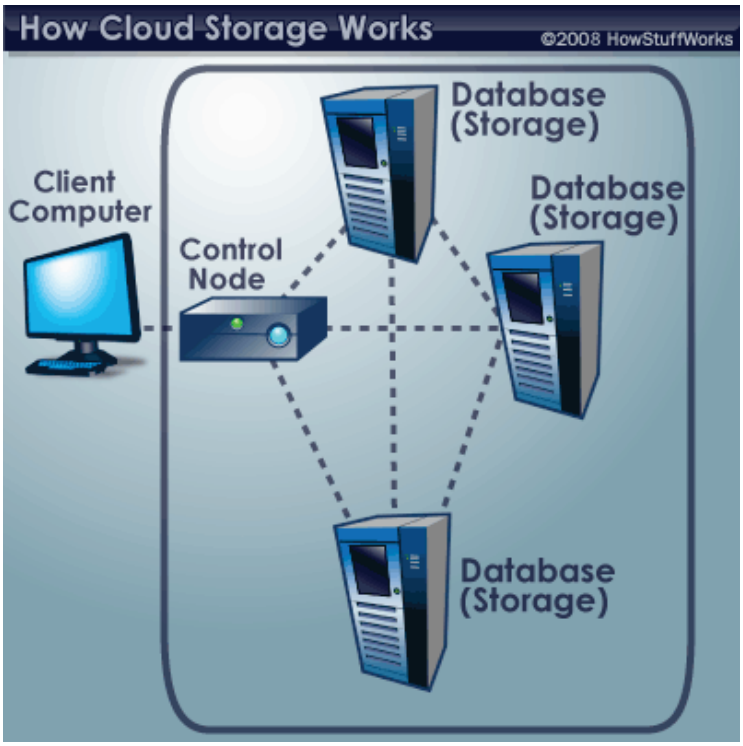
How Cloud Storage Works

by Jonathan Strickland



Comedian George Carlin has a routine in which he talks about how humans seem to spend their lives accumulating "stuff." Once they've gathered enough stuff, they have to find places to store all of it. If Carlin were to update that routine today, he could make the same observation about computer information. It seems that everyone with a computer spends a lot of time acquiring data and then trying to find a way to store it.

For some computer owners, finding enough storage space to hold all the data they've acquired is a real challenge. Some people invest in larger hard drives. Others prefer external storage devices like thumb drives or compact discs. Desperate computer owners might delete entire folders worth of old files in order to make space for new information. But some are choosing to rely on a growing trend: **cloud storage**.

While cloud storage sounds like it has something to do with weather fronts and storm systems, it really refers to saving data to an off-site storage system maintained by a third party. Instead of storing information to your computer's hard drive or other local storage device, you save it to a remote database. The Internet provides the connection between your computer and the database.

On the surface, cloud storage has several advantages over traditional data storage. For example, if you store your data on a cloud storage system, you'll be able to get to that data from any location that has Internet access. You wouldn't need to carry around a physical storage device or use the same computer to save and retrieve your information. With the right storage system, you could even allow other people to access the data, turning a personal project into a collaborative effort.

So cloud storage is convenient and offers more flexibility, but how does it work?

Castle in the Clouds

Cloud storage is a subcategory of **cloud computing**. Cloud computing systems offer users access to not only storage, but also processing power and computer applications installed on a remote network.

Cloud Storage Basics

There are hundreds of different cloud storage systems. Some have a very specific focus, such as storing Web e-mail messages or digital pictures. Others are available to store all forms of digital data. Some cloud storage systems are small operations, while others are so large that the physical equipment can fill up an entire warehouse. The facilities that house cloud storage systems are called **data centers**.

At its most basic level, a cloud storage system needs just one data server connected to the Internet. A client (e.g., a computer user subscribing to a cloud storage service) sends copies of files over the Internet to the data server, which then records the information. When the client wishes to retrieve the information, he or she accesses the data server through a Web-based interface. The server then either sends the files back to the client or allows the client to access and manipulate the files on the server itself.

Cloud storage systems generally rely on hundreds of data servers. Because computers occasionally require maintenance or repair, it's important to store the same information on multiple machines. This is called **redundancy**. Without redundancy, a cloud storage system couldn't ensure clients that they could access their information at any given time. Most systems store the same data on servers that use different power supplies. That way, clients can access their data even if one power supply fails.

Not all cloud storage clients are worried about running out of storage space. They use cloud storage as a way to create backups of data. If something happens to the client's computer system, the data survives off-site. It's a digital-age variation of "don't put all your eggs in one basket."

What are some examples of cloud storage systems?

Examples of Cloud Storage

There are hundreds of cloud storage providers on the Web, and their numbers seem to increase every day. Not only are there a lot of companies competing to provide storage, but also the amount of storage each company offers to clients seems to grow regularly.

You're probably familiar with several providers of cloud storage services, though you might not think of them in that way. Here are a few well-known companies that offer some form of cloud storage:

- Google Docs allows users to upload documents, spreadsheets and presentations to Google's data servers. Users can edit files using a Google application. Users can also publish documents so that other people can read them or even make edits, which means Google Docs is also an example of cloud computing.
- Web e-mail providers like Gmail, Hotmail and Yahoo! Mail store e-mail messages on their own servers. Users can access their e-mail from computers and other devices connected to the Internet.
- Sites like Flickr and Picasa host millions of digital photographs. Their users create online photo albums by uploading pictures directly to the services' servers.
- YouTube hosts millions of user-uploaded video files.
- Web site hosting companies like StartLogic, Hostmonster and GoDaddy store the files and data for client Web sites.
- Social networking sites like Facebook and MySpace allow members to post pictures and other content. All of that content is stored on the respective site's servers.
- Services like Xdrive, MediaMax and Strongspace offer storage space for any kind of digital data.

Some of the services listed above are free. Others charge a flat fee for a certain amount of storage, and still others have a sliding scale depending on what the client needs. In general, the price for online storage has fallen as more companies have entered the industry. Even many of the companies that charge for digital storage offer at least a certain amount for free.

Is there enough of a demand for storage to support all the companies jumping into the market? Some people think that if there's space to be filled, someone will fill it. Others think the industry is destined to experience a crash not unlike the dot-com bubble burst in 2000. We'll have to wait and see.

What are some potential cloud storage problems?

A Storm's Brewing

Some people envision a future in which the entire Web becomes a massive storage cloud. People will constantly upload and download data to and from the cloud. The concept of data ownership will lose its meaning. Everyone will have access to everything and secrecy will cease to exist. Other people dismiss these ideas and say that cloud storage is just a tool like any other, and while some might use it to great advantage, it won't bring about the end of civilization as we know it. Who's right? We'll just have to wait and see.

Concerns about Cloud Storage

The two biggest concerns about cloud storage are **reliability** and **security**. Clients aren't likely to entrust their data to another company without a guarantee that they'll be able to access their information whenever they want and no one else will be able to get at it.

To secure data, most systems use a combination of techniques, including:

- **Encryption**, which means they use a complex **algorithm** to encode information. To decode the encrypted files, a user needs the encryption key. While it's possible to crack encrypted information, most hackers don't have access to the amount of computer processing power they would need to decrypt information.
- **Authentication** processes, which require to create a user name and password.
- **Authorization** practices -- the client lists the people who are authorized to access information stored on the cloud system. Many corporations have multiple levels of authorization. For example, a front-line employee might have very limited access to data stored on a cloud system, while the head of human resources might have extensive access to files.

Even with these protective measures in place, many people worry that data saved on a remote storage system is vulnerable. There's always the possibility that a hacker will find an electronic back door and access data. Hackers could also attempt to steal the physical machines on which data are stored. A disgruntled employee could alter or destroy data using his or her authenticated user name and password. Cloud storage companies invest a lot of money in security measures in order to limit the possibility of data theft or corruption.

The other big concern, reliability, is just as important as security. An unstable cloud storage system is a liability. No one wants to save data to a failure-prone system, nor do they want to trust a company that isn't financially stable. While most cloud storage systems try to address this concern through redundancy techniques, there's still the possibility that an entire system could crash and leave clients with no way to access their saved data.

Cloud storage companies live and die by their reputations. It's in each company's best interests to provide the most secure and reliable service possible. If a company can't meet these basic client expectations, it doesn't have much of a chance -- there are too many other options available on the market.

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