

Jamie Gau - Cloud-Based Web Services Assignment 2 Report

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ACCA6024 – Cloud-Based Web Services

Cloud Computing, Docker and Node.js Technologies

Assignment 2

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Chapter 1 – Introduction

1.1 – Abstract/Structure of the Report

The first part of this report will outline the use of cloud computing in the modern world, as well as the benefits, drawbacks, cost, reliability, and scalability of utilising it and its services. These topics will be covered in chapter 2 of the report. Chapter 3 will focus on NodeJS and Docker technologies, specifically the adoption of Docker, and the fundamental differences and driving forces behind it. It will also include an evaluation on the development process of producing NodeJS applications that can run in Docker. Code snippets will be provided to further support the claims that are made. Chapter 4 will contain the conclusion to the entire report, in the form of a brief summary. Finally, chapter 5 will contain the list of references used in this report.

Chapter 2 – Cloud Computing Applications

2.1 – What is Cloud Computing?

Cloud computing refers to the process of delivering hosted services over the internet. This works by using remote physical servers, databases, and computers to allow clients to access data and cloud applications over the internet. An internet connection links the front end to the back end, which serves as a repository, storing data accessed by the front end. Communications between these two ends are managed through a central server, that relies on protocols to facilitate the exchange of data. Cloud computing relies greatly on the use of virtualisation to allow for the easy provisioning and abstraction of services and underlying systems that users will be requesting or utilising. The services that are delivered over the internet can be split into 3 different categories: infrastructure as a service (IaaS), software as a service (SaaS) and platform as a service (PaaS). [1]

2.1.1 – IaaS Cloud Computing

Infrastructure as a service cloud computing is a form of cloud computing that delivers services and resources to users over the internet on-demand, or on a pay-as-you-go basis. IaaS allows end users to scale resources on an as-needed basis, reducing any upfront expenditures and “spiky” workloads. In contrast to PaaS and SaaS, IaaS provides the lowest-level control of resources in the cloud. Many corporations have adopted the use of IaaS cloud computing, as it is seen as very cost-efficient and effective. [2]

2.1.2 – SaaS Cloud Computing

Another main type of cloud computing is software as a service cloud computing. SaaS is a model for deploying software in which a third-party company/organisation builds applications using the cloud

infrastructure, then makes them available to end users over the internet. This allows for that software to then be accessed from any device with an internet connection, and not just from a specific physical device. SaaS can be deployed in 1 of 3 different models: private cloud, software built on infrastructure provisioned for exclusive use by a single organisation, public cloud, software built on infrastructure designed to be used by the public, and hybrid cloud, the software can interchange between public and private when needed. [3]

2.1.3 – PaaS Cloud Computing

The last type of cloud computing is platform as a service. PaaS cloud computing aims to provide cloud components for certain pieces of software, all whilst being mainly used for applications. It tries to provide a framework for developers that can be built upon in order to make customized applications, in contrast to IaaS and SaaS, which delivers the software over the internet. This platform is delivered through the web, meaning that developers can create applications without worrying about issues like operating systems, storage or any software updates that may be required. [4]

2.2 – Benefits of Cloud Computing

Cloud computing, whilst largely utilised in today's world, does come with both benefits and drawbacks, as does anything related to technology. Here are a few reasons why cloud computing is so highly utilised in the modern world:

One advantage of cloud computing is that it is very cost-efficient. Whilst the initial cost of implementing a cloud-based server may be fairly steep, once a company is on the cloud, then accessing company data becomes very easy, therefore it will save lots of time and money in the long run. Most features of cloud computing also work on a pay-as-you-go basis, so there is no need to worry about dropping lots of money on features that you will not need. The pay-as-you-go feature also applies to the storage, meaning that you will not need to pay any extra for more storage and will always have as much as you need. According to a survey given out to CIOs and IT leaders in 2015 by Bitglass, half of those surveyed reported big cost savings due to cloud-based services. [5]

Another benefit to cloud computing is that it allows for very efficient collaboration projects. Using cloud computing, a company has many more ways that they can access and share data, other than the usual methods. This allows a company to do operations like share files with third party customers without the use of a physical device, like a memory stick. This can be done through shared folders that can be accessed by only a select few with the right privileges. Another way this could be seen as effective is when a company may want to share accounting records with a person

such as a financial advisor or an accountant, again without the use of physical technology or in-person meetings. [6]

A few more benefits to cloud computing include the fact that it will give a strategic advantage against your competitors, that may not utilise cloud computing, as it has been proven to make a positive difference in a business. As well as that, it has a very quick deployment time, meaning that a brand-new cloud-based system could be implemented within minutes. This time can vary based on the number of technologies used in your business. Finally, the mobility of a cloud computing system is currently unmatched, with employees being able to access the files of your company from many different devices, including mobile devices, meaning that the file sharing system can be portable. [7]

2.3 – Drawbacks of Cloud Computing

As with everything, cloud computing does come with its disadvantages, as it is not a perfect system. Listed below will be a few reasons as to why a company may be more reluctant to incorporate cloud computing into its operations:

One of the main disadvantages that comes with cloud computing, as it does with any form of data storage, is security of the data that is being stored in a company's cloud-based system. A lot of cloud service providers implement the relevant security standards and certifications in order to ensure that the data stored within a cloud environment is safe. However, there is no conceivable way to protect data stored in a virtual data centre from threats such as data theft, data leakage, service hijacking, insecure interfaces, DOS attacks etc. Resuming from the earlier point, the security provided by the cloud service provider may vary from company to company, so there is no reliable way to ensure the protection of your data, and big cloud data leaks have been known to happen in the past. [8]

Another big disadvantage of cloud computing is any potential downtime that the services may face. This is cited as possibly the biggest disadvantage of cloud computing. Since, cloud-based systems are internet-based, they come with the same disadvantages that any service that is internet-based does, that being the fact that the service can go down at any time, meaning that a company will not be able to access any data that is stored on the cloud server for a little while. This can also cost a company quite a bit. For example, in 2017, an outage on Amazon Web Services cost traded companies up to \$150,000,000. There are practices a company can take in order to minimise the damages that downtime can potentially cause, such as designing services with high availability and disaster recovery in mind or utilising multi-region deployments for their services with automated failover. Unfortunately, there is no way to prevent these outages altogether, and they just have to be dealt with accordingly. [9]

A few more disadvantages of cloud computing include issues such as low connection issues if the internet has a slow connection, meaning that data transfer and accessing may be a slow process, as compared to accessing the data from a physical device. Another issue is that any technical problems will need specialised help and will not likely be able to be fixed within the company, but this is countered by tech support usually being available 24/7 from any cloud service providers, Google and Amazon being just a select few. Finally, because the system is online, attacks on a cloud computing system can be exposed to a much larger range than just the systems within the company and may very well go beyond that. [10]

2.4 – Costs of Cloud Computing

As explained earlier, the cost benefits of cloud computing far outweighs any upfront costs that may occur in setting up the server. However, there are some other issues to consider that may cost a company. AWS (Amazon Web Services) is a cloud computing platform that sells their services to companies all around the globe. Their main pricing policy is a pay-as-you-go basis, meaning that the company pays for only the services that they use, and only when they're using them, meaning that they won't get overcharged for unnecessary storage that they aren't using. According to the Amazon S3 pricing, they offer volume-based discounts too. For example, 50TB would cost 0.023GB/month, whereas 500TB+ would reduce that cost to 0.021GB/month. [11]

2.5 – The Reliability and Scalability of Cloud Computing

Reliability, when it comes to cloud computing, is measured by the frequency in which components break down. This may happen often with cloud computing, leading to downtimes. These downtimes, thankfully, usually only affect one service in a particular region, and rarely have a long-lasting effect on business disruption [12]. Scalability in cloud computing refers to how well a system can react and adapt to changing demands. Due to many cloud service providers offering pay-as-you-go payment bases, a company will never use more storage than they need, meaning that most cloud computing systems are very scalable to meet their customers' demands. [13]

Chapter 3 – Docker and Node.js

3.1 – The Adoption of Docker

Docker is a software framework that specialises in the building, running, and management of containers on servers and the cloud. As the internet is now mostly built upon the cloud, it no longer focusses solely on single servers like it would have in the past. Servers have now been mostly become pieces of software, rather than being restricted to hardware. These software-based servers are what we call containers and are a hybrid mix of the operating system that they're running on,

usually Linux, and a hyper-localised runtime environment. Other software that can be used as an alternative to Docker include Podman, CRI-O or LXC, to name a few. [14]

There are many benefits to using a container software program like docker. For one, it creates a consistent environment that is isolated from other apps. This means that, regardless of where the app is deployed, everything remains consistent. This may lead to a massive increase in productivity. Another advantage is the cost-effectiveness. Docker containers are known to deploy in seconds, as compared to the old method of deploying servers, which would involve things like provisioning, getting the hardware up and running, all the massive amounts of extra work and overheads. Docker eliminates this almost entirely. Finally, Docker is a very mobile software, meaning that the deployment of servers is consistent, portable, and movable. [15]

However, docker does have some issues to consider before you choose to adopt it. One, containers don't run at bare-metal speeds, meaning that, while they consume resources more efficiently than that of a virtual machine, they are still subject to performance overhead due to issues like overlay networking or interfacing between containers. Two, the container ecosystem is fractured. This means that, although the core docker platform is open source, some container products will conflict with other container products. Finally, there are the complications with persistent storage data, meaning that all the data disappears forever if you shut the container down before saving the data elsewhere. This, for obvious reasons, will cause problems for people who are new to adopt Docker. [16]

3.2 – The Node.js and Docker Application Development Process

The development process of Node.js applications on the Docker framework is complicated. On one hand, new users will have an issue with switching between operating systems, as both these programs run on a LinuxOS. For example, the author of the report had to entirely learn how to navigate Ubuntu. Another issue that arose was the text editor used to author Node.js files. The author used Vi, a popular Linux text editor, but it still had its complications to get over.

Another complication that came up, at least in the author's development process, was node modules. The location of the node_module folder is very important. The author had to move the node_modules up a folder to the main directory in order to configure the container properly. After looking online, this seemed to be a common issue.

On the other hand, the development process was smooth. Docker is a useful piece of technology that makes the development process of Node.js more efficient and smoother than that of conventional means. It also provided the author with the knowledge and skills necessary to deploy

these types of applications again in the future. There are both sides to the argument, and neither are eight.

Chapter 4 – Conclusion

4.1 – A Brief Summary of the Report

In summary, cloud computing is a fairly recent technology that has many advantages to it, more so than that of the disadvantages, which is probably why it is so heavily utilised in the modern world. In regard to docker technology, it is a useful piece of software with many benefits to using it. However, people who are new to using it should be aware of the issues that come with adopting it, and how to avoid them. Finally, the development process of node applications through docker is complicated, but worth it in the end.

Chapter 5 – Reference List

5.1 – Reference List

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GRADEMARK REPORT

FINAL GRADE

50/100

GENERAL COMMENTS

Instructor

Cloud Computing (40): 32

Virtual & Container (15): 9.5

Eval Dev (25): 8.5

eComm (20): 0

Feedback:

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Slightly more detail required on scalability and reliability.

More depth was expected to the VM and containers discussion, the comparison performed was a bit limited as a result.

Evaluation of node.js development was very brief.

No Code.

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