juniper Financial Services

Table 1. Common List of Juniper E-Rate Eligible Products and Services

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<th>Eligible as Category 2</th>
<th>Juniper Product/Service</th>
<th>Eligible Broadband Internal Connections Components</th>
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<tr>
<td>Internal Connections</td>
<td>SRX Series Services Gateways</td>
<td>Routers, network switches, firewalls (combined functionalities are eligible)</td>
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<td></td>
<td>MX Series 3D Universal Edge Routers</td>
<td>Routers</td>
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<td>EX Series Ethernet Switches</td>
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<td>Wireless access points</td>
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<td></td>
<td>WLC Series Wireless LAN Controller</td>
<td>Wireless LAN controllers</td>
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<td>Junos Content Encore</td>
<td>Caching</td>
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Summary
In a 21st century classroom, if the network goes down, learning stops. That’s why K-12 school districts have turned to Juniper, which is a leader in high-IQ networks and known for carrier-class reliability, to power and secure their wired and wireless networks. As K-12 school districts find that they need to reinvent their campus and data center network infrastructures to be ready for digital learning, Juniper’s high-IQ networks empower them to cost-effectively manage district networks from a converged and holistic perspective, creating a high-performance and secure 21st century learning environment.

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](http://www.juniper.net).