

Understand the Cloud

SKOKIE PUBLIC LIBRARY
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“I don’t need a hard disk in my computer if I can get to the server faster...carrying around these non-connected computers is byzantine by comparison.”

Steve Jobs, 1997

<http://www.forbes.com/sites/joemckendrick/2013/03/24/10-quotes-on-cloud-computing-that-really-say-it-all/>

Computing on the ground

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So before we get to just what cloud computing is, we're going to talk about what came before it--which we're going to call "computing on the ground."

Do you remember...

When computers were defined by
processor speed, storage, and
memory?

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So, when you went to the store to buy a computer for your home or for your business, you'd have to ask yourself what kind of tasks you hoped to accomplish on your computer and make sure you bought a computer that was the right fit. You had to be well versed in all these areas, or in the very least find a salesperson who was.

Or what it was like **buying, installing,**
and **updating** software?

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And so even after you bought a computer you would have to head back to a store to get software---because your old software would frequently become out of date---or simply not have all the bells and whistles that you discovered you needed. And then there was the fun of installing or updating the software which was frequently cumbersome and a headache and took forever...and even then it sometimes didn't seem to work correctly.

When you suddenly had **gigabytes** of digital photos and music to store?

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And suddenly things like music and photographs went digital. And you went from needing a gigabyte of storage to meet your needs to thinking, "I'm going to need a lot more storage." You were no longer storing your music on CDs or storing your photographs on prints that went (ideally) into photo albums--suddenly these tangible objects became digital 0s and 1s and you could store them on your computer. And if you're like me, you found yourself digitizing thousands of CDs to your computer, or purchasing a digital camera where you were no longer shackled to a roll of 24 or 26 pictures, but you could take hundreds of photos at any occasion and dump them onto your computer. Suddenly we needed a lot more storage!

So, you bought a bigger **hard drive** to **store** them.

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You bought a new computer with an internal 100 gigabyte drive, though eventually you needed an external 500 gigabyte hard drive....a terabyte drive. And if you were smart, you'd buy a backup drive or two just in case your primary drives broke. (Tell story of how we lost all the pictures of our first born--though how we were able to reclaim these through family sharing the pictures they had taken....as well as how some of the pictures I had taken were on Flickr.



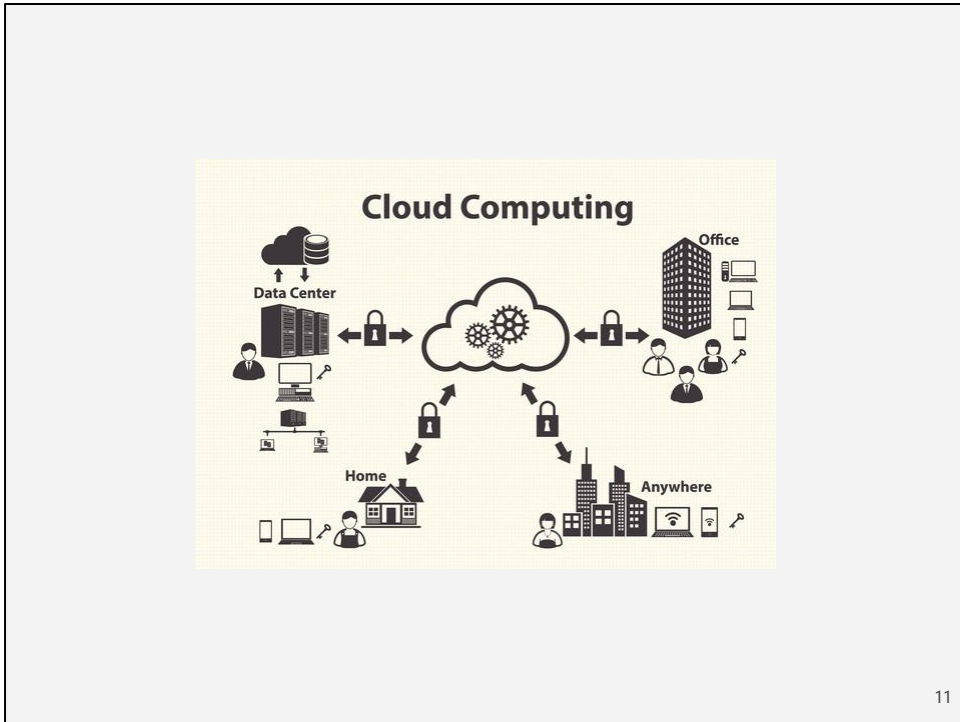
During the computing on the ground era you moved all that data on tapes originally---way back yonder in the 80s---i can remember my dad bringing home a Commodore 64 and it took upwards of a half hour to load up a game using what was called a dattasette. Then it moved to floppy disks--first the big 8 inch kind, then 5 inch, and finally the 3 inch "compact" kind. And there were other kinds of storage-- The DAT, the Zip Drive, flash memory cards CDs, hard drives, flash drives..etc... **All these dynamics drove the computer industry for the last 30 years or so.**

Computing in the cloud

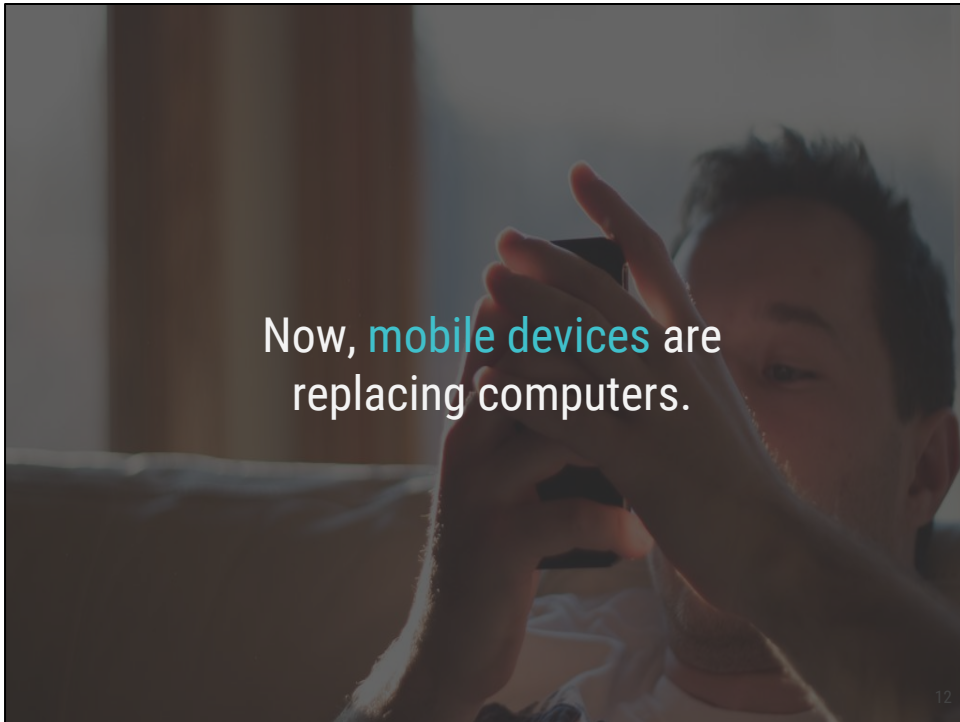
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Which brings us to where we're at right now: computing in the cloud! So real quickly---let's give a definition of cloud computing. **In the simplest terms, cloud computing means storing and accessing data and programs over the Internet instead of your computer's hard drive. Simple as that!** The cloud is just a metaphor for the Internet. **What the cloud is not, is what I was just talking about--it's *not*** about what is on your hard drive at home. When you store data on or run programs from the hard drive, that's called ***local storage and computing***. Everything you need is physically close to you, which means accessing your data is ideally fast and easy for that one computer, or others on the local network. Working off your hard drive is how the computer industry originally functioned, as I was just saying, for the last few decades--that was computing on the ground.

A fancier definition of cloud computing comes 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 computing resources (e.g., networks, storage, applications and services) that can be rapidly provisioned and released with minimal management effort or service provider.



As I was just saying, In computing lingo, the cloud is simply another word for the public internet. Drawing diagrams of large-scale computer networks, planners and system administrators often use a fluffy cloud to represent the internet, either outside the corporate networks, or as a link between far-flung systems. It looks something like this:



So what's suddenly changed after 3 decades of computers on the ground? Why are we suddenly in the cloud? Biggest Reason: Today, nearly two-thirds (77%) of U.S. adults own a smartphone, up from 35% in 2011. A majority of us are spending more and more time on mobile devices---

Connectivity to the network is more important than computing power.

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Because we're increasingly mobile--and increasingly dependent on using our computers when out and about--connectivity is becoming more important than computing power. For example, many people come into the library with their laptops or smartphones and now assume, correctly, that they'll be able to connect to the Library WiFi to get their work done. And their work, more often than not, isn't stored on their computer or smartphone---it's waiting for them in the cloud.

Or to give another, more personal example of how connectivity is more important than computing power-- I'm terribly directly challenged--I get lost in my own house---so when I'm driving to somewhere i've never been I rely on using Google maps to guide me in real time to where i need to be--i'm relying on--i'm depending on being able to connect to the network, in this case Google Maps, to get where i need to go.

We use **web browsers** to
communicate, work, create, and play.

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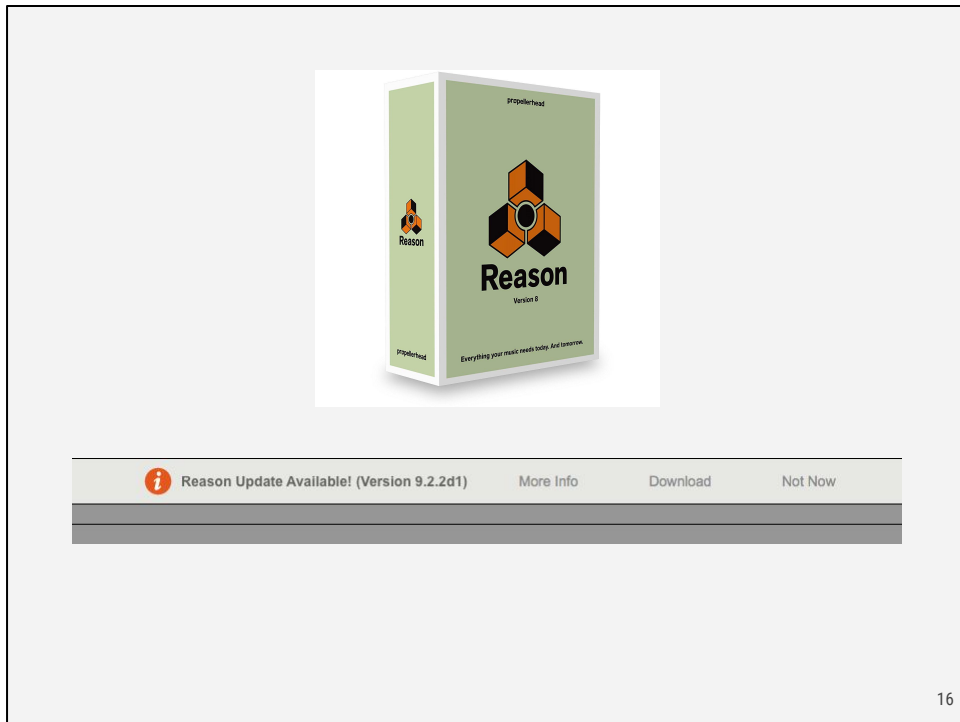
When we use email--whether it's Google Mail, Yahoo or Hotmail---we're using the cloud. More and more businesses, city governments and people are reliant on cloud technology to get their work done.

To give an example of how somebody might use a browser to create or play--I created this entire presentation using Google Slides. I simply connected to my Google account through a browser (I use Firefox), opened their free Google Slides platform and was able to create this presentation. I could easily work on it from home or at work or really anywhere, so long as I had a computer (a home computer, a tablet, a smart phone) and wifi connectivity.

Web-based software is instantly
available, always up-to-date.

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We're no longer having to go the store to buy software.

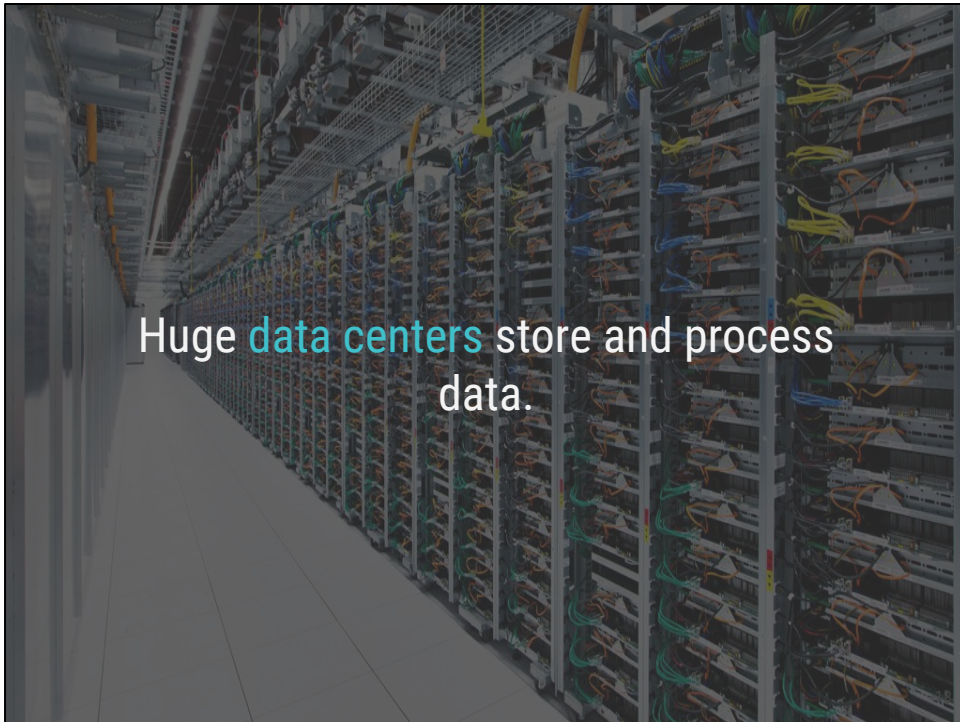


For example, I make music using a program called Reason created by the Swedish company Propellerhead. It's used to be that when an update came along you'd have to buy the actual physical software and install it on your computer---usually a disc that I'd order and that would then arrive several days later in the mail. Now, however, when Reason makes an update I get a real-time notice when I'm using the software--and so paying and updating the software takes, literally, a minute or two as opposed to the week or two it used to take. When I'm using Reason, it's always up to date. If Propellerhead, the company that makes Reason discovers a flaw or glitch, they can fix it and make the update instantly available to all its users.

We create **accounts** to use software
for **free** (or with monthly fees).

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Back to my Google account --I can use a variety of free software besides just Google Slides---I use Google email, photo storage, spreadsheets or, as I mentioned before, Google Maps. I also like to create personal video essays and sometimes use software by a company called Adobe that a couple years ago went entirely online. So, again, instead of buying their software physically, which is what you used to do before---you now subscribe to their apps (they no longer call them software) by choosing the plan that works for you and it's constantly updated in real time. This is important--they make cutting edge photography/film/animation/after-effects software---.which like so much technology is constantly, rapidly evolving. So where it used to be that you might be using physical software that was several years out-of-date, you can now use (in fact you're only option is to use) the most recent platform they've created



Huge **data centers** store and process data.

So where is the cloud? Well, it's not actually a cloud--if it's anything it's these huge data centers that store and process data. As of last year there were roughly 3 million data centers in the U.S. alone--that means about 1 data center per 100 people. When I saw this fact the other night I thought--where did I get that information--that's a huge amount. The information comes from the Chicago-based non-for profit Natural Resource Defense Council (NRDC)---and it includes server rooms supporting small- to medium-sized organizations, to the data centers running large corporations, to the server farms hosting Amazon, Facebook, Google and others' Internet-based "cloud" computing services.

Files are **backed up** across **multiple locations**, sometimes around the world.

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Because there are so many of these data centers if one or two or a dozen of these data centers goes down, chances are good that another dozen, in different locations around the U.S. or the world can continue to store and process your data. It's all distributed.

Types of cloud computing

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So what kinds of cloud computing are out there? Because there sadly isn't just one kind. They had to go and make it even more complicated!

Software as a service (SaaS)

TurboTax online
Google Drive
Salesforce CRM
Reason (music software)

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The first kind of Cloud Computing is known as Software as a Service: SaaS is a [software](#) delivery method that provides access to software and its functions remotely as a Web-based service.--Often you pay a monthly or yearly fee for the software. Also, because the software is hosted remotely, users don't need to invest in additional [hardware](#). Software as a Service removes the need for you to have to deal with the installation, set-up and often daily upkeep and maintenance. Software as a Service is sometimes known as “hosted applications.” So the Reason music software I was discussing earlier falls under the SaaS umbrella.

Platform as a service (PaaS)

Google App Engine
Amazon Elastic Beanstalk
Heroku

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The next kind of Cloud Computing is known as Platform as a Service: PaaS is a set of tools and services designed to make coding and distributing those applications quick and efficient. PaaS can be defined as a computing platform that allows the creation of web applications quickly and easily and without the complexity of buying and maintaining the software and infrastructure underneath it. PaaS is similar to SaaS except that, rather than being software delivered over the web, it is a platform for the creation of software. This is great for folks like my young cousin who just graduated from graduate school is determined to make a killer app that everybody will need. Something like PaaS allows him to focus on the coding for this killer app rather than spending lots of time worrying about the backend infrastructure.

Infrastructure as a service (IaaS)

Google Compute Engine

Amazon EC2 & S3

Microsoft Azure

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Infrastructure as a Service (IaaS) is a way of delivering Cloud Computing infrastructure – servers, storage, network and operating systems – as an on-demand service. Rather than purchasing servers, software, datacenter space or network equipment, clients instead buy those resources as a fully outsourced service on demand. So if your app were to suddenly take off, you could move from 1 server to 1000 servers to meet your newfound demand.

Examples of cloud computing

Hosting email with Office 365

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"Office 365" refers to subscription plans that include access to Office applications (like Word and Excel) plus other productivity services that are enabled over the Internet (or cloud services), such as [Skype for Business web conferencing](#) and [Exchange Online](#) hosted email for business, and additional online storage with [OneDrive for Business](#). You get regular updates and improvements. And you can access these files/apps from any computer connected to the internet.

“Some people have very large mailboxes, so we can save money on storage by moving that content to Microsoft Office 365 rather than keeping it on our storage area network.”

Michael Van Horenbeeck, Consultant. Xylos
<http://office.microsoft.com/en-us/exchange/microsoft-exchange-online-customer-stories-FX103934579.aspx>

example...

Using [Amazon Web Services](#) for infrastructure

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Amazon is most dominant force in cloud computing. While would-be competitors snoozed, the internet retailer tiptoed into the business technology market over the past decade, becoming the dominant force in cloud computing. Its computing business, Amazon Web Services, hauled in \$12.2 billion in revenue last year from customers ranging from [Netflix](#) to the C.I.A.

Amazon Web Services (AWS) lets companies buy powerful computers cheaply and whenever they need them to handle traffic, to store video, to power a database. It's not an understatement to say that AWS is *the* piece of infrastructure that has enabled the current tech boom. The only single technology which might come close to it is the smartphone. Why? **The 2010s tech industry is built on quickly scaling a product to as many users as possible.** It's based, on other words, on fast growth. Amazon Web Service and its competitors are what permit that fast growth. They have taken the normally considerable equipment costs—of servers, cables, hard drives, and power supplies—and abstracted them away. Entrepreneurs and coders can think about and purchase computing power on an as-needed basis, while the physical data centers they're actually using sit far away in Virginia or Oregon.



Perhaps the most well-known example of cloud computing on a large scale comes from **Netflix**. The digital-video service [runs](#) its computing needs on Amazon's IaaS (Infrastructure as a Service) platform, with no traditional data centers of its own. This arrangement works despite Netflix and Amazon being direct rivals in the video market. Here's a great video on how that works.

Benefits of cloud computing

PEOPLE

Spend less time **managing** a
computer.

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No hassles with software compatibility, installation, and upgrade. It does all these things for you.

Your files are always available.

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This is a big one for me. I'm no longer chained to just 1 computer to get work done...or I don't have to worry about making sure to download my work to a flash drive, travel, and reupload it to another computer. Now my files will travel anywhere I can log into the internet. I can do the work on my tower computer, on my iphone in bed, or at my work computer.

Use **devices** that suit each situation.

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Get more out of less expensive devices--you don't have to buy a super powerful computer that can run all sorts of complex programs---now you can have access to very complex programs via "cheap" tablet computers--even your mobile phone.

Benefits of cloud computing

COMPANIES

Focus on **core business** not
managing **infrastructure**.

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Less operational issues (like dealing with your tech infrastructure) allow your employees to spend their time on other more useful activities that may offer a greater potential value to your business. This benefit is different for every organization and harder to quantify, but people are an organizations biggest asset and this allows you to better utilize this asset.

Easily **scale** services to meet demand.

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Your business can scale up or scale down your operation and storage needs quickly to suit your situation, allowing flexibility as your needs change. Rather than purchasing and installing expensive upgrades yourself, your cloud computer service provider can handle this for you. Using the cloud frees up your time so you can get on with running your business.

Small companies access vast
resources of mega companies like
Amazon and Microsoft

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This speaks for itself. A small company can tap into the huge resources of a mega company and reap the benefits.

Drawbacks?

Control, access, and cost

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Control: To varying degrees (depending on the particular service) cloud users have limited control over the function and execution of their hosting infrastructure. A cloud provider's management policies might impose limits on what customers can do with their deployments. Customers are also limited to the control and management of their applications, data, and services, but not the backend infrastructure. Of course, none of this will normally be a problem, but it should be taken into account.

Access: This may be **one of the worst disadvantages of cloud computing**. No cloud provider, even the very best, would claim immunity to service outages. Cloud computing systems are internet based, which means your access is fully dependent on your Internet connection. And, like any hardware, cloud platforms themselves can fail for any one of a thousand reasons.

Can your business absorb a prolonged bout of frequent outages or slowdowns? And don't think it doesn't happen. 2014 saw more than a few incidents where service providers like DropBox faced an outage for as long as two days.

Cost: While cloud computing is relatively inexpensive to start up, depending on your needs, an in-house solution may cost less in the long run. Buying an in-house server and installing a network system is definitely a large, up-front capital investment, and you also need to consider ongoing IT maintenance costs.

With cloud computing, you pay the same amount each month to maintain not only your server, but also all your data. The choice you make may depend on whether you have a lot of startup capital to invest in a private network. Be sure to compare all the costs for supporting both an in-house server and cloud-based server to see which

option works best for your situation.

Security and the cloud

Is the cloud secure?

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Security is a complex and rapidly evolving issue. Obviously big companies like Amazon or Microsoft want your business and with organizations like Target and Sony suffering big cyber breaches recently, keeping the cloud safe is a big concern.

One of the [biggest benefits of cloud computing](#) is that data is no longer stored physically in your business. If your business unfortunately burns down in a fire, you don't have to worry about losing years of hard work along with everything else. The downside of this is one of control. Not only is your data now under the watchful eye of a third party, but that third party could also be located in a European country with looser security laws or general regulations than in the United States.

In order to make cloud computing safe for your business, always make sure that you're verifying where your data is stored, what security measures your solutions partner is both required to provide and goes above and beyond to provide and other factors before you choose one particular company.

Most computer security experts agree, that as of now, when you don't own the network, it's open to the rest of the world, and you don't control the layers of the stack, the cloud — by definition — is more insecure than storing data on premises.

The top method for cloud-based security issues experts say, is stolen or cracked passwords. Hackers gained access to Target's data by stealing a vendor's login information. More recently, at eBay, hackers gained access to its entire customer

database by stealing an employee's passwords.

The most basic defense, security experts say, is strong authentication schemes — and strong, unique passwords to different cloud applications are only the start. Security specialists recommend that companies enable multifactor authentication, perhaps requiring users to sign in with their password as well as a one-time code, like one texted to their phones or momentarily displayed on a security token.



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