

By Doug Johnson

Computing in the Clouds

Is there a storm looming on your school's budgetary horizon? Cloud computing may offer a silver lining.

Teachers and administrators for grades K–12, pay attention: The program I used to write this article and the place I stored it may be just as important as the content you'll read in it.

Why would you care how I handle my files? Because following my example may save you time and money. Consider these facts:

- I wrote this article without the aid of word processing software loaded on my computer.
- I used several computers in several locations to write this article without using a flashdrive to move the file.
- I shared this article with the editors of *L&L* without attaching it to an e-mail.
- I saved my electronic draft in a place where I will have access to the content, even if my laptop is lost, the external hard drive where I keep my backups fails, and the new version of Microsoft Office refuses to open my file format.
- And I am doing all of these things at no cost.

How did I do it? I used the cloud.

Chances are, you have too. Have you ever used a Web-based e-mail program? How about an online photo-editing tool? Or maybe you've been invited to collaborate on a wiki or on Google Docs, a set of online productivity tools that allows the creation of documents, spreadsheets, presentations, and surveys. All of these use cloud computing.

For schools, this may be very good news, and not a moment too soon. Cloud computing, you see, has the potential to offer staff and students better services at a lower cost than the technology deployment models they're using now. And saving money and improving efficiencies are two areas where schools can use all the help they can get.

Silver Linings

The term *cloud computing* originated from the cloud metaphor and graphic that often represent the Internet on network diagrams, because cloud computing relies on applications and file storage that reside on a network—either a local-area network, a district intranet, or the Internet itself.

This offers several real advantages. Because the files and the programs are all stored elsewhere, your local computer doesn't have to hold much on its hard drive, so it can run faster or be smaller. And you can work on any project, anywhere, no matter what

computer you're using. If you're on a computer with Internet access—whether it is on your desk at school, on your lap at home, in any computer lab or coffee shop in the world, or at Grandpa's house—you can work without worrying about transporting files on flashdrives, keeping track of the latest version of a document, or having the right software to open a file. You can easily share and collaboratively edit your files with others in a cloud-based application, such as a wiki or Google Docs, as well.

Unlike most software that resides on computer hard drives, Web-based applications that perform a wide array of productivity tasks are free. These tools may not be as comprehensive as Office or Adobe Photoshop, but they often have surprisingly full feature sets and are compatible with standard programs.



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interchangeable, so if a device needs repair or is left at home, you can easily substitute another machine. The only applications a student needs to keep on a netbook are a full-fledged Web browser and antivirus and spyware programs.

I predict that K–12 schools will at some point ask parents to provide basic

computing devices for their children as a part of the school supply list. As a parent, I was asked to purchase a \$100 graphing calculator when my son was in high school six years ago. How big a stretch is it to ask parents to provide a \$250 netbook computer today?

Living in the Cloud

Before advocating for cloud computing for my staff and students, I decided to see if I could “live in the cloud” as a computer user myself for the past few months. I have found that the move hasn't been all that difficult, even for a geezer like me. Here's how I moved my tasks to the cloud:

Computer. Rather than using a full-scale laptop computer, I've been using a 10-inch ASUS 1000HA netbook that cost about \$350. The smaller keyboard and screen size took some getting used to, but now I can work on the computer for long periods of time. The speed is acceptable, the battery life is good, and the wireless connectivity is fast.

E-mail. Both my school's Microsoft Exchange system and my personal Gmail accounts already have robust online e-mail clients. My biggest challenge has been moving all my saved e-mail from my hard drive–based Entourage/Outlook client to my online Gmail account, and then tagging all that old e-mail so I can find it again. (I have a folder mind, not a tag mind, I'm afraid.)

Web searching and bookmarking. I already have a delicious.com account, so I just imported the bookmarks I had saved in my browser.

Word processing, presentations, and spreadsheets. After years of using Office, the move to Google Docs for my day-to-day productivity has been surprisingly easy. In fact, getting away from Office's “feature creep” has been refreshing. However, although Docs is fine for writing short pieces, it's not practical for writing a book. But how many of your students will be writing books?

The presentation program lacks animation, transitions, and in-program image editing, but for 95% of my work and for storing my files, Google Docs works just fine, thank you. And all the work I create in Docs is compatible with Microsoft Office and Open Office.

Photo storage and editing. I've been storing my best photographs on a commercial storage site for years and editing them with Photoshop Elements. But Flickr and Picasa are free online applications that work well for this amateur's editing and storage needs. Picasa gives iPhoto a run for its money as a photo organizer, and

Cloud computing also makes it possible to use less-powerful computers, such as netbooks (see “Netbooks: Back to the Basics” on page 20). A school district can lower its computing costs by using these inexpensive computers to access the cloud. The savings just accumulate from there, as cloud computing's file storage and basic applications are free. Schools can reallocate money from student workstations in labs, big file servers, and expensive software to pay for increased bandwidth, greater wireless coverage, or—maybe, just maybe—smaller class sizes. That's why many U.S. colleges, universities, and K–12 school districts are already working in the cloud.

Cloud computing makes one-to-one laptop programs much more feasible. With a low-cost netbook and the cloud, student computers are virtually

Cloud Computing Glossary

Like all technologies, cloud computing comes with a bevy of new vocabulary words to learn. Here are a few to get you started:

Application service provider (ASP): Company that offers individuals or enterprises access over the Internet to applications and related services that would otherwise have to be located on their own personal or enterprise computers.

Fat client: Networked computer with most resources installed locally rather than distributed over a network. Most personal computers are fat clients because they have their own hard drives, CD/DVD drives, software applications, and so on. This is also called a *thick client*. (See *thin client* below.)

Hybrid cloud: Environment in which an organization provides and manages some resources in-house and has others provided externally. For example, a school might use a public cloud service for general computing but store student data on its own private server.

Infrastructure as a service (IaaS): A provision model in which an organization outsources the equipment used to support operations, including storage, hardware, servers, and networking components. The service provider owns the equipment and is responsible for housing, running, and maintaining it, and the client typically pays on a per-use basis.

On-demand (OD) computing: Enterprise model in which computing resources are made available to the user as needed. The resources may be maintained within the user's organization or made available by a service provider.

Platform as a service (PaaS): A paradigm for delivering operating systems and associated services over the Internet without downloads or installation. This is sometimes called *cloudware*.

Private cloud: Proprietary computing architecture that provides hosted services to a limited number of people behind a firewall. This is also called an *internal cloud* or a *corporate cloud*.

Public cloud: System in which a service provider makes resources, such as applications and storage, available to the general public over the Internet. Public cloud services may be free or offered on a pay-per-use basis. An example of a free public cloud is the Google AppEngine.

Software as a service (SaaS): A software distribution model in which applications are hosted by a vendor or service provider and made available to customers over a network, typically the Internet. Google Apps is one provider of free SaaS.

Thin client: A low-cost, centrally managed workstation without CD-ROM players, disk drives, or expansion slots. The term derives from the fact that small computers in networks tend to be clients and not servers. This is also sometimes called a *lean client*. (See *thick client* above.)

Utility computing: Model in which computer processing power is seen as a utility that clients can pay for as needed.

Virtualization: The creation of a virtual (rather than actual) version of a technology, such as an operating system, a server, a storage device, or network resources. The usual goal of virtualization is to centralize administrative tasks while improving scalability and workloads.

All definitions are from *Techtarget.com*.



Picnik allows me even more photo-editing abilities.

Webpage editing and webmastering. My personal blog, wiki, and website are already completely managed via application service providers who use online tools for management and editing, as does our school website and the professional association websites I help manage.

School-specific tasks. All of my district's gradebooks, reporting systems, communications, accounting, and other management systems are already Web based. As cloud computing has gained maturity and acceptance, our district has started looking for an appropriate "enterprise" solution that will provide a common set of tools and storage to all staff and students. Although it is certainly possible now for each individual to access the tools I've been using, as an organization we need to have some standardization. Google Apps Education Edition and Microsoft's live@edu are enterprise systems that are free for K-12 schools.

Chance of Showers

So why shouldn't everyone fly to the cloud right now? Here are a few questions that need serious consideration:

What happens when there is no Internet access? You can now use Gmail and Google Docs offline in conjunction with Google Gears, a browser applet. Work offline and your documents will be synced when you reconnect. Bandwidth limitations may be a challenge for some districts with a small pipe to the Internet, however.

Might there someday be a charge for the services that are currently free? The sustainability of the revenue model is anybody's guess. Profits now come from advertisements and selling more fully featured versions of applications or larger storage spaces.

Schools can reallocate money from student workstations in labs, big file servers, and expensive software to pay for **increased bandwidth, greater wireless coverage, or—maybe, just maybe—smaller class sizes.**

Are my files secure? This is probably the deal-breaker for many skeptics of this trend. As a devout belt-and-suspender kind of guy, I'd encourage you to keep local backup copies of all important online documents. But Jeffrey Kaplan, managing director of the consulting firm ThinkStrategies ("Five Myths About SaaS," *CIO*, March 23, 2009), assures, "Although service disruptions experienced by Google ... get plenty of attention, those types of incidents don't happen very often, and they don't last as long as many enterprise outages. And there hasn't been a major compromise of a SaaS [software as a service] operation reported yet, even as we continue to read regular accounts of security breaches in traditional IT environments."

Are my files private? Can we trust Google and others not to peek at our stuff? This is another major concern. A slide in an online seminar offered through Google Apps Education Edition claims that:

- Google does not own your data.
- Google does not share your data.
- You can keep your data as long as you want.
- Google will remove your data when you ask.
- You can take your data elsewhere.

I study the privacy settings of any online program I use, as who gets access to what is getting more granular all the time. Of course, my own insurance against problems associated with unwarranted data access is living a completely sin-free life, but I know that won't work for everyone.

Are some things just too cumbersome to do online? Cloud computing is not for every computing need. Any big data crunching/data processing tasks will still need big computing power. If

you want to edit a video, for instance, you'll need a full computer. I also can't play or make CDs or DVDs with my netbook.

Am I abetting Google's/Microsoft's world domination? Definitely. Just accept it and get over it. If you feel uncomfortable using Google or Microsoft, there are alternatives, such as Zoho.

Cloudy Forecast

It's a good time to consider the impact of cloud computing and netbooks on our classrooms, libraries, and school systems. With such a low (and dropping) cost, I'd bet dollars to doughnuts that even in these tough economic times, quite a number of students will be able to get their hands on netbooks.

Before making the jump into the cloud, however, schools need to consider:

- Does the school have a policy about student-owned devices? (Parents are unlikely to allow a simple ban on them, just as they protested outright bans on cell phones.)
- Does it have the reliable, adequate, and secure wireless infrastructure to support dozens, if not hundreds, of student-owned netbooks?
- Will its teachers have the training, resources, and strategies to use netbooks to improve student learning?
- Is the district exploring cloud-based enterprise solutions like Google Apps Education Edition or Microsoft's live@edu?
- What happens when students don't need schools to provide them with computers or Internet access? As they gain access to broadband wireless Internet access that's carried on cell phone signals, they may see schools as irrelevant to their quest for access to computing functionality.

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Netbooks: **Back to the Basics**

As a technology director, my longstanding complaint has been that no one makes a computer that's just right for kids and schools—one that's inexpensive, reliable, lightweight, and easily maintained, with a long battery life and a high degree of functionality. But that device may finally be here: the netbook.

Netbooks, according to Wikipedia, are “a category of small-sized, low-cost, lightweight, lean-function subnotebooks optimized for Internet access and core computing functions (e.g., word

processing)—either directly from applications installed on the netbook itself or indirectly, via cloud computing.” And it seems that this new category is becoming mainstream. In late 2008, eight of the ten best-selling computers on Amazon were netbooks. Popular models are available from Dell, HP, Asus, Intel, Workhorse, and Acer, and more manufacturers have netbook lines on the horizon. (See “Buyer’s Guide,” *L&L*, December/January 2008–09, pp. 40–41.)

Most netbooks share these characteristics:

- They're lightweight at 2–4 pounds.
- They have small screens measuring 7–10 inches.
- They have static memory or smaller hard drives.
- Their keyboards are somewhat smaller than a full-sized keyboard.
- They have wireless Internet connectivity.
- They come equipped with webcams, microphones, and speakers.
- They have USB ports and memory card slots.
- You can buy them for less than \$400 (and the going rate is likely to decline in the future).

Netbooks run WindowsXP or some flavor of the open-source operating system Linux. They often come bundled with an open-source productivity suite, such as OpenOffice, and an open-source Web browser, such as Mozilla Firefox.

Although these devices do allow students to work offline to write papers, use spreadsheets, and design slideshow presentations, they are designed to be used in a cloud computing environment, where the bulk of the work happens online. As both student work and applications are stored online, a basic operating system configuration would make machines interchangeable.

—Doug Johnson

Change is coming, people. I believe a good term to describe the rise of cloud computing is *disruptive technology* (Google it). For schools in dire need of cost savings, though, this cloud is likely to have a silver lining.

Google Docs: <http://docs.google.com>
Google Gears: <http://gears.google.com>
Linux: www.linux.org
Microsoft's live@edu: <http://get.liveat.edu.com>
Mozilla Firefox: www.mozilla.com
Open Office: www.openoffice.org
Zoho: www.zoho.com

Resources

“Five Myths About SaaS” by Jeffrey Kaplan.
CIO (March 23, 2009): [www.cio.com/
article/486091/Five_Myths_About_SaaS?](http://www.cio.com/article/486091/Five_Myths_About_SaaS?)
Google App Engine: [http://code.google.com/
appengine](http://code.google.com/appengine)
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com/a/help/intl/en/edu/index.html](http://www.google.com/a/help/intl/en/edu/index.html)



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