

## **Lost in the cloud: How safe are your online possessions?** by Douglas Heaven *New Scientist* #2910, 30 March 2013.

*In the digital age, your files and memories are not truly yours any more. They belong to the cloud.*

KYLE GOODWIN wants his stuff back. One day, he decided to set up a company in Ohio to film local sports events. For a while, business was good, but then he got a shock.

To keep his valuable footage safe, Goodwin had placed it in a popular storage facility. On 19 January last year, all those assets disappeared without warning. As did everything put there by more than 150 million others. When he asked for his livelihood back, he was refused. So he decided to go to court.

Goodwin's experience represents a much deeper problem – and it is at the heart of the way we use technology today. "This is about internet users and the future of internet usage," says Corynne McSherry of the Electronic Frontier Foundation (EFF), which is providing Goodwin with legal help. Why? Goodwin's video footage was digital, and stored on a computer server in "the cloud". The US government, who confiscated his material, is essentially claiming that he forfeited his rights to his property the minute he uploaded it.

What's at stake affects you because almost everybody online now uses cloud computing in some way, whether it is for webmail, social media or reading ebooks. Clusters of servers thousands of miles away now hold our favourite music, photo memories and vital correspondence. We are headed for a world in which we will live our entire digital lives in the cloud, but these developments are poised to change our basic assumptions about ownership in surprising ways. Are we ready?

The cloud is the result of a pendulum swing in computing. A few decades ago, computer users would typically share a single machine – a mainframe – with many others, accessing it over an office or university network from local terminals. CPU time and storage were expensive, so resources were pooled. That ended with the arrival of cheap PCs.

Now the pendulum is swinging back. The difference is that those shared computer resources now sit in vast data centres owned by the likes of Amazon, Google or Microsoft. Yet the greatest trick the cloud's creators ever pulled was convincing the world it doesn't exist. Half of the participants in a recent survey by Wakefield Research said they did not use the cloud, and yet 95 per cent of that group actually did.

The cloud's influence pervades our digital lives. Amazon alone is thought to own 450,000 servers around the world, providing storage and other services to thousands of websites and businesses, which find it a cheap and convenient alternative to investing in servers of their own. According to one 2012 study, every day a third of US internet users visit a site that relies on an Amazon server.

The cloud also underpins much of our personal activities, allowing us the convenience of accessing online services and digital possessions from any of our devices. This covers photos, videos we post on social media sites, and correspondence and attachments in webmail services like Gmail or Microsoft's Outlook.com. Increasingly, we are also using digital file lockers such as Google Drive, Microsoft's Skydrive and Apple's iCloud. (see "No silver lining").

It is widely thought inevitable that by 2020 the cloud will run all digital life. In this scenario, many of our gadgets would just be dumb, empty objects whose sole job is to access the internet, with all the computing and storage handled at the other end of the line.

This vision makes a lot of people uneasy. Computing pioneer and activist Richard Stallman, for example, voiced the concerns of many when he re-dubbed cloud computing "careless computing".

Storing personal possessions with a service offered by third parties like Amazon, Google and Microsoft is like dumping all your stuff in someone else's warehouse. But here's the rub: service

agreements that would be unacceptable for a bricks-and-mortar warehouse have become standard fare for cloud storage. Though you technically retain copyright if you have created the photos, videos or text you upload, the reality is that agreeing to the service terms – which, let's be honest, you probably didn't read – generally means you forego many of the rights you might reasonably expect. For example, the popular photo-sharing app, Instagram, recently changed its terms after it was acquired by Facebook, giving itself a license to use people's uploaded photos for advertising.

Further, cloud-based services have been known to deliberately delete files – emails that their algorithmic text-crawlers deem potentially illegal or pornographic, for example. And they can lose your stuff with impunity. By contrast, if you want to delete your files, there is no guarantee that they will actually be removed from cloud servers. "Whenever you hand over your property to a third party there's risk," says McSherry, "but people don't even realise what the risk is. They do it because it's convenient."

These issues are at the heart of Goodwin's legal battle. Like millions of others, he stored his files with a company called Megaupload, an online digital locker. Unfortunately for its legitimate users, Megaupload became better known as a hub for pirated films, games and software. So the FBI took it offline.

Goodwin has turned to the courts to get his footage back. The court is yet to decide, but the US government's response is that, in the cloud, Goodwin forfeited his property rights.

While the government's defence may sound ridiculous, it is on pretty firm legal ground, says Chris Reed at Queen Mary, University of London, who works on the legal aspects of cloud computing. "Possession, which is sort of what property is all about, is irrelevant," he says. The problem is that our understanding of property is based on material objects. "But we look at all this digital information and it has no physical existence we can point to."

After all, a digital file exists as a state of matter (various magnetic states, say) rather than matter itself (the disc on which the magnetism resides). If cloud service providers gave you actual property rights, then there would be hundreds of thousands of owners of the magnetic discs inside the servers on which your information is stored.

In any case, your cloud possessions rarely exist in just one location. For example, if you upload something to the digital locker Dropbox, which uses Amazon's servers, it is transferred via your internet service provider (ISP) through multiple way-stations called routers to one of Amazon's data centres, most of which are in North America. Once there, your file will be duplicated across multiple servers – perhaps even split into pieces – to balance the load and keep people's data flowing. There is no way for you to know where it will end up.

What's more, if your file has already been uploaded by someone else – a digital copy of a Radiohead album, for instance – then Dropbox will just link you to the existing files rather than waste bandwidth and space by uploading a duplicate. Are those files uploaded by that other person now yours? Surely not. Untangling relationships with your possessions in the cloud quickly gets confusing. "It's a muddle of abstractions," says Richard Harper at Microsoft Research in Cambridge, UK.

This is causing tension between our intuitive beliefs about property and the reality that this technology has created. How can we resolve this?

Some have proposed restructuring the basic architecture of the cloud to help bring it closer to traditional notions of property. Brad Templeton, who chaired the EFF's board of directors until 2010, believes we can keep the cloud while also keeping some of the control we have with personal computing. "My hope is to find a happy medium somewhere in between," he says.

Templeton advocates an idea called the "data deposit box model". A photo posted on Facebook, for example, would be kept on a web server that you had some control over, which could be a small

server in your home, or perhaps a neighbourhood server run co-operatively. The idea is that there would be no quibble about whether you legally own that photo, since it would be stored somewhere akin to a rented apartment or a safety deposit box, rather than on Facebook's third-party servers. The image on Facebook's pages would then be provided by your local store whenever it was needed.

Templeton thinks such a facility could be provided as part of a package from ISPs. And there are already projects that provide easy-to-use software allowing individuals to run data deposit boxes, such as Diaspora and FreedomBox. The community of Diaspora users has even grown into its own social network, a mini self-reliant Facebook. The downside is that unless ISPs or the likes of Facebook sign up, the balance Templeton hopes for is unlikely to materialise.

Are there alternatives? Perhaps, but rather than redesigning the cloud, they would involve making it easier for us to navigate and understand its workings.

To get a better handle on these issues, Harper argues that it is important to understand what people feel is missing from their experience of using the cloud. To that end, he and Will Odom at Carnegie Mellon University in Pittsburgh, Pennsylvania, have been studying people's attitudes to cloud ownership from a sociological perspective.

For example, one interviewee told them that a collection of photos uploaded to a website was among their most important possessions: "But at the same time, I have no idea how to get them... it feels like there's this illusion that they're mine... it's a very strange feeling that I do not know how to resolve."

This feeling appears to span generations. In a similar study, Tim Regan, also at Microsoft Research, interviewed teenagers about their use of Facebook. Though the teenagers were initially nonchalant about posting personal photos online, Regan pushed. "Underneath there was a real unease about where this stuff was and who owned it," he says. "It was almost as if the unease was so great that people were unwilling to face it, which was a little scary."

What do these reports tell us in practice? Harper thinks that designing computer interfaces to provide a sense of "geography" in the cloud would help, giving a way to orient ourselves when rummaging through our digital items. "People like to feel they know where something is," he says.

An app launched last year called Found might be a start. This allows you to view and search all your online stuff from Gmail, Dropbox and similar services from a single piece of software on your computer, so you know what your stake in the cloud actually is.

Ultimately, we may need a fundamental redesign of the visual displays we use to navigate in the digital world, says Odom. Fortunately, there is a precedent. Before the desktop interface arrived on personal computers, with its windows and icons, the average computer user couldn't picture all the digital files held on their hard drive. In principle, designers could do the same thing for the cloud.

Before that hypothetical cloud interface arrives, many are predicting a cloud "doomsday event" in the next few years – a massive and widespread loss of data, for example. "Then people will take notice," says Reed.

We now face a choice: remake cloud possessions in the image of their material ancestors or give up some of our core beliefs about what it means to own things. While Reed thinks a resolution is possible, it could be 20 years before the legal and social issues are settled. "It's going to take that period of time. We're in that turbulent period where everything is changing," he says.

This article appeared in print under the headline "Lost in the clouds"

## **No silver lining**

How much of your life relies on the cloud?

## **Books**

When you buy an ebook, the purchase is different to a physical copy. Buy from Amazon and you pay a licence to access a cloud-stored book from your e-reader. This means Amazon reserves the right to take the book back. In 2009, Amazon realised it didn't have the rights to sell ebooks of George Orwell's 1984 or Animal Farm in the US, so it deleted them from the Kindles of US readers who had bought copies. And last year, a Norwegian woman discovered Amazon had deleted her entire library because, the company argued, she had breached its terms of service.

## **Photos and video**

Around 45 per cent of internet users upload their photos to the cloud, by using social networks and photo album sites. One-fifth upload videos. Technically, you retain copyright, but the terms of service often undermine those rights. For example, Facebook can do pretty much whatever they want with your photos without paying you.

## **Email**

If you use the likes of Gmail, Hotmail or Yahoo Mail, it is all in the cloud. One implication is that you may be subject to the laws of the country in which your emails are hosted. For example, law enforcers in the US don't need a warrant to rummage through your inbox as long as the emails are hosted on a US server and are older than six months. That is thanks to an ageing law signed by Ronald Reagan over 25 years ago.

## **Music and movies**

The cloud underpins subscription services like Netflix or Spotify, as well as Google Play and Apple's iCloud, which allow you to stream your entertainment from any device. Less well known is that the fate of purchased downloads can remain tied to the cloud too, long after money has changed hands. If you buy MP3s with digital rights management, it must often be updated by the seller's server if you change computer later. In the past, both Microsoft and Yahoo have pulled this reauthorisation service, which gave an expiry date to music bought from their stores.

## **File storage**

Around a third of businesses store information in the cloud. And personal subscriptions to online storage lockers like Microsoft's Skydrive, Google Drive or Dropbox are predicted to reach 1.3 billion by 2017. Yet if your stuff is lost or deleted, you have little comeback (see main story).

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