# *An Exploration of the Benefits of Cloud Computing and its Application for Personal and Commercial Use*

Nathan Padinha

ITE 213

Re

12/20/23

Table of Contents

Cloud Computing is a networking model which allows the user to access software and hardware that would otherwise be inaccessible. Due to its supportive nature, it has not only left a positive impact on commercial and corporate settings, but also on personal and entrepreneurial pursuits.

The cloud can be used for a number of different things including, but not limited to, file storage and management, video and game streaming and web hosting. All this is possible from anywhere and on nearly any device. In its simplest form, cloud computing is defined as the processes of your computer being accessed through the internet. Put more simply, it is like having a computer that you can always get to as long as you have an internet connection. Many large companies could not exist without the cloud. Hulu, Netflix and Max are all cloud exclusive services and do not have physical or locally hosted alternatives. However useful it is to watch movies or play games, the cloud is not exclusively for personal use. Many companies rely on the cloud to function efficiently. Pinterest uses AWS cloud to create a platform millions of people enjoy (Singh, Prashant.). On a larger scale, General Electric uses a cloud files system which they use for analytics and management.

Cloud computing dates back to 1963 where the Defense Advanced Research Projects Agency gave MIT $2,000,000 for project MAC along with the requirement that they develop a basic multi user system. It needed to be a computer that could be accessed by multiple people simultaneously. This basic system would eventually become the precursor to the modern day cloud. If you want something that is more directly recognizable as a cloud, you have to jump to the 1990's. Professor Ramnath, who declared it a new "computing paradigm", said that "the boundaries of computing will be determined by economic rationale, rather than technical limits alone." (Foote, Keith D) Which in layman's terms means that using the cloud instead of

technology being the problem the new limitation would be money. The first example of a cloud which resembles the modern day was in 2006 when Amazon released AWS (Amazon Web Services). Later that same year Google docs was released which is a billion user platform that is still widely used to this day.

Cloud computing provides serious benefits over traditional computing environments, especially when applied to small businesses and personal use because almost nothing is hosted locally the hardware barrier to use high level software is much lower which significantly reduces the cost and increases accessibility. There are three different Cloud Service Models. These Service Models are: SaaS, PaaS and IaaS.

SaaS (Software as a Service) is a service that offers a pay-per-use model of software deployment, as opposed to licensed software where you do not own the software the service provider simply deploys in instance of the software on your computer. As a result, installation of the software is not necessary as well as making the software platform independent. Due to the lightweight nature of SaaS it can run in a browser making it significantly more accessible to people who may not own high level hardware to run these taxing programs. This also significantly reduces cost for the user because software licenses are almost always more expensive then the SaaS deployment of the same software. Two popular companies that use SaaS in their cloud services are Google with the services like Google Drive and Gmail and Microsoft with their Microsoft365 line of software (Ecourse Review).

PaaS or Platform as a Service is a cloud computing model mainly used by developers. It has four main components: a PLEE (Programming Language Execution Environment), an operating system (OS), a web server and a database. This provides an environment where

developers can run programs without worrying about damaging their hardware. In this model the only thing affecting one's hardware is data management and application resources; everything else is handled by the provider. Two popular companies that use PaaS in their cloud services are Amazon with their AWS (Amazon web services) and Google with their Google app engine (Ecourse Review).

Infrastructure as a Service or IaaS is a service model in which everything is run through the service provider. The provider offers all resources in a virtual environment so many people can access them at the same time. This service model is used by many businesses including schools so that everyone who needs to access any programs or software can do so from anywhere regardless of the hardware limitations they're working with. Most users of the service model are network administrators who are deploying them in their business or District. On the consumer side they are responsible for handling applications and data management (Ecourse Review).

There are three Cloud deployment models: public clouds, private clouds and hybrid clouds. These three models have different uses but are all useful if deployed in the right circumstance.

Public clouds are deployed by service providers where their customers pay for the ability to use software and have access to their hardware. These are typically run on subscription models or pay-as-you-go models where customers pay for utilization of the product. Simply after the customer stops paying money they stop getting access to the products and services. Public clouds allow you to offload management which means that you do not have full control over your services. This makes it popular with everyday people to run services such as email (IntelCanada).

Private clouds are the opposite. They have full control over everything including services, data and management. The ability to have full control is because private clouds are exclusive, meaning there is only one client per cloud (IntelCanada).

Hybrid clouds are a combination of both public and private clouds as could be expected due to its name. Hybrid clouds allow for the control of private clouds, but they give you the safety net of having a public cloud during a spike in demand. This is especially useful for the development of apps and services so that you can have your app work dependably and manage it reliably, but also in cases of high demand and traffic which have the safety net of a public cloud ensuring that your app does not go down (IntelCanada).

There are many players in the field of cloud computing, however, there are a few titans that stand above the rest. Amazon, Google and Microsoft are far and away the biggest providers of personally used clouds. All three of these companies have impressive Cloud lineups. Google has many services including: Docs, Sheets, Slides, Forms, Google Drive, Gmail, Google Meet, Google Chat and Google Voice. Microsoft's lineup includes Azure virtual machines, SQL database, Blob storage, Cosmos DB, App services, Azure functions and the Event grid. As opposed to Google and Microsoft who are more marketed towards everyday individuals, Amazon web services (AWS) is geared to application providers and vendors. In their section on AWS - Amazon says AWS is designed to allow application providers, ISVs, and vendors to quickly and securely host their applications. Amazon themselves admits that Amazon web services are not built for everyday people but developers and vendors (“Benefits.” Amazon Web Services, Inc.).

As of February 6th, 2023 Google has roughly 10% of the market share in the cloud computing market, Microsoft has nearly 25% and is rapidly growing while Amazon holds the lead with a truly impressive near 35% market share. While Amazon's current market share is impressive, it is worth noting that Microsoft is rapidly approaching (Miller, Ron). A study done in 2018 compared Amazon Web Services (AWS) and Microsoft Azure in the field of high-performance computing concluded that Microsoft Azure was the overall cheaper solution due to its faster network and larger Ram for a comparatively low price and cheaper bandwidth when compared to Amazon (Kotas, Charlotte, Thomas Naughton, and Neena Imam).

It's a good idea for the everyday individual investing in cloud computing, however it is a recurring cost. Publicly used clouds are subscription based; an example would be the cost of Google's Premium Cloud service ranging from a minimum of $20 annually to a maximum of $100 annually. This price is determined by how much storage the subscriber uses. As an example, Google provides 15 GB worth of free storage across all of their platforms. If you reach the maximum allotted storage of your free account, you can then buy more storage with a subscription which charges either monthly or annually. This depends on the chosen plan.

Microsoft, like Google, also charges for their services. The Microsoft 365 line of services offers similar products to Google. Microsoft 365 packages include Microsoft Word, Excel, PowerPoint and other popular services such as OneDrive. OneDrive which is Microsoft's cloud storage service can range between $70 to $100 annually.

Cloud services other than storage that are publicly available also come as subscriptions services such as Netflix, Disney Plus, Google Stadia and Xbox Game Pass all come at a variety of prices. The one thing they all have in common is they are all subscriptions. All of these

services stored on cloud services are typically more cost effective than they would be for the consumer to host locally. For example: Google's premium storage plan is $99.99 for 2 terabytes of storage, if one was to create a network attached storage server ( NAS server) the storage alone can start at $59.99, this is not including the computer used to host to the server or the electricity powering the server (the average consumer can expect to spend around $149.99 for a reliable 2TB SSD alone). In addition, a network attached storage server is only available on your local network whereas Google Drive or Microsoft OneDrive can be accessed from any device with an internet connection anywhere in the world. This is why for most people it is recommended to use a cloud storage service such as Google drive or Microsoft OneDrive or their storage Service needs.

If as a business owner you wanted to migrate to a cloud-based ecosystem, you may be wondering how to migrate your software and why you should migrate. Touching on the first point, migrating to a cloud-based ecosystem is relatively simple due to the fact that most cloud services allow you to directly transfer files from your hardware to their servers seamlessly. The biggest hurdle you would have with introducing a cloud-based ecosystem would be with the personnel. As a business owner you would need to train your employees on how to use the new system to ensure a seamless transition of self-hosted to Cloud-hosted software. Benefits of moving your operations to a cloud-based model include a reduction in cost, increased scalability and increased security (IBM Technology).

Generally speaking, for the everyday user the cloud is a secure place to operate. However, just like any other system, the cloud has security flaws which if exploited could result in data leaks and other breaches of security. Cloud security breaks down into a few simple points; access risks, data risks and platform risks. The simplest of these three risk types is access risks. Access

risks boil down to making sure people who shouldn't be accessing your software aren't accessing your software. This can include removing compromised employee privileges on the network or cloud service, disallowing at-home use of company resources, and other physical security precautions such as man traps.

Data risks are slightly more complex though still relatively easy to understand. Examples of data risks include improper disclosure of data, receiving harmful data through an application and storing harmful data. Improper disclosure is when a person divulges information through means by which it should not be communicated by for example sending credit card or social security information via email. Receiving harmful data through an application, put in layman's terms, getting harmful data such as malware through an unchecked application. Storing harmful data is storing either personal data to which the company does not have a right, or illegal data such as pirated movies or games. All three of these data issues can be resolved through sufficient training. In the past, many large companies have made it mandatory to take classes on improper disclosure and phishing to ensure that risk is mitigated. These same companies have also issued training on application weaknesses and the legality of data to ensure there are no legal liabilities or possible security risks that would affect the company (Google).

The third area of cloud security is platform security. Unfortunately the user has very little say in platform security as it is entirely controlled by the cloud service provider. This example shows what Google uses for their platform security. Please note that this is not an industry standard, but similar practices are taken by most cloud service providers. Google takes security extremely seriously; they have over 850 security engineers whose jobs are dedicated to finding security flaws and fixing them. They have penetration tests that are constantly running to try and crack Google's security. On top of that, they have a 24/7 active watch of guards watching

the physical hardware. They also have a bug bounty program which looks for bugs and alerts Google's engineers if it finds one. On top of all of that they have a 2-billion-dollar annual security investment. As said before these are not industry standards, but most companies have similar practices such as guards watching the physical servers, large security budgets and programs designed to attempt to break their security (Google).

In conclusion, Cloud computing has revolutionized both personal and commercial computing from governmental research projects in the 1960s to corporations like Google and Amazon creating clouds for personal use. Cloud computing has undoubtedly made an extraordinary impact on every aspect of computing and without it the landscape of the modern day computer would not look the same. The three service models give users flexibility to an unprecedented degree allowing for different kinds of users to access the cloud for exactly what they need; everything from an average person to a developer to an IT administrator can find exactly what they need on the cloud. The cost-effectiveness of cloud computing cannot be overstated. By removing the need for expensive and complex hardware, cloud services lower the barrier of entry for small businesses and individuals to access industry level software for significantly cheaper than they would otherwise be able to. It is both cheap and secure because providers like Google spend billions in security through dedicated teams along with advanced penetration testing. For businesses thinking about migrating, the benefits are amazing. Reduced cost, increased scalability and enhanced security are all things a business needs; these are all things the cloud has in spades. Though it is important to remember that along with the cloud comes employee training to make sure the cloud remains easy to use, safe and secure.

## *Reference*

Ecourse Review. “Cloud Computing Services Models - IaaS PaaS SaaS Explained.” YouTube, 5 Apr. 2017, www.youtube.com/watch?v=36zducUX16w.

Foote, Keith D. “A Brief History of Cloud Computing.” DATAVERSITY, 4 May 2023, www.dataversity.net/brief-history-cloud-computing/.

Gorelik, Eugene. Cloud computing models. Diss. Massachusetts Institute of Technology, 2013.

Google. “Top 3 Data Risks in Cloud Security.” Www.youtube.com, www.youtube.com/watch?v=QJcRkpzW8Mw&list=PLIivdWyY5sqLO-4ePY-A2yROgONOA6Cz4&index=3. Accessed 18 Dec. 2023.

Google. “Top 3 Platform Risks in Cloud Security.” Www.youtube.com, www.youtube.com/watch?v=N83Ru1c77U4&list=PLIivdWyY5sqLO-4ePY-A2yROgONOA6Cz4&index=4. Accessed 18 Dec. 2023.

IBM Technology. “What Is Cloud Migration?” Www.youtube.com, www.youtube.com/watch?v=yWByEVB0VJE.

IntelCanada. “Public Cloud vs Private Cloud vs Hybrid Cloud.” YouTube, 26 Nov. 2014, www.youtube.com/watch?v=3WIJ4axzFlU.

Kotas, Charlotte, Thomas Naughton, and Neena Imam. "A comparison of Amazon Web Services and Microsoft Azure cloud platforms for high performance computing." 2018 IEEE International Conference on Consumer Electronics (ICCE). IEEE, 2018.

Miller, Ron. “Even as Cloud Infrastructure Market Growth Slows, Microsoft Continues to Gain on Amazon.” TechCrunch, 6 Feb. 2023, techcrunch.com/2023/02/06/even-as-cloud-infrastructure-market-growth-slows-microsoft-continues-to-gain-on-amazon/.

Singh, Prashant. “Cloud Migration Of Pinterest and How Pinterest Using the AWS Services.” Medium, 2 July 2023.