Cloud Storage: The Risks and Rewards

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Introduction

Backing up to the cloud means putting your backups on a remote server that can be accessed by Internet connection.[1] You can access your information from anywhere you have an Internet connection without taking up space on your machine's hard drive. Many businesses have started to use cloud computing and it is expected that there will be a "26 percent growth in adoption over the next several years".[2] However, the cloud is not *just* for businesses; even the U.S. government has started to adopt the cloud model. Cloud storage is offered for personal use (for free or fee) by a number of companies including Apple (iCloud), DropBox and Google (Google Drive). With massive adoption of cloud backups users are increasingly concerned about how secure this backup method is.[3] With 100 percent adoption of cloud backups, everything will be available from anywhere. How much should you trust the cloud?

Why has Cloud Storage Become Popular?

Cloud storage is not a new way to backup your files. The idea was first introduced in the 1960s by computer scientists John McCarthy and J.C.R. Licklider.[4] So why has cloud storage only become popular in recent years?

Prior to the 1990s, bandwidth and what we consider decent transfer rates were rare. In the 1970s, typical transfer speeds (for those who had the Internet) were around 300 bits per second,[5] – 27 seconds per kilobyte or approximately eight hours per megabyte. These speeds are not adequate for transferring large amounts of data. Furthermore, few people had access to the Internet during the 1970s and even into the early 1990s. For example, only two percent of households in the U.S. had access in 1994 and only twenty-six percent had access in 1998.[6] There was not much of a market for personal cloud storage services.

Online storage services started to spring up as bandwidth and speeds increased and more people started using the Internet.[7] Among the first to popularize this service was DropBox, Inc. in 2007.[8] They pioneered seamless operating system integration, competitive prices and even offered a free plan with limited options. Dropbox created the industry standard for remote backup services.[9] Apple's iCloud storage service launched in 2011 and Google Drive in 2012.

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[1] (Freedman 2012)
[2] (Clancy)
[3] (Krossman)
[4] (Mohamed)
[5] (12ht)
[6] (National Science Foundation)
[7] (Rhea, Wells and Eaton)
[8] (DropBox, Inc)
[9] (Zelman)

Dropbox alone had four million users in February 2010[10] and more than one hundred million users as of November 2012.[11] Apple's iCloud hit over 190 million users in October of 2012[12] and Google Drive announced their ten million-user mark in June 2012.[13]

Risks

Cloud storage may be convenient but is your data secure? No matter which cloud storage service you choose, the services "have full access to your data and control where it is stored".[14] Cloud servers have been compromised, causing uncertainty or data compromise for customers.

DropBox Compromises

Although DropBox is currently the face of personal cloud storage, it is not because they are the most secure. Back in July 2011 DropBox announced that a code update had "completely disabled the authentication system for an unknown period of time".[15] That means that for a few hours, anyone could access any DropBox account without any credentials. For many of us, that is a pretty scary thought. Although DropBox reassured us that they are "implementing additional safeguards to prevent this from happening again", they were compromised once again in July 2012.[16]

The July 2012 compromise ended with a small number of customers' accounts being subject to unauthorized access. Sound familiar? DropBox launched a full investigation and announced "that usernames and passwords recently stolen from other websites were used to sign in to a small number of Dropbox accounts. This may not sound like it is their fault but one of the accounts accessed was "an employee Dropbox account containing a project document with user email addresses". The email addresses acquired were then spammed. Since the 2012 compromise DropBox has added an optional two-factor authentication system that sends a temporary code to your phone needed to log in and a "new page that lets you examine all active logins to your account". [17]   DropBox has not, to date reported any compromises since the attack.

iCloud Compromise

The iCloud compromise was a scary glimpse into the reality of what a little social engineering and loosely followed internal policies can lead to. In one hour Mat Honan's "entire digital life was destroyed".[18] Hackers social engineered their way into Honans

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[10] (Ying)
[11] (Constine)
[12] (Lardinois)
[13] (Crook)
[14] (Schwartzberg)
[15] (Bott)
[16] (Ferdowsi)
[17] (Kerr)
[18] (Honan)

iCloud account by calling AppleCare and using his email address, billing address and last four digits of his credit card as identification.[19]

The hackers obtained his billing address from a simple and public whois lookup. From there they called Amazon (who also has a cloud storage service) and asked to change the email address on the account to an email address the hackers had access to. Amazon did so without a problem after the hacker provided Honans billing address as identification. The hackers were able to reset the password on the Amazon account by having password reset information sent to the newly changed email and get ahold of the last four digits of his credit card once inside.[20]

They now had enough information to fulfill AppleCare's identification requirements and get into Honan's iCloud account. Once the hackers were in Honan's iCloud account they were able to "reset his iCloud password, reset his Gmail password, gain control of his Twitter account".[21] Sadly, this is not the end of the destruction of Honan's "digital life". Honan had Find my iPhone turned on for his iPhone/iPad and Find my Mac[22] turned on for his MacBook Air. This is a service that allows you to locate your lost or stolen Apple products and even remotely wipe those devises, which is exactly what the attackers did.

Although this attack was not a technological one, this says a lot about how careful Apple really is with you account. Strict enforcement of policies to prevent social engineering attacks like this one is a must in any company holding sensitive information. Do not let this one isolated incident taint your decision-making. There have not been any other breaches reported since this incident and none before.

Google Drive Compromises

There have been no major Google Drive compromises to date. A user reported on Google's support forum that he received a legitimate email from Google saying there was an "unauthorized attempt to login" to his account from Shanghai. Another user reported the same problem in the thread.[23] Luckily, the hackers were not able to access either of these accounts but what would happen if they were to get in?

Google states in their Terms of service that "Anything that has been permanently deleted from Google Drive by the owner, or if the owner's account was deleted, can't be recovered. It's also not possible to recover anything in Google Drive after a Google Apps domain administrator deletes someone's account."[24] Meaning in the event your Google Drive is compromised and wiped, there is *nothing* you can do to get your files back.

Google Drive seems like the safest choice on the surface but you risk losing everything you have ever backed up onto your account if there is a breach.

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[19] (Kerr, Apple Responds to Journalist's iCloud Attack)
[20] (Manjoo)
[21] (Rose)
[22] (Apple, Inc.)
[23] (Google Support Forum)
[24] (Google, Inc)

Security of Data Transfers

During transfer is the only time that your files are out of both your and your provider's hands. Your data can be captured and read or modified during transfer using a man-in-the-middle (MitM) attack if not encrypted.[25] Most cloud services have a secure socket layer for safer file transfer.[26] Do not choose a service without a valid SSL certificate.[27] You can encrypt files yourself before you upload them to your storage device but encrypted transfer is one step safer and practical. There are a few different ways to upload your data depending on your provider.

FTP

FTP or File Transfer Protocol had it's first standard in 1971, prior to TCP/IP's existence. "FTP has traditionally used clear text passwords."[28] Meaning that your log in information can be read by anyone running a MitM attack between you and your provider's server; even if your data is encrypted your credentials can still be compromised.[28] Alternatively, there is SFTP that uses a secure shell to encrypt your credentials when logging in.

SSL

"SSL (Secure Sockets Layer) is the standard security technology for establishing an encrypted link between a web server and a browser."[29] This means that if your cloud storage service's website has a valid SSL certificate, any information sent from your browser to the server and vice versa is encrypted. [29] There was a vulnerability in SSL that allowed hackers to strip the encryption that has been fixed but many service providers have yet to update their versions of SSL.[30] Be sure to check the encryption offered by a service before subscribing.

Encryption in Storage

"As innovators like Apple and Microsoft, Google and Amazon, turn their customers on to the benefits of storing in the cloud, the importance of data encryption steps to the forefront."[31] You can back up any legal file you would like to your cloud storage including tax forms, utility bills, pay stubs, ebill receipts and medical records. These are files you do not want getting out as they may contain sensitive information like credit card numbers, social security numbers, addresses, phone numbers, email addresses which can all be used for identity theft.

Many cloud storage providers have built in storage encryption for no extra charge.[26] You can also encrypt your files yourself or use an additional cloud storage encryption

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[25] (Peterson and Reiher)
[26] (Kabay and Legendre)
[27] (Jefferies)
[28] (Process Software)
[29] (SSL)
[30] (Kumar)
[31] (Top 10 Cloud Storage)

service such as Box Cryptor for additional security.[32] SSL tunnels only encrypt your data during the transfer to your cloud storage server, so your data will be readable by anyone who compromises your account if there is no encryption during storage.

Cloud Storage and the U.S. Government

The U.S. government has even started using the cloud. In June 2012, The U.S. General Services Administration launched an "Effort to Transition Federal Government to Cloud Computing"[33] Before this announcement the General Services Administration had already accomplished two things:

"1. First to Move Email to the Cloud:

Last year, GSA was the first federal agency to move to a cloud based email system, which has saved $2 million dollars in costs so far. In addition, email system operating costs are expected to see additional 50 percent in savings with an estimated $15 million in savings over five years.

2. Working to Standardize Security of Cloud Services:

FedRAMP is an initiative to standardize security assessments of cloud products and services. By addressing one of the key barriers to cloud adoption, this program will accelerate adoption by federal agencies. It will allow agencies to share authorizations, saving time and money otherwise spent on duplicative security reviews."[33]

During the next year they are:

"3. Working on Blanket Purchase Agreements for the Federal Government:

Everything agencies need to move to the cloud is available right now through GSA. The products currently available from GSA include data storage, virtual machines, and web hosting. GSA is working to provide more cloud services to federal agencies, including email services."[33]

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[32] (Box Cryptor)
[33] (General Services Administration)

Synoptic Table of Cloud Services

ADrive	Files, sharing	Personal, Business, Adrive Enterprise	50 GB - 10 TB - unlimited	free- $7/mo - $16/mo	Manual	SSL transfer for paid services	PCs, Mac, Unix
BACKBLAZE	System, versions, locate stolen computer	1	unlimited	$5/mo	Continuous, scheduled, or manual	encrypted on client; user-added key	Windows, Mac
BackupGenie	Automated backup, versions, sharing	3	75 GB, 250 GB, unlimited	$5/mo, $7/mo, $10/mo	daily	SSL transfer, 256bit AES storage	Windows, Mac, iPad, iPhone
BackupandShare	Automated backup, versions, sharing	Individual, Business	10 GB, unlimited	free, $50/mo, $150/mo	daily or manual	SSL transfer	Windows, Mac, iPad, iPhone, Android, Windows Mobile
backupify | Google Apps	backup, restore, search	Professional, Enterprise, Enterprise +	unlimited	$3/user-mo, $4/user-mo, $990/domain-mo	daily or manual	SSL transfer, storage	Google Apps domains
backupify | Salesfore	backup, restore, search, export	Professional, Enterprise, Unlimited Salesforce	1 GB/user	$50/mo for 10 users base + $5/user-mo additional	daily or manual	SSL transfer, storage	Salesforce CRM software
backupify | Personal Apps	backup, restore	MyCloud Personal, 100 & 500	1 GB, 10 GB, 50 GB	free, $5/mo, $20/mo	weekly, nightly	SSL transfer, storage	Facebook, Twitter, Gmail, Google Drive, Google Calendar, Google Sites, Google Contacts,

							Flickr, Picasa, LinkedIn, Blogger, Zoho
Barracuda	backup appliance, cloud, private cloud, revisions history, restore	Models 190, 390, 490, 690, 890, 990, 1090	from 500GB to 80 TB	from $1,000 to $135,000	total control	SSL transfer, storage	Windows
Box							
Box Backup	open-source software	n/a	n/a -- do-it-yourself	free	total control	SSL transfer, storage	UNIX, Windows
Carbonite	backup, restore	Home, HomePlus, HomePremier, Business, BusinessPremier	unlimited, 250 GB, 500 GB	$60/year through $600/yr	continuous or scheduled	SSL, Blowfish storage; user-added key	Windows, Mac
CRASHPLAN	backup, restore, versions, multiple storage sites	CRASHPLAN, CRASHPLAN+, CRASHPLANPRO, CRASHPLANPROe	unlimited	free through $25/yr; also perpetual licenses -- e.g., $3,000 for 50 users + annual support	daily	encrypted on client; user-added key	Windows, Mac, Linux, Solaris
Dropbox	sharing, backups, restore, two factor authorization	Free, Pro, Teams	2 GB up to 1 TB	free through $63,000 for 500 users	continuous	by client	Windows, Mac, Linux, iPad, iPhone, Android and BlackBerry.
Druva	sharing, backups, restore, data analytics, remote deactivation	Professional, Enterprise, Unlimited	15 GB/user up to 100 GB/user	$6/user-mo up	scheduled	SSL transfer, 256bit AES storage	Windows, Mac, Linux, iPad, iPhone, Android and BlackBerry.

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egnyte	local cloud, file server, file sharring, file transfer/FTP, remote file access, mobile apps, third party integration	Group, Office, Business, Enterprise	150 GB up to 3 TB	$24.99/month - $129.99/month. Enterprise: $12.99/employee/month	continuous or scheduled	SSL transfer, 256bit AES encryption in transit and at rest,	PC, Mac, iOS, Android, Windows Mobile, WebOS
Elephantdrive	web access, secure sharing/sending,	Free, Personal, Business	2 GB up to 2 TB	Free - $169.95/month, Variation in Business Tier	Automated	256bit AES encryption, optional personal key encryption	PC, Mac, Android (Beta), NAS
Google Drive	web access, OS integration	Free, 25 GB, 100 GB, Peronalized Plan	5 GB up to 16 TB	Free - $799.99/month	N/A	SSL transfer	PC, Mac, Android, iOS
IBackup	API for 3rd party developers	n/a	10 GB up to 300 GB	$9.95/month - $299.95/month	N/A	SSL transfer, 256-bit AES encryption	PC, Mac, Linux, Android, iOS
iCloud	iTunes, Photo Stream, Documents, Safari, Calendar, Contacts, Mail, Apps, iBooks, Backup, Restor, Find my iPhone, Find my Friends	n/a	5 GB up to 55 GB	Free - $100/year	Automatic	SSL Transfer, 128-bit AES encryption	Mac, iOS
Jungle Disk	web access	Personal, Business	Unlimited	$2/month - $5/month + $0.15/GB	Automatic	AES-256 encryption	PC, Mac, iOS
Justcloud	sync multiple computers, web access, file sharing, mobile access	n/a	Unlimited	n/a	Automatic	265 Bit Encryption	PC, Mac, iOS, Android, Blackberry

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Keepit	backup history, restore from backup, replicated backups,	Home Plan, Business Plan	Unlimited	£4.95/month - $49.00/month	Automatic	256-bit Rijndael encryption	PC, Mac, Linux
livedrive	Reseller options	Backup, Briefcase, Pro Suite, Business	Unlimited, 2 TB, 10TB+	$7.95/month - $159.95/month	Automatic	"256-bit military grade encryption"	PC, Mac, Android, iOS
Microsoft SkyDrive	remote access, version tracking, online slide shows	n/a	7 GB up to 107 GB	Free - $50.00/year	Automatic	SSL transfer	PC, Mac, Windows Phone, Android, iOS
mimedia	access media on demand, music, photo, and video streaming	Free, Premium	7 GB up to 100 GB	Free - $4.99/month	Automatic	SSL transfer, NSA level 256-bit encryption	PC, Mac, iOS, Android
Mozy	local backup service, bandwidth throttling, web based and DVD restore, server support, custom domain, custom install	Home, Pro, Enterprise	50 GB - 1 TB	$5.99/month/computer - $379.99/month/computer	Automatic	SSL transfer, 256-bit AES encryption	Mac, PC, iOS, Android
MyOtherDrive	collaboration, secure links, DDL for your files, USB drive backup	Free, Pro, Enterprise	2 GB - 10 TB	Free - $2,400/year	Automatic	SSL transfer, AES 128-bit	PC, Mac
myPCBackup	multiple computer sync, web access, free trial, file versioning	n/a	unlimited	Pay-as-you-go	Automatic	SSL transfer	PC, Mac, iOS, Android, Blackberry
OpenDrive	file sync, web	Personal, Business	5 GB - 1 TB	Free - $25/month	Manual	SSL transfer,	PC, Mac, iOS,

	access		(custom plan available)			custom encryption	Android
PennyBackup	fast backups, free software, data recovery	n/a	unlimited	$0.089/GB	Manual	256-bit AES encryption	PC
S3	Encryption client, versioning	Free, Paid	5 GB - Unlimited	Free - Pay as you go	Manual	SSL transfer, server side encryption	n/a
SOS Online Backup	Mobile bakcup	Home, Business	5 GB - 2 TB	$79.99/year - $7,490.00/year	Manual	military-grade encryption	PC, Mac, NAS, iOS, Android
SugarSync	Sync multiple devices, mobile apps, remote access, outlook integration, versioning	n/a	5 GB - Custom	Free - Custom	Manual	SSL transfer, 128-bit AES server side encryption	PC, Mac, iOS, Android, Kindle, Symbian
Zip cloud	Sync multiple computers, web access	Personal, Business, Partner	75 GB - 5 TB	$4.95/month - $791.20/month	Automated	256bit SSL encryption	PC, Mac, iOS, Android, Blackberry

Concluding Remarks

Cloud storage is the future of storing digital data and early adapters will definitely benefit in the long run.[34] However, you must make sure your data is well protected. Above is a chart that Dr. M. E. Kabay and I have put together for you to take a look at and see which service fits your needs the best. While it is easier to not deal with encryption, the risk is not worth the ease.

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[34] (Maltais 2012)

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