# K-12 and the Cloud

## A catalyst for transformational change

White paper

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Everybody On

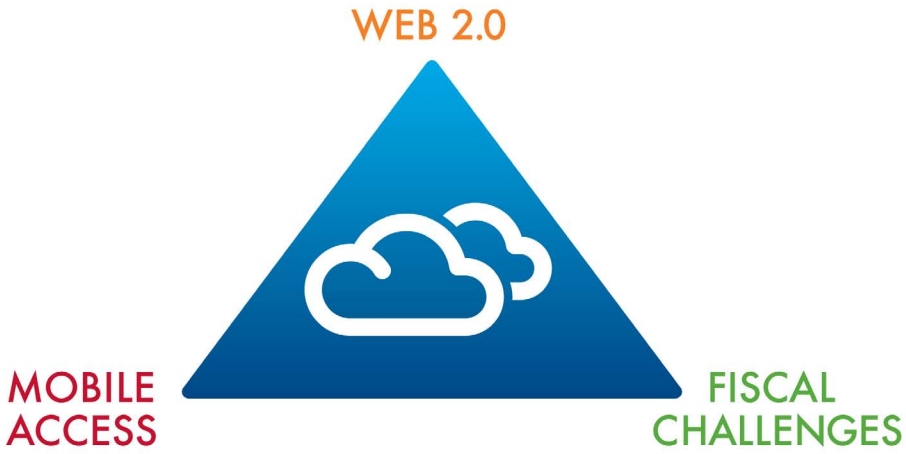
# Executive summary

You've seen the benefits that technology brings to education, not only for teaching and learning but also for management and administration. Yet given today's troubled economy, chances are you're also concerned about the cost. As applications proliferate, how will you keep up with the constant need to replace or upgrade software, servers and high-performance desktops and notebooks? Maybe it's time to consider moving some or all of your district's computing to the cloud. Cloud computing offers an easy and cost-effective way to realize all the benefits that technology in education brings to K-12 classrooms while deriving the greatest value from your district's IT budget.

# Drivers

## Precipitators of change

Cloud computing is poised to rain down a welcome storm of change on K-12 education—providing easy, low-cost access to more resources for teaching and learning, enabling educators and administrators to work and collaborate more productively than ever and dramatically reducing K-12 districts' IT costs. Several developments in recent years have created just the right conditions for this shift away from traditional client/server computing environments in K-12 and toward a new, network-based model for technology in education.




### Mobile access: A worldwide explosion of mobile devices

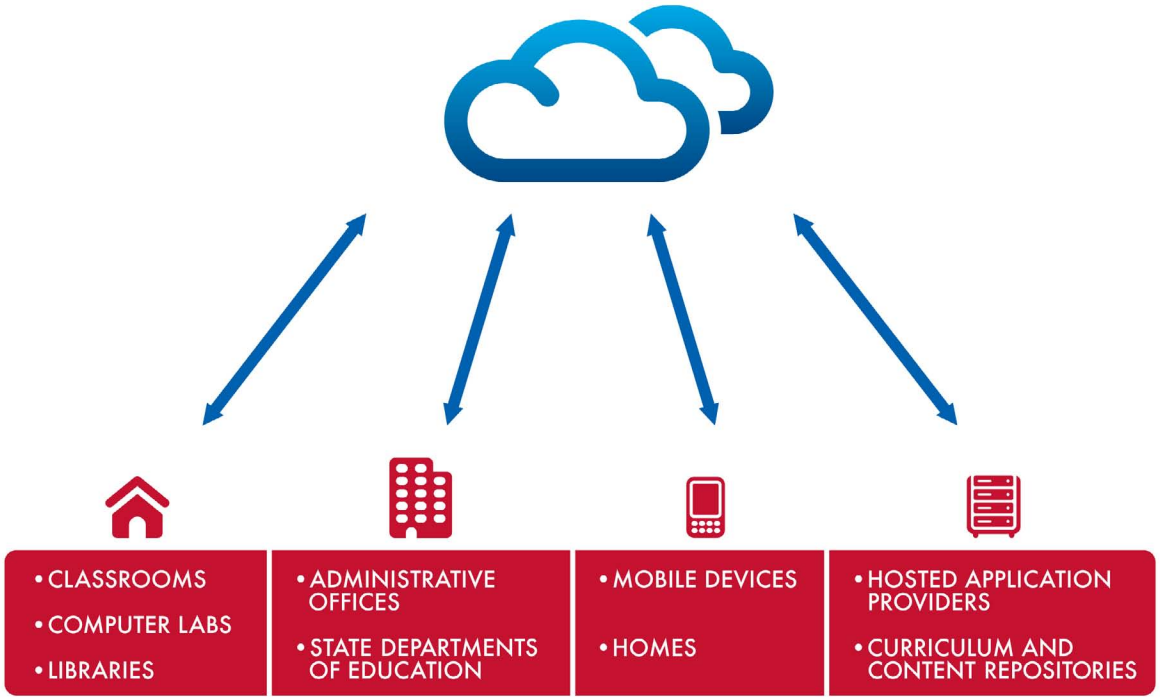
In March 2011, market researchers reported that there were 5.3 billion mobile subscribers in the world—the equivalent of 77% of the world's population – and that sales of mobile devices, most notably smartphones, rose in 2010.[1] In the U.S. specifically, and looking at the K-12 population in particular, it's been reported that 83% of teens use cell phones, as do a significant number of younger people within the K-12 age group.[2] Clearly, mobile devices are increasingly becoming part of the fabric of everyday life. This development dovetails with one of the most notable characteristics of cloud computing: the ability to easily access technology resources using virtually any device that's equipped with a web browser—including most mobile devices—rather than having to rely exclusively on access to traditional desktop or notebook computers and software programs.

### Web 2.0: The perfect climate

The cloud is still a relatively new phenomenon for education. But many school districts have already paved the way for K-12 environments to move to the cloud, through their extensive use of Web 2.0 applications for learning, curriculum management and professional development, as described on p. 5 of this paper. Because they "live" on the Web, these applications don't take up valuable space on school or district servers, and they don't require the extensive, costly licensing that server-based applications do. Applications in the cloud take the advantage one step further, because users can also save the work they do to the cloud—rather than to a particular desktop or notebook hard drive—and then securely retrieve it later from any browser-equipped device. The investment community is also taking notice of this trend, funding educational technology companies to the tune of $177 million in 2010.[3]

## Fiscal challenges: Dealing with an economic drought

School districts everywhere in the U.S. have been hit hard recently by difficult economic times. This sets up a perfect opportunity to take advantage of the cost-savings benefits that cloud computing offers. As explained on p. 6, cloud computing has the potential to significantly reduce IT costs for hardware (such as servers, desktop and laptop systems, and storage hardware) and software (operating systems and applications), because resources can be located centrally in the cloud, where they're shared among users who can access them from anywhere using any device with Internet access. The savings also extend to reducing the need to rely entirely on traditional learning resources like textbooks, which must be purchased and distributed at significant cost. The financial benefits of cloud computing are becoming available to K-12 environments at the exact time that they are needed most.




### CLOUD BASICS I

Cloud computing is evolving all the time, and so is the way it's defined. But one definition that seems to resonate with many technology-industry observers is the one from the National Institute of Standards and Technology, which defines cloud computing as:

> *"a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction."*[4]

That's pretty abstract, so let's break it down:

- *Shared pool of resources* means the hardware and software that you use every day reside in a centrally located "cloud" whose resources are shared by users.
- *Convenient, on-demand network access* means you can have access to these resources whenever you need them, through an ordinary browser.
- *Minimal management effort or service provider interaction* means that you can easily get instant, portal-based access to off-site resources without IT assistance.

These characteristics can make access to resources much more efficient and cost-effective than the traditional client/server, desktop-based model. You'll see a number of examples of how cloud computing is working for K-12 throughout this paper.

# Transformations

## From how students learn, to how districts work

As a new paradigm for access to technology, the cloud empowers all members of the learning community. The cloud delivers a multitude of new tools that enhance the teaching and learning process and promote increased collaboration and productivity in the classroom and beyond.

### Opportunities for teaching and learning: The sky's the limit

The quest for ubiquitous access to technology in education has reached a turning point with the emergence of cloud computing. The cloud is part of a larger technology phenomenon that takes advantage of mobility and Web 2.0 to pave the way for improved educational experiences.

*The mobile explosion.* Writing in the Jacksonville Examiner, one chronicler of K-12 trends recently listed the increasing presence of tablet computers, smartphones and other mobile devices in the classroom at the top of the ten latest e-learning trends in K-12.[5] And the 2011 Horizon Report on emerging technologies in education asserts that "mobiles continue to merit close attention as an emerging technology for teaching and learning," projecting a one- year-or-less horizon for time-to-adoption.[6] With their ability to provide access to the cloud from any web browser, the explosion of mobile devices today is making new, cloud-based opportunities for teaching and learning more accessible than ever before.

*Expanded avenues of access.* Another technology development that coincides with the rise of the cloud is the emergence of affordable, accessible hardware for classrooms, labs and other locations where learning takes place. Because the cloud moves software applications out of their traditional home on the desktop or laptop, the computers that are used to access them no longer have to have the expensive processing power and memory that applications ordinarily require. As a result, netbooks and thin clients are looking increasingly attractive to budget-challenged districts. These streamlined alternatives to traditional notebook computers strip away unneeded processing and storage capabilities to simply offer access to the Internet and to networked applications. In fact, any computer can be used to access the cloud, including older computers whose useful lifecycles were previously limited by the need to upgrade to more powerful processors and more memory.

*Paving the way with Web 2.0.* Many districts are already making extensive use of Web 2.0 applications. Students now have access to Web 2.0 applications for writing papers, creating presentations and incorporating digital images into their work. Teachers also have a variety of applications available to them for lesson planning and course development. At the administrative level, there are applications for student-data analysis, online testing and district administration. The most visible change to end users is that instead of saving their work to a server, or to their computer's desktop, they can save their work to the cloud. So rather than being tied to—and limited by—one particular computer, users can connect to the cloud from any browser-equipped device, anytime they're ready to resume work.

*Breaking down barriers.* A welcome consequence of enabling access to teaching and learning technology anywhere, anytime is that it creates new opportunities for teachers and students. For example, in one low-income school district, it has meant that students no longer have to struggle with programs being inaccessible to them when they're away from school.[7] In districts where

budget cuts have limited the number of teachers available in specialized classes such as foreign languages and advanced placement, access to the cloud means teachers can more easily transport the learning experience to wherever students need it. Shared online resources can also give students the ability to "visit" people and places around the world, no matter where they are, as part of the new technology-enriched educational experience.

## Effecting institutional change: On the horizon

Cloud computing represents a tremendous force for positive change not just in teaching and learning, but also in making decisions and taking action to improve the educational experience in every way. In the cloud, where there are no location-based limitations on sharing and collaborating, educators, administrators and IT professionals are beginning to find more ways to work together.

*Building bridges.* Historically, IT and non-IT professionals in education have worked mainly as independent entities, but this is changing as technology continues to play an increasing role in teaching and learning. It's not unusual now for educational technology and IT professionals to work together as part of the same group. Cloud computing can facilitate this shift and foster strong working relationships between the two by creating collaborative environments in the cloud.

*Sharing information.* Teachers and administrators frequently share concerns, goals and responsibilities for areas such as student attendance, achievement and academic growth. But they have not traditionally been able to easily share resources and data in the interest of working together to accomplish those goals. Cloud computing increases the availability of records and data, enabling these groups to share student information through browser-based, collaborative access from any location without having to use any particular computer.

*Connecting beyond the district.* Enabling positive changes in how people work together within school districts is a great benefit of the cloud, but it's not the only one. Another advantage is that it makes it easy to collaborate beyond the district, using browser-accessible technologies ranging from simple web-based collaboration tools to entire virtual worlds—all easily available without having to maintain any of the software or work files on their own servers or computers. This gives teachers, administrators and IT professionals alike new freedom to leverage the experience and perspective of their peers and other professionals and colleagues from around the world.

## Recalculating the economic equation: Savings in the forecast

One of the greatest benefits of cloud computing in K-12 education is the potential for cost savings—especially in a time of extreme economic challenge. School districts everywhere are asking themselves how to save dollars, identify fresh sources of funding and juggle budgets to do more with less. Cloud computing can help in many ways.

*Ongoing IT savings.* Hosting applications in the cloud can reduce a district's IT costs for both hardware and software. The "heavy lifting" of computer processing is done in the cloud, reducing the need to invest in fully loaded desktop and notebook systems. Teachers and students can access resources from any browser-equipped device, opening the door to lower-cost alternatives like netbooks, tablets and even smartphones.

*Longer technology lifecycles.* Regardless of what type of device provides access, that device's useful life will be extended since it doesn't have to be constantly upgraded or replaced to keep pace with the growing processing and memory requirements of increasingly demanding applications. In addition, the software is also hosted in the cloud, eliminating typical licensing and maintenance costs in favor of pay-as-you-go, usage-based licensing arrangements. And the work that students create—which today often includes large, data-intensive photo and video files—can also be stored in the cloud, reducing the need for large individual hard drives.

*Other savings.* Beyond the hardware and software cost savings, teaching and learning in the cloud can reduce other costs. When instructional resources can be readily shared, they don't have to be reproduced for every student in every class. It also stands to reason that there will be less need for printing—and therefore lower expenses for paper and ink—when teachers and students have more access to resources other than traditional, printer-connected desktop or notebook computers. (In addition, it's faster, easier and more efficient to distribute homework and collect assignments when students do the work online instead of on paper.)

*Resource reallocation.* Cloud-related savings can also lead to opportunities to find more efficient and productive ways to use budget dollars. Districts and schools can take money once reserved for everything from reproducing handouts and worksheets, to buying wall maps and other reference tools, and redirect those dollars to investments in digital resources. These resources can be far less costly than traditional resources, particularly when they are accessible as software services through the cloud.

# Preparations

## Putting the right foundation in place

Any district that is considering a cloud computing strategy should address the following three key areas as part of its preliminary planning activities. Your cloud provider will be an invaluable resource in this process, either providing the services to you directly or working with other technology partners in a coordinated effort.

### 1. Technology infrastructure: The right environment for success

Investing in the appropriate technology infrastructure will ensure that your district is able to reap the full benefits of cloud computing. Addressing the following areas will provide a solid foundation for building a private cloud (see "Private cloud? Public cloud? What's the difference?" on the left) to serve your district.

*Network bandwidth* must be sufficient to support moving large amounts of data back and forth wirelessly between access devices and applications and data on servers. You'll need a robust, preferably fiber-based, network infrastructure that is capable of supporting near-constant data movement from access device to data center to network backbone. If you don't already have this infrastructure, keep in mind that you'll need to invest in it ultimately anyway—whether you build a cloud or not—as district Internet usage continues to increase in virtually every aspect of K-12 education.

*Internet connectivity* must be provided through a reliable, high-speed connection that supports fast response times when users connect to the applications they need. Users should be able to expect the same rapid response when they connect to a word processing or presentation-creation program in the cloud that they get when they connect to those same programs on a powerful desktop or notebook computer.

*Single sign-on portal* is a capability that facilitates cloud computing by enabling users to quickly and easily access multiple resources in the cloud without having to use different login screens or credentials to get to them. It's essential to delivering the ease of access that users expect from cloud computing.

*Technical support* requirements will shift when you move into the cloud, because you'll no longer need to manually distribute software and upgrades to each individual computer throughout the district or frequently upgrade to new systems with more processing power and memory. Instead, most of your support needs will be related to the servers in the cloud that house all your applications and data. Even so, these needs will be minimized by server virtualization in the cloud—a technology that allows you to replicate the capabilities of a few servers to deliver the processing power of many. Fewer servers means lower support requirements.

*Learning Management System (LMS)* software is a critical consideration for districts looking to migrate to cloud computing and the promise of anytime-anywhere access. A good LMS is the program that serves as the access point for everything from online coursework, to homework assignments, to study groups—whether a student is at school, home, library or anywhere else.

**PRIVATE CLOUD? PUBLIC CLOUD? WHAT'S THE DIFFERENCE?**

Cloud computing can take the form of:

- A private cloud, owned and operated for one district's exclusive use
- A public cloud, operated by a third party to provide cloud services to multiple organizations
- A community cloud, shared by several organizations that have common concerns
- A hybrid cloud that brings together two or more clouds of any kind

A private cloud is a good choice if it's important to you to control your network infrastructure and how it grows and scales over time. (You can maintain this control while minimizing the time and resources required to run the cloud by having your cloud provider manage it for you.)

A private cloud is also a good choice if you have strong concerns about the security of a cloud infrastructure that exists beyond your district's firewalls.

School districts interested in cloud computing are typically most interested in a hybrid model where they can take advantage of the best attributes of both private and public clouds.

When designing a hybrid cloud environment, consider integrating a single sign-on portal that simplifies the user experience for administrators, faculty and students.

## 2. Security and privacy: Shelter from the storm

Cloud computing security is of particular concern to school districts, which maintain a variety of confidential information about students ranging from academic records to health information. As the caretakers of this sensitive data, districts are required to comply with regulations governing the security of private information, such as the Family Educational Rights and Privacy Act (FERPA) and the Heath Insurance Portability and Accountability Act (HIPAA) that specifically applies to the privacy of health records.

Even if you're not going to migrate all the confidential data you maintain to the cloud, the prospect of keeping any of it in a separate environment that exists beyond the district's traditional IT security perimeter may seem extremely risky. But with the proper precautions, operating in the cloud can be extremely secure. In fact, in one case that was recently described in a cloud-related whitepaper, a university "found that cloud computing actually helped strengthen security and improve protection against viruses, resulting in 66% reduction in calls to the IT department."[8]

That's not to say there's no reason for concern; rather, it's to stress the importance of choosing a provider or providers of cloud hardware and software that offer the following capabilities and characteristics.

- *Integration* with security and identity management technologies you may already have in place
- *User authentication* using proven cryptographic methods
- *Privacy capabilities* including data encryption, data anonymization and mobile location privacy
- *Single sign-on login* capability to eliminate the need for users to write down multiple user names and passwords
- *Access protection* to prevent third parties from accessing data
- *Secure cloud-based data backup and storage*

In addition, your technology provider or providers should demonstrate leadership in ongoing efforts to improve security, such as operating their own cloud-security research labs and working closely with non-commercial organizations that are dedicated to promoting cloud security, such as the Cloud Security Alliance and its affiliate members.

## 3. Cultural transitions: Weathering the winds of change

Cloud computing represents a major change that has the potential to bring many important benefits to school districts. But to fully reap these benefits, it's important to carefully manage that change, particularly with respect to helping people learn to adapt to it and use it to their advantage. As one observer has pointed out, moving to the cloud is not just a technology buy-in, it's a cultural change.[9] Educating users about its benefits and ensuring appropriate training is a critical step in making it a successful move.

*What to do.* One of the main things that will benefit teachers and administrators is to learn more about how to smoothly integrate the cloud with what they're doing already—for example, how to take advantage of the expanded opportunities for sharing and collaboration that are available in the cloud. Learning about this and other new ways of teaching, learning and working together can take the form of professional development classes, attendance at professional conferences, and ongoing training and support.

*Where to get help*. Sources of training and support include:

- District professional-development planner
- District IT training team
- Online professional learning networks
- Planning and professional development workshops and services from your cloud provider or other technology provider

## Conclusion

Moving to the cloud can improve the K-12 education experience from the classroom to the superintendent's office. Cloud computing can make high-quality online resources available to more students anywhere, anytime. It can transform mobile devices from distractions into learning tools, and can help teachers to empower students through compelling projects such as digital storytelling and multi-media presentations. Moving to the cloud can facilitate web-based collaboration and information sharing among administrators, educators and IT professionals, both inside and outside the district.

However, migrating to the cloud can also pose some challenges. Districts must consider everything from network infrastructure to user training to information security. HP is here to help, with the technology and services to help make a smooth, effective transition. Make sure you realize all the benefits of this rapidly evolving technology; contact us today.

# About HP for education

## Why HP for K-12

Outside of school, students are harnessing the power of technology to enrich their day-to-day lives. In the classroom, using technology resources is essential to prepare them for their real lives of higher education, internships and the 21st century workforce. Students need technology-based, digital learning environments so that education is engaging, relevant and reflects 21st century skills. Schools need these technology tools to remain effective and relevant. Working with our partners, HP has designed a portfolio of digital learning solutions, including cloud solutions, to give districts the technology tools they need to help prepare students for success.

## Why HP and Microsoft for cloud computing

HP has long been a leader in providing technologies for a lifetime of education. Now we've taken our commitment to the cloud, partnering with other industry leaders like Microsoft®, to deliver a turnkey solution. HP SchoolCloud puts the entire package together to help your school or district create its own private cloud computing environment. That includes servers, access devices, software, a virtual instructional desktop, storage and professional development for teachers. SchoolCloud comes fully integrated with LaunchPad™ by ClassLink, the first cloud-based instructional desktop (CBID) designed specifically for the K-12 market. HP proudly partners with Microsoft to provide schools with the comprehensive, education-based solutions they need. Connecting and collaborating can be easier than ever, thanks to the powerful combination of Windows 7, Microsoft Office 2010, Windows Live Essentials, Live@edu and Office 365 for Education. These easy-to-use tools can help students and educators stay connected from virtually anywhere, so they can communicate more clearly and bring ideas to life more quickly.

# For more information

To read more about HP cloud technology for K-12, please visit:
**www.hp.com/go/schoolcloud**

# Notes

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8 “Cloud computing in education: Savings, flexibility, and choice for IT,” A Microsoft U.S. Education white paper, April 2010, http://www.microsoft.com/educloud

9 “When K-12 Moves to the Cloud,” ReadWriteWeb, August 24, 2010, http://www.readwriteweb.com/cloud/2010/08/when-k-12-moves-to-the-cloud.php

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