Facilitating Anywhere, Anytime Learning

Networking solutions for today’s education environment
Introduction
Today’s classroom is being transformed by mobile devices, digital content, online assessments and social collaboration. At the district and campus levels, technologies such as virtualization and cloud computing are replacing traditional IT in order to keep pace with digital learning as well as to reduce costs and gain organizational flexibility. These shifts are making significant demands on education technology infrastructures. Here is just a glimpse at the impact:

- **76 percent of K-20 students** are bringing a personal device to class and using it to access the campus network.  
  ![Image](image.png)

- **92 percent of K-20 classrooms** are using interactive whiteboards; 82 percent are using mobile devices; and 62 percent are using videoconferencing. 

- **64 percent of K-20 institutions** have moved or are planning to move email to the cloud. 

- **73 percent of K-20 institutions** have virtualized or are virtualizing part of their IT environment in the near future. 

These emerging technologies are being adopted to create more personalized, accessible and student-centered learning. This change is exactly what education needs to meet the expectations of next-generation learning and prepare students for the future workforce. However, the migration to digital learning environments is creating new demands on all forms of IT, straining education’s digital foundation.

Building an Open, Flexible, Scalable Network
As new lines of thinking and new learning platforms have transformed the world of academic technology, so too is the perspective on networking beginning to shift. Traditionally, networks have been viewed as rigid “pipes” that move data from server to client, one point to another. A new, emerging approach to networking, however, is intelligent, optimized and application aware. It adapts to dynamic workloads. It automates management and frees IT staff for other tasks.

This open, software-defined architecture allows IT to be in control of the network’s destiny with more choice of network platforms, increased flexibility to accommodate growth and change, and improved application integration. Also appealing is the lower total cost of ownership (TCO) that comes with a future-proof architecture. Yet open networks seamlessly integrate with existing infrastructure and can be managed with familiar systems and tools.

This open approach should be part of a broader networking strategy that includes:

- Using open standards and interfaces, which enhance flexibility (no vendor/proprietary technology lock-in), enable the ability to augment network capacity and capabilities, ease management across environments, and allow resources to be allocated as a package across complex physical and virtual computing environments

- Automating mission-critical processes such as the configuration of network switches and network monitoring, helping to improve efficiency and allowing networks to better utilize human resources

- Enabling institutions to achieve broader coverage, seamless operation and...
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comprehensive, automated management that reduces administrative time and enhances organizational productivity.

In short, the latest developments in networking lead to an approach that is sophisticated enough to meet the demands of the digital learning era.

Networking Strategies that Help Overcome Obstacles

The digital learning era requires the IT department to address several networking challenges, including bandwidth demands, aging infrastructure, securing access, increasing complexity due to the rise in mobile technology and lack of funding. But new networking strategies and solutions can help IT administrators overcome these challenges.

Improving Bandwidth

Today’s students walk onto campus expecting the network to be available and deliver high performance levels. In a Center for Digital Education (CDE) survey, only 31 percent of K-20 IT and education leaders said their connectivity completely met their needs for digital content; 30 percent said it met their needs for video streaming; and 28 percent said it met their needs for online testing.5

Inadequate bandwidth makes it nearly impossible to support the media-rich digital content and student mobility that delivers an anywhere, anytime learning experience. Additionally, the entire network can grind to a halt when too many users and too many high-demand applications compete for too little bandwidth.

To meet the rigors of bandwidth demands, networking strategies should embrace comprehensive, end-to-end solutions, such as virtualization, which enable the distribution of resources with a smaller footprint (and lower costs). Strategies should also enable flexibility in quality of service by allowing IT administrators to prioritize network traffic and manage traffic flow.

Keys to a More Efficient Network

As network automation continues to evolve, more vendors will claim to have solutions that can help an organization transition to a virtual infrastructure. Considering the important role the network will play in the evolution of the data center, it is critical that IT administrators in both the K-12 and higher education marketplaces consider the following guidelines when making purchase decisions:

• Seek an open standards-based approach. Many solution providers claim to be open, and many claim to be standards based. It is crucial, however, that the network truly be both. (In particular, beware of vendors that include a number of proprietary features that are “based on standards.”)

• Implement non-blocking, congestion-free architecture. Though it may be more expensive in the short term, over time this approach will minimize the end-to-end latency of traffic flowing across a network. Solutions that are “near non-blocking” or over subscribed could lead to congestion problems that impair application performance.

• Embrace solutions that are hypervisor-, switch- and server-agnostic. Considering the rate of innovation and the reach of virtualization, it’s important the network be able to support any of the hypervisor vendors.

If institutions are not watchful of this factor, they may lose out in choice and flexibility of computing platforms.
Securing Access
Securing the network access layer is a significant challenge, since campuses are often running multiple operating systems on multiple servers, and each operating system has its own unique security issues. IT staff must ensure users accessing the network are using approved security protocols and that data is kept private and safe. They also must make sure that as users come onto the network from a variety of different locations (using different devices), each user gets only the access he or she deserves.

To help secure the access layer and manage access control, networking strategies should incorporate an open, software-driven automation framework that facilitates efficient IT and workload intelligence. IT administrators can leverage this framework to automatically monitor and manage a variety of key network functions, including access control, in real time.

Remaining Compliant
The increase in the number of devices accessing the network also raises issues with compliance. Districts must comply with regulations such as the Children’s Internet Protection Act (CIPA), which mandates that harmful Internet sites be restricted from students under the age of 18, and the Family Educational Rights and Privacy Act (FERPA), which protects students’ personal data.

Higher education institutions also face similar regulations such as the Health Insurance Portability and Accountability Act (HIPAA), which mandates the privacy of protected health information, and the Payment Card Industry Data Security Standard (PCI DSS), which requires certain data security standards be met if colleges and universities accept credit card payments. Lack of compliance may lead to fines and legal actions as well as reputation damage that undermines the trust of students, parents, faculty, staff, local leaders and the public.

New networking strategies help institutions comply with regulations through capabilities such as the automatic provisioning of access rights, so only certain users are granted access to certain information.

Increasing Complexity
Today’s growing demand for anytime, anywhere network access has expanded to include the use of personal mobile devices such as laptops, tablets, smartphones, e-readers and more. It is now common practice for an education institution to plan for students bringing two to three personal devices each to campus. And with more organizations espousing a bring-your-own-device (BYOD) philosophy, network administrators must be ready to support a slew of different devices — which might require additional training and other initiatives down the road.

Managing BYOD Access
The best bring-your-own-device (BYOD) access solutions offer visibility into wireless networks and policy-based control over network security and user access capabilities. Particularly important are capabilities for:

- Managing security and access policies, including guest access
- Allowing authorized users to automatically provision personal mobile devices and to access the network with automatic sign-on
- Ongoing checks of the security posture for user devices and network endpoints
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for the growth you need, when you need it. Additionally, an open network architecture can adapt to new technologies and traffic demands without requiring extensive and costly replacement of infrastructure.

One way many K-12 organizations improve a network affordably is to leverage funds made available through the federally sponsored E-rate program.

This effort, launched in 1996, is the commonly used name for the Schools and Libraries Program of the Universal Service Fund, which is administered by the Universal Service Administrative Company under the direction of the Federal Communications Commission (FCC). The program provides discounts to help schools and libraries purchase telecommunications services, Internet access and networking equipment; discounts for support depend on the level of poverty and the urban or rural status of the population served. They range from 20 to 90 percent of the costs of eligible services.

In mid-2014, “E-rate 2.0” was announced, promising an additional $2 billion in reserve funds for funding years 2015 and 2016 to provide broadband connectivity; this is funding on top of the typical $2.4 billion annual budget for

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Eligible Dell Offerings for E-rate Discounts

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<thead>
<tr>
<th>Dell has a variety of offerings that are eligible for Category 2 E-rate discounts, including:</th>
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<tr>
<td><strong>INTERNAL CONNECTIONS (CATEGORY 2)</strong></td>
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<tr>
<td>• LAN infrastructure: routers, switches, wireless access points; antennas, cabling, connectors; and related components used for internal broadband connections</td>
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<tr>
<td>• Racks</td>
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<tr>
<td>• Wireless controller systems</td>
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<tr>
<td>• Firewall services and components, uninterruptible power supply/battery backup</td>
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<tr>
<td>• Software supporting each of these components</td>
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<tr>
<td>• Caching servers</td>
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<tr>
<td>• Installation services</td>
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<tr>
<td><strong>BASIC MAINTENANCE (CATEGORY 2)</strong></td>
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<tr>
<td>• Repair and upkeep of eligible components</td>
</tr>
<tr>
<td>• Basic technical support</td>
</tr>
<tr>
<td>• Software bug fixes/patches/minor updates</td>
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<td>• Configuration changes</td>
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Automation helps IT staff tackle the issue of increased complexity. Administrators can pre-establish policies regarding disparate devices with different operating systems, and use automation to enforce those policies in any number of ways. They also can securely onboard new devices and quickly identify and resolve problems as they arise. With this capability, ensuring access to network resources or the use of anti-virus and peer-to-peer applications becomes a process that can actually be maintained without much interaction by the user or IT.

Generally speaking, deploying an open approach to networking that allows data to flow freely in all directions, from client to server and server to server, enables networks to do more than ever before, and empowers IT departments to be proactive in the way they monitor and manage the networks themselves.

**Addressing Funding**

Limited budgets present a considerable challenge throughout K-20 education. Because of this reality, sometimes network upgrades are put on hold due to the impression they will cost too much money. Yet it is possible to find solutions that offer the flexibility to build the network incrementally, paying only for the growth you need, when you need it.
the program. In the past, demand for Priority 1 funding had been so high that there had been little to no money left for Priority 2 applicants. The extra $2 billion in funding will change this as it is specifically earmarked for Category 2 (previously Priority 2 services). In addition, thanks to E-rate 2.0, managed Wi-Fi service is now eligible under Category Two for the first time. Due to the new E-rate reforms, the program will be streamlined to make it easier for districts to take advantage of the funding and to release the funding sooner.

Although E-Rate is only applicable to the K-12 space, there are also funding opportunities available for higher education institutions. In late 2013, the U.S. Department of Education awarded $20.1 million to 39 colleges and universities under the Strengthening Institutions Program (SIP). SIP helps postsecondary schools expand their capacity to serve low-income students by providing funds to improve and strengthen their academic quality, institutional management and fiscal stability, as well as build a framework to help students complete college.⁶

**The Benefits of an Open Networking Approach**

In addition to helping education institutions overcome the specific roadblocks mentioned previously, open networking delivers a number of capabilities that yield general benefits for education institutions that adopt the approach. Some of these capabilities and benefits are listed in the table below.

Open networking delivers additional benefits in the world of wireless. For example, managing devices with access points (APs) means better security overall. In addition, taking the time to on-board devices from the beginning translates into easier management and less troubleshooting down the road. Embracing 802.11ac, the latest Wi-Fi technology, supports gigabit speeds, broader coverage range, stronger security and extended battery life for mobile devices.

There are other benefits, too. In general, open networking standards enable academic institutions and organizations to be more flexible and responsive. What’s more, the ability to scale easily with cost-effective switching elements means customers can pay as they go, instead of buying into unnecessary solutions at the outset. As campuses continue to tie new efforts to sustainability, new network technologies can help by using significantly less power, cooling and space.

Finally, open networking is an evolutionary endeavor. This differs from the way in which some vendors make customers commit to

### Capabilities and Benefits of an Open Networking Approach

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<th>Capabilities</th>
<th>Benefits</th>
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<tr>
<td>Anywhere, anytime secure access and delivery</td>
<td>Greater user productivity across the board</td>
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<td>Automatic management of policies and users</td>
<td>More consistent policy application across the network; frees human resources for other tasks</td>
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<tr>
<td>Simplicity</td>
<td>Maximized efficiency and speed for results</td>
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<td>Advanced services, including scoping, training, etc.</td>
<td>Lower operating expenses</td>
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The Dell Approach

Dell’s open networking framework for efficient IT and workload intelligence aims to virtualize, automate and orchestrate networking functions and services. The framework addresses the widest range of traditional, virtual and cloud environments with a comprehensive portfolio of wired and wireless networking solutions.

This framework also supports a choice of networking operating systems (such as from Cumulus Networks) for use on Dell network switches. Software and hardware flexibility helps IT managers reduce costs while improving scalability in the emerging model of software-defined data centers.

In those data centers, feature-rich Top-of-Rack and Blade Switching solutions as well as high-performance 10/40GbE networking fabrics are available to fit your campus and budget. For education institutions, this means complete solutions to mobilize users, desktops and devices securely wherever they may be in the network, meeting the fast-paced needs of education-on-the-go. Throughout, Dell adds advanced management software to help save time and money.

Dell networking solutions take into account the big picture of the education IT operation, crafted specifically to ensure institutions can continue to provide open access in a secure environment. What’s more, representatives from Dell’s Advanced Services team can help campuses optimize issues such as scoping, architecting, training, deployment and maintenance (among others).

Conclusion

After years of operating within the confines of a rigid and inflexible networking paradigm, a new, open and software-defined approach to networking is emerging. This approach is more flexible, allowing data to flow up, down and all around the network to deliver administrators, teachers and students exactly what they want, exactly when they want it. Applied correctly, the open approach to networking can streamline an entire IT operation, providing welcome efficiencies and lower costs. Most importantly, it helps education institutions build up their digital foundations to take advantage of the technological advancements that are revolutionizing learning.

Endnotes

1. Center for Digital Education Smart Infrastructure Survey, 2013
2. Center for Digital Education Classroom Management Survey, 2014
3. Center for Digital Education Smart Infrastructure Survey, 2013
4. Ibid.
5. Ibid.