



INFRASTRUCTURE AND NETWORKING

The Backbone of Educational Technology Programs

As districts develop educational computing initiatives, they have to create a vision and plan for the infrastructure needed to support the program. This infrastructure consists of the technical foundation and support needed to establish and maintain an effective digital learning environment. It includes not just the notebooks used by students and staff but also the networking capacity, servers, storage, and human support. The technical and human infrastructures are critical components for making any technology implementation successful.

VISION

Whether your school or district's vision is to implement a few notebooks or a full-scale one-to-one computing program, it's important to work with key stakeholders to agree on the short and long-term vision for your technology program. Identifying what you are trying to achieve and why it's important will help you align your tactical plan with specific details and timelines.

As you determine your vision, the stakeholders will represent all of the perspectives of your learning environment—high-level IT decision makers, administrators, instructional technologists, teachers, school board members, and students. All bring important points of view to the vision and planning process. With all voices considered, you are more likely to garner support throughout the planning and implementation process. You will also be able to articulate your vision and goals more clearly and concisely.

PLAN

This planning team should determine the overall expectations for technology in the classrooms, administrative offices and across the school or district overall. The technology must support the vision, which means that planners should establish the process and timetable for acquiring, deploying, and providing access to technology for intended users. They should plan strategies for implementing technology to meet classroom and administrative needs and that support the organization's overall vision.

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- Anytime, Anywhere Learning
- Security
- Money Matters
- Educational Technology Leadership
- 21st Century Learning and Assessment
- Professional Development
- Strategic Data Management & Decision Support
- Mobility Solutions
- New Tools for Learning

For more information, go to

<http://www.techlearning.com/K12/Fundamentals>

<http://www.guide2digitallearning.com>

Elements of Infrastructure Planning

- Establish clear goals and a realistic strategy for using technology to improve instruction and administration in the education organization.
- Assess the hardware, software, networking, human resources, and financial resources needed to improve education and administrative services.
- Provide for a sufficient budget and schedule to acquire, maintain, and secure the hardware, software and related issues (e.g., training) that will be needed to implement the strategy.
- Strategize to accommodate the evolutionary issue of security.
- Address interoperability and flexibility by making sure the deployment adheres to industry standards, not a sole source solution.
- Create a professional development strategy to ensure staff members know how to use these new technologies.
- Establish an evaluation process that enables the organization to monitor progress toward the specified goals, and make midcourse corrections in response to new developments and opportunities as they arise.

Case Study, School District of Hillsborough County: To standardize and update the district's technology, decision makers needed to evaluate equipment purchases on the basis of the total cost of ownership. At the same time, they wanted a greater return on investment from what they were purchasing and committing to, not just on the dollar volume, but value from a relationship with one vendor and the value-add that it can bring.

Chief Information and Technology Officer Jack Davis says, "Under our partnership with HP, the standardization of devices throughout the School District has meant our teachers can remain focused on educating students, and our IT staff has been able to train quickly and comprehensively, making it highly successful at maintaining the availability of the technology."

Analyzing the existing situation is the first step. It should focus on assessing the capacity and limitations of the current infrastructure, staff, and funds available for immediate and sustainable long-term growth. A team should explore and evaluate current technical and networking resources. It should consider the new program's educational and administrative goals to determine if the capabilities and capacity of the old infrastructure are sufficient to meet these requirements and are capable of easy expansion to address future needs.

The infrastructure solution must meet the intended goals; thus doing a needs assessment is a second and concurrent step. This assessment should consider what demands on the technological and support infrastructure will emerge with the addition of new equipment, new administrative mandates, and new classroom models. Another consideration is the refresh rate or lifecycle of technology. Demands grow and capacities need to be enhanced and sustainable over time.

BUDGET

Building the infrastructure well is an initial investment that pays off in lowered costs over time. Initially, decisions must address the vision of educational goals, the current infrastructure's capacity, network scalability and maintenance, future needs, and the staff support required to create, maintain, and expand support services. In addition, assessments should include at least interoperability with legacy systems, ongoing access control and data security costs and efforts, simplicity to deploy and manage, and flexibility to address future changes to follow industry standards. This infrastructure will consume the largest portion of a project's initial budget, although it may end up being a small portion of the Total Cost of Ownership (TCO).

It is important to address 5 years into the future when calculating an ROI/TCO. Often the first year or two are not enough, especially in the K-12 environment where systems and solutions must last a minimum of 5 years and often are not replaced for ten or more. This is critical when putting long term plans together since it is often the operational costs that strangle a district's budget. Issues to be addressed in putting this together should include maintenance, management and training, warranties, software licenses or seat licenses, training, and ongoing security costs.

Understanding the full range of costs associated with technology assists school leaders in budgeting for the future. In order to plan for technology and change, districts should evaluate the Total Cost of Ownership, factoring in direct costs such as support, training, and management; indirect costs like downtime; and hidden costs incurred when teachers, staff, and office personnel must manage and support the equipment on their own. Only by evaluating all of the components of technology programs can a district determine the real costs. The Consortium for School Networking offers a free, online tool to determine Total Cost of Ownership for technology. You can access the tool, along with background information and case studies at http://classroomtco.cosn.org/gartner_intro.html.

"Collier County Public School District, and every student within it, has benefited enormously from the standardization on HP solutions at all layers of our infrastructure. We have been able to centralize our business operations and simplify core functions and deliver an integrated, simple to maintain environment in which all students have equal access to the latest technology."

*—Dr. Russell Clukey, Executive Director of Technology
Collier County Public School District*

Since 1997, schools have received discounted telecommunications services based on economic need and location (urban or rural) through the federal E-rate program. Discounts can be applied to commercially available telecommunications services, Internet access, and internal connections. Eligible services range from basic local and long distance phone services and Internet access services, to acquisition and installation of

equipment to provide internal connections. Because of this program, many districts are able to leverage costs to provide a robust networking infrastructure that sustains educational and administrative services and reduces both initial and long-term costs.

Solutions

SERVER

A server, including the device itself and its operating system, provides services for connected clients as part of a client-server architecture. Services can include database access, file transfer, remote access or resources such as file space over a network connection. It is designed to perform these tasks, often for extended periods of time with minimal human direction. Examples include file servers, web servers, and e-mail servers. Blade servers are self-contained computer servers, designed for high density, space, power and other considerations.

“This project of replacing our whole network has progressed as seamlessly as possible. We look forward to putting our ProCurve equipment to work to help us stay at the cutting edge of using IT to improve education.”

- David Kessler, Manager of Network Infrastructure and Operations,
Columbia Public School District

STORAGE

Districts also have to decide on storage capacity and determine how much space is needed for organizing and maintaining digital files and the capacity to find and access data. While small file systems can use a data storage device such as a CD-ROM or DVD, schools and districts have a large volume of files that require more space and more permanent storage capacity. Storage must protect data reliably, simply, and easily because a school district needs dependable backup.

DATA WAREHOUSE

A data warehouse is a repository of an organization’s electronically stored data that provides the means to load, retrieve and analyze data for reporting. Whether it is a collection of simple relational databases or massive containers with ongoing transactional data, data warehouses are structured to facilitate data collection, management, querying and reporting for decision making. Today, accountability demands mandate data-driven decision-making, which requires the capabilities of data warehousing.

NETWORKING

Networks in school districts have to be robust in order to provide reliable access, easy management, simple deployment, cost-effective connectivity, standards-based platforms, future-proof investment, and expert support services. Ideally schools need a unified network strategy—one that combines all resources onto the same unified platform that can be hardened to assure safety and reliability while making ongoing management simple and cost effective.

Case Study, Columbia Public School District:

With more than 17,000 K-12 students and about 1,400 teachers spread across 30 schools—and with high standards of educational excellence—the district represents a significant IT challenge. They have a server farm with 87 HP servers that provide storage and deliver applications to the desktops of students, teachers and staff.

A long-time user of ProCurve Networking products, Columbia Public Schools recently upgraded its network and added ProCurve Switch 8212zl core switches at each of its school buildings. The district’s IT department now offers a 10 Gbit distributed network to every school, for streaming audio and video content securely to teachers, deploying a wireless network and providing all voice/phone traffic over the network. As a result, Columbia Public Schools is able to expand its educational capabilities while also reducing operating costs.

The Digital District

With access to individual notebooks and the Internet, students are able to learn in an environment where information is readily available, where they can own their learning structures, and where they are so engaged that learning becomes meaningful. Reports from districts that have technology programs indicate higher attendance rates, increased engagement, and improved writing skills. The infrastructure should support the goals and priorities of the district and address the need for access control to meet child information protection guidelines.

Administrative Goals

- Improve administrative computing capacity and efficiency.
- Maximize total cost of ownership and technology value.
- Align instructional and operational use of technology.
- Take advantage of the latest technologies and best practices.

Technology Goals

- Use a variety of technology tools in effective ways to increase productivity.
- Use communication tools to reach out to the world beyond the classroom and communicate ideas in powerful ways.
- Use technology effectively to access, evaluate, process, and synthesize information from a variety of sources.
- Use technology to identify and solve complex problems in real-world contexts.

Learning Goals

- Integrate technology into curriculum.
- Improve student achievement.
- Improve student communication skills.
- Provide access to research, learning materials, and the tools to apply what they have learned.
- Improve student collaboration skills.
- Help students acquire critical-thinking skills.

IT Goals

- Ability to manage data easily and cost-effectively.
- Standardization of hardware and software.
- Built-in application and information security.
- Centralized maintenance and upgrades.
- Flexible, scalable, secure wireless.
- E-mail and messaging capacities.
- Reduced IT complexity.
- Improved economies of scale.
- Better return on IT investment.



Plans should address wired and wireless networking from core to distribution to edge and the capacity to address such applications as time of day and types of traffic. In addition, networks should have the flexibility to address the evolving needs of applications, devices, and modalities; access control for staff, faculty, students, visitors, and the community; content filtering; and converged applications such as VoIP, video, Internet, collaborative learning, and others.

Wireless technologies have seen explosive growth in K-12 schools, which are choosing Wireless Local Area Networks (WLANs) that permit students and teachers to connect with Internet-equipped wireless laptops or roll mobile computer carts from one classroom to another in order to take advantage of the benefits of wireless access in the classroom setting. Students can have true anytime, anywhere access across campus with wireless Internet connections in the classroom that enhance collaboration across the district for students, teachers and administrators.

Today's districts have to build effective communities of learners, equipping them with the most advanced technologies and cost-effective solutions. Security, convergence and high-performance networks all help students reach their potential.

In a community of increasingly sophisticated technology users, reliability and ease of use and management are more critical than ever. Administrators, instructors, students, and families require consistent, anytime and anywhere access to each other and to learning resources.

These considerations will help you reach the goal of building a robust infrastructure to support the community of learners in your school district.

COST EFFECTIVENESS

Just as collaboration among parents, teachers, administrators, and students is critical to developing proficiency in the presentation and application of information, a school network must be integrated and interoperable. For increased return on investment, schools must carefully plan how to increase efficiencies, productivity, and access to online learning resources.

An infrastructure design should consider how to manage evolving capabilities and assure a solid return on investment. To stretch limited budgets while delivering strong educational returns on public expenditures, enhancements to a district's technology plan must be integrated and focused on creating unified district architecture. It must eliminate inefficiencies in management solutions, training, hardware components, power and cooling, maintenance and warranties and software seat licenses and upgrades.

CAPACITY

To meet the considerable demands of technology-based learning and administration dependencies on real-time data, K-12 educational networks must be reliable, flexible, and robust. To handle the realities of 21st century communications, these networks must also provide security and mobility without jeopardizing performance. And to continue to meet evolving needs cost-effectively, a school's network must allow for practical scalability that is able to support all users during critical school hours and provide performance that enables students and teachers to have the high-speed access they need to be successful.

CONVERGENCE

For schools around the world, converged network infrastructures demonstrate their cost-saving and efficiency-enhancing benefits everyday. By leveraging existing cabling and management resources, by eliminating the need for many out-sourced services, and by offering built-in productivity tools, they save money and facilitate collaboration. In addition, built with interoperability and deployment flexibility in mind, the right convergence solutions such as integrating voice and data whether it is wired or wireless can overlay existing network installations.

SECURITY

Schools are looking for ways to both physically protect their students and faculty and ensure the confidentiality of their networked resources. As their IT staffs research options, they are learning that secure converged networks provide high-performance and high-value solutions. Because networks are only as secure as their weakest access link, network protection should be integrated into all components and be standards-based.