**Clouds, Services and Servers – Corbin Peever**

Cloud computing is a relatively new term on most people’s lips, but it is something that has been around for a long time now. According to EDUCBA (2020), the earliest form of cloud computing dates all the way back to 1963 when J.C.R Licklider, an American Psychologist and Computer Scientist, created a computer system that allowed three users to all operate on the same, local, computer that ran on magnetic tape. Licklider would go on to create an early precursor to the internet, called ARPAnet, in 1969.

Since then cloud computing, and computing in general, have come a very long way. Where it was once only possible for three users to operate locally on a primitive computer using magnetic tape and pullies, we can now easily maintain online networks of hundreds-of-thousands of users, all sharing their own personal data, at millions of gigabytes per minute. It is expected that by 2025 the internet will exceed 163 zettabytes in size (Nicole Martin 2019, para 9). That’s the equivalent of 151.7 trillion, studio length, television quality, 1GB movies.

The size of the Cloud is massive, and it affords us so much utility, but how does it work? HCL tech summarises is nicely on their website (hcltech.com n.d, para 1) – “Cloud-computing is an application-based software infrastructure that stores data on remote servers which can be accessed through the internet.” It gives internet users access to systems, applications, services and storage that they would normally have to pay to license or develop themselves. This is especially useful when you need to upgrade your storage but don’t want to commit to a large initial cost; you can buy data from a data pool like Google Cloud or Microsoft Azure. Or as a company you can’t afford the hefty costs of a local server network; you can use a collaboration service like Dropbox or Slack. Or as a fledgling business you can’t afford to buy a full Microsoft Office Suite for all of your staff; you can use Microsoft Office Online for free!

With the rapid expansion and commercialisation of the internet, society has been impelled to revolutionise and improve on how we manage ourselves online. Data storage, security, flexible scalability, technical support and social and environmental impacts are all topics that are important to consider when contemplating how we manage the internet, our data and how we move forward. Cloud computing offers a solution so effective; it’s already becoming our primary solution worldwide. In fact, unless specifically designed not to, almost all current data is in contact with the Cloud – in some form or another.

Traditionally, data storage has always been done locally. Though there are a few upstream data-storage services that have been around for a long time, like data storage on a website, the status-quo has been to store your own files on your own hard-drive, external drive, or local network. Similarly, if you interacted with a website online, or downloaded a file, it would come from, or be stored on, the other party’s local storage in a peer-to-peer format. There are clear benefits to storing your data this way. You, the user, know exactly where your data is stored and who has access to it, own your own equipment outright without risking future expenses, have control over the equipment used – you can fit your needs and can have confidence in the backup procedure in case of data loss.

With huge advancements made in cloud technology, and the ever-increasing requirement to revolutionise our data storage methods in-way for more flexible options, cloud computing is becoming more diverse than ever. Cloud-companies now offer a huge array of online services designed to give the user better control, with less of the initial cost.

Services are online based, customer facing solutions leveraging cloud software and are used in innumerable different functions. They come in three main forms; Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS) and Software-as-a-Service.

**Here is a brief explanation on the three:**

1. **Infrastructure-as-a-Service:**  Refers to a physical, data-storage or hosting facility or enterprise. IaaS is mainly used as a data cloud storage solution because it affords customers flexible scalability options, thorough backing up and redundancy and unparalleled security, all without having to buy their own equipment or pay for maintenance and management of their local network. Examples of IaaS are data warehouses/lakes like the Microsoft Data Centre in Iowa, USA.
2. **Platform-as-a-Service:** This is when a company establishes a platform, or suite, in which a user can develop, test and launch their own apps, without having to manage data storage or fluctuations in data requirements. Often, they are developed with built-in SaaS functionality. Although Microsoft Azure is based on IaaS architecture it also offers a PaaS to develop, launch and manage web and mobile apps among other things.
3. **Software-as-a-Service:** Also known as web-based software, hosted software and on-demand software (Josh Fechter 2020, para 1), SaaS refers to when a company offers a user-facing software that is centralized by the company and has limited usability. Cloud-Based Microsoft Office Online is an example of SaaS. It allows users to create, edit, share and collaborate on a host of Office 365 applications, purely online, for free.

There are many other types of services like Security-as-a-Service, Machine-Learning-as-a-Service and Data-as-a-Service, but all are speculative and haven’t achieved notoriety like the three previously listed.

Even though the Cloud is already such a prolific aspect of the internet, its growth is only expected to increase with the global public cloud computing market set to exceed $620 billion US by 2023 and upwards of 90% of companies already existing on the cloud (Hosting Tribunal 2020, para 4 & para 10). As you can imagine, there are many different iterations of cloud computing.

**The primary examples of cloud computing are:**

1. **The Internet** - the first and most notable form of cloud computing – a system that allows users to share data between devices over long distances using the Internet Protocol.
2. **Social Networking** is currently the most popular form of cloud computing if you don’t include the internet. Huge amounts of data are stored and shared between users, in real-time, constantly. Examples are Facebook, Instagram and Tik Tok.
3. **Streaming Services** like Netflix, YouTube, Apple Music, Soundcloud and Twitch. These SaaS companies allow users to manage and store their own data and preferences, but only through access to the frond-end of the application.
4. **Chatbots** involve machine learning programs that leverage large cloud-based databases to interact with humans usually in-regards-to customer service queries or technical support. You can find a chatbot on most good quality websites.
5. **Communication** SaaS applications like Skype, Microsoft Teams and WhatsApp that enable groups of people to communicate at the same time using video or sound, sometimes with built-in PaaS functions.
6. **Productivity/Collaboration** applications like Google Docs or Slack that users can use to organise groups of people in a professional capacity. Specifically focuses on productivity in a vocational or educational setting.
7. **Storage/Recovery** facilities that offer IaaS solutions to their customers – data centres in particular. Data centres are large facilities whose sole purpose is to offer data storage solutions on a large scale with the highest possible security, back up/redundancy and flexibility. An example of a data centre is the Equinex Data Centre in Sydney.
8. **App Development** PaaS or suites that allow development, management and deployment of web and mobile applications. Examples include Microsoft Azure, Amazon Web Services and Google App Engine.
9. **Application Development Testing** clouds like mobile app testing clouds that are used to test new applications on a variety of devices in life-like situations. Amazon Web Services comes with a Device Farm for testing alongside development.
10. **Cloud Analytics** – a term describing big businesses using cloud computing to perform market analytics on massive amounts of customer data from pre-structured data warehouses like Google BigQuery.

Cloud computing may have started as a complex system of mechanics in a college laboratory almost sixty years ago, but its progress has come far. There is no shortage of choice in the way of safely storing our personal data, and there are more software development options than ever before. But is there a cost to such a boon? And where are the nay-sayers, if there are any? Well, certainly in some ways there is an impending need to be concerned about the future of the Cloud and what it implies for our privacy and security.

The nature of the Cloud is its interconnectedness, this is also its greatest downfall. Because the Cloud is a collection of many devices, if someone were to upload malware or gain access to one device, they have the potential to affect a vast network of people and the damage can have massive, worldwide consequences. In 2016 it was expected that data centre outages were caused by cyber-attack 22% of the time, up from 18% in 2010 (João Marques Lima 2017, para 12). In 2014 Apple’s iCloud was accessed by hackers and dozens of super-famous celebrities’ nude photos were leaked to the public (Susan Noakes 2014, para 2). A hacker gained access to a user’s device through the find-my-phone function and was able to access countless more accounts through the cloud. In 2017 Amazon Web Service experienced a four-and-a-half-hour downtime due to a mistake in performing updates (Amazon 2017). This affected Expedia, Slack and even the U.S. Securities and Exchange Commission (Nat Levy 2017, para 2).

But the future of the Cloud is anything but overcast. We will all notice its presence more and more as companies adopt it as their primary way of offering products to customers. Or perhaps we’ll notice it less and less as it is imbibed as the new representation of computing on the internet rather than the exception. Microsoft Azure is a perfect example of this.

Azure has a massive range of products to choose from, encompassing every example of a cloud service. Machine Learning, analytics, blockchain, databases, DevOps, Mobile and Web Apps, Storage, Security and Virtual Machines are a few examples of their huge product range (Microsoft 2020). It really is a fully functional development suite to build, manage, launch, maintain and store fully-fledged mobile and web apps. But this is a very small droplet in a very large Cloud. According to ZDNet (Larry Dignan 2020) Amazon, Google, Oracle, Alibaba, Dell and IBM are a few of the other market leaders that also add a tun of water-weight, with countless more unmentioned.

The usefulness in being able to “bolt-on” applications, storage and platforms to launch from is undeniable and the allure of compartmentalising services into smaller “bite-size” pieces that can be adjusted to suit the user’s needs is too appealing when the alternative is often a large up-front cost or many hours of work.

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As an aspiring professional in IT, I expect my career will be defined by cloud computing in many ways. I already have access to more storage potential on cloud IaaS than I do on any local storage device and I can see clear benefits in using development-specific utilities when creating market-level applications. The industry is ever-changing, and Moore’s Law, the law that posits that the processing power of new computers doubles every two years, has now begun to slow down with some people suggesting that theory will have completely run its course by the early 2020’s (Luke Dormehl 2018, para 5).

Industry has been driven by a constant improvement in computing power and to continue this age of prosperity, we will have to take on a different approach to new advancements and I believe Cloud computing has incredible potential to become the “new” way we evolve technology, alongside other powerful new creations like machine learning and ingenuity in CPU cores.

Either way, Cloud computing is here to stay. It is already a monolith of data and continues to increase every day. The future of computing is still unsure, but there certainly isn’t a storm coming over the horizon. Just nice, sunny, days for the Cloud.

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