

Technical Report 1: Cloud service analysis

Team: Online Learning

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Summary

This report evaluates the effectiveness of the most prominent cloud computing services: Amazon Web Services (AWS), Microsoft Azure and Google Cloud Platform. Each service was researched in order to determine which of the three services best suited the project.

Each of the three providers has websites detailing their services. From these websites, we found Amazon Web Services had a variety of component services along with a flexible pricing model alongside a straightforward interface allowing for easy interaction.

By analysing the pros and cons of these services, we found Amazon Web Services to be a good choice for deploying our project. The flexibility and stability provided by Amazon Web Services, as well as its compatibility with a large number of languages and operating systems stood out among the alternatives.

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1. Introduction

Cloud Service Providers (CSP) are third party companies that provide a cloud based infrastructure, network and applications. These cloud services are hosted in data centres, meaning that the clients don't need to build their own infrastructure on site. There are many CSPs around, with major 3 competitors being Amazon Web Services, Microsoft Azure and Google Cloud Platform. The task of this tech report is to look into these 3 different platforms to compare and contrast them.

Our goal is to find which platform will meet our needs the best when creating the Student Project Management Dashboard (SPDM). The Dashboard is going to be a web app and as such, we need a platform to host it. We will need to consider the different benefits each provider offers as well as the limitations.

2. Key Solution Approaches

The three cloud services being explored are Amazon Web Services, Microsoft Azure and Google Cloud computing. They all provide similar functionalities around networking, database storage and flexible computing. The three services all have the basic features of a cloud platform which are self service and instant provisioning, autoscaling and security compliance. [18]

AWS (Amazon Web Services) is a detailed, simple and powerful cloud service offered by Amazon. It is flexible, reliable and secure, and is used by various industries around the world. AWS provides a wide variety of services and functions, more than both Azure and Google Cloud Platform. It can cater to a range of application requirements and can be used for both small and large customized development projects.

Microsoft Azure is a cloud computing service that many large businesses use. Its main feature is its easy integration with other Microsoft services including Teams and Office365, as well as helping businesses transition to cloud computing through its hybrid cloud support integrating Windows Server and SQL Server. [8]

Google Cloud Platform (GCP), offered by Google, is a suite of cloud computing services that runs on the same infrastructure that Google uses internally for its end-user products, such as Google Search, Gmail, Youtube. It is designed for cloud-native business. It is committed to open source technologies and portability, while offering good pricing and flexible contracts. GCP has generally fewer features and services compared to AWS and Azure. [11] [18]

3. Evaluation of Solution Approaches

3.1 Amazon Web Services

3.1.1 Features

The features of AWS that make it so popular are:

- Has numerous pre-built services that organizations can use to build custom cloud-based solutions [1].
- AWS provides powerful data and relationship management. Users can have various schemas, create attributes for objects, and set custom inheritance rules for their directories. [2]
- Amazon facilitates flexible schema management by providing the option of extending your directory schema as needed. Applications can share a single directory and avoid duplicates. [2]
- AWS is a fully-managed service by removing mundane administrative tasks. [2]
- Traditional cloud services require expensive querying of data. AWS has a built-in search functionality which makes searching for objects and relationships easier. [2]
- AWS has a built-in encryption functionality.
- AWS provides relationship databases, non-relationship databases and graph databases [1]

3.1.2 Advantages

Security

AWS has end-to-end encryption which is highly secure, both physical and over the web. AWS provides end-to-end privacy where users can protect their information, identity, applications and devices [3].

Flexibility

AWS is highly flexible when compared to other cloud services. AWS lets users choose their own programming models, language and OS that are better suited for their project. AWS also facilitates easy migration of pre-existing applications, so the user does not have to rewrite the entire application. [4]

Cost-effectiveness

AWS requires no long-term contracts or up-front payments making it highly cost-effective. Users only have to pay for the computing power, resources and cloud storage that they use. [4]

Scalability

AWS has load-balancing and auto scaling features that can scale up or down based on the required demand. This allows resources to keep up with unexpected demand or scale down when demand decreases. [4]

Ease of use

AWS has an easy to use management console and well-documented web services resulting in a low-learning curve making it simple to use for any user. [3]

3.1.3 Disadvantages

Pricing

AWS tends to be more expensive when compared to other services. Technical support for AWS also incurs an extra fee.

App-deployment

AWS has more limited app deployment options when compared to other services such as Azure.

Lack of Support

Lack of support for hybrid cloud makes it difficult to transition existing local solutions to AWS. Technical support for AWS is a premium service.

3.2 Microsoft Azure

3.2.1 Features

- Integration with many other Microsoft services. Examples include Office365 and Microsoft Teams [8]
- Microsoft Azure can be used to deploy applications written in a large variety of language and across multiple platforms [9]
- Applications can be easily deployed through Azure using VSCode [9]
- Azure offers extensive support for hybrid cloud operation and can be easily integrated with systems such as Windows Server and SQL Server [8]
- Azure supports serverless solutions through the use of Functions

3.2.2 Advantages

Security

Microsoft Azure has a strong focus on security, with the most cloud compliance certificates than any other provider and dedicated more than \$1 billion USD a year on software security research [5]. This will be useful to keep staff and student's private data secure.

Reliability

Azure apps offer 99.95% availability on their uptime [6]. This means we are able to rely on them to provide a steady platform for our app

Scalability and Cost-effectiveness

It allows the app to be scalable and cost effective [7]. Azure allows us to manage how much computing power we use and when, on a pay for what you use basis. This not only means

we only pay for what we use when we use it but we can easily scale our projects to necessary sizes.

External applications

Azure gives connectors to other apps within the Microsoft family, such as Office 365, allowing seamless integration with those applications. [7]

Pricing

Azure claims to be cheaper than AWS for Windows Servers and will price match AWS on comparable services [10]. This means we will get the best pricing for what we need.

3.2.3 Disadvantages

Single platform

Azure is a single provider platform, meaning if Azure itself crashes, we will lose all access to data from the app [7]. While having a low chance of happening, it would be highly damaging should this occur during the university semester.

Server-monitoring

It needs people to manage server monitoring and patching [7]. As such, people with knowledge of Azure keep things running smoothly as Azure doesn't assist in managing cloud-based data centers.

3.3 Google Cloud Platform

3.3.1 Features

GCP consists of a set of physical assets, such as computers and hard disk drives, and virtual resources, such as virtual machines (VMs), that are contained in Google's data centers around the globe.[11]

Some common services GCP provides [12]:

- Computing and hosting: serverless working environment, managed application platform, container-based computing, personal cloud-based infrastructure, VMs.
- Storage services: data storage, persistent disks, NFS file servers.
- Database services: SQL database, NoSQL database services.
- Networking services: load-balance traffic across resources, create DNS records, and connect existing networks to Google's network.
- Big data services: process and query big data in the cloud to get fast answers to complicated questions.

3.3.2 Advantages

Security

Data is encrypted in transit between Google, the customers, and data centers; the layers of the Google application and storage stack require authentication and authorization. [13]

Flexibility

GCP App Engine supports various languages (Java, Python, PHP, Go, and Node.js), website templates can include JS along with HTML. [17]

Cost-effectiveness

Rightsizing and sustained use discounts are claimed to help deliver an average savings of 35% for many compute workloads. GCP storage are claimed to provide prices averaging 21% less than AWS for online storage workloads. [14]

Scalability

Google Cloud has built-in services to auto scale applications and equally distribute application load. GCP uses Managed Instance Groups to allow users to automatically add or delete instances and define a policy that scales up and down the numbers of instances based upon measured load and target utilization.[15]

Ease of use

GCP offers step-by-step examples of doing many of the most common tasks, for example, spinning up a Linux-based virtual machine. [16]

3.3.3. Disadvantages

Expensive Support:

Support fees would cost a minimum of \$100 USD per month up to but not limited to \$250 USD per month if support is needed.

Documentation is not very elaborate:

Although there is existing open source documentation for the cloud service, there is a lack of in-depth discussion of why some of the limitations are set. This could lead to unnecessary testing on the development end.

4. Limitations

Unable to Meetup in Person:

Due to the outbreak of COVID-19, members are not allowed to gather to collaborate on the project at hand. This could potentially lead to reduced efficiency due to lack of coordination and support.

Other Commitments of Members:

Members have different schedules and commitments, hence they would not be able to fully commit to a set time to coordinate a spike. In addition, the limited amount of time would limit how much can be achieved within the spike.

Lack of Experience with such Services:

Not all members would have experience on such services, thus having a greater learning curve. This could limit what could be done within the spike.

Operation on Different Operating Systems (OS):

With different OS, there may be different conditions required to use the service. OS's may have different directory calls as well as different ways to execute codes, which may lead to extra steps needed.

5. Recommendations

After extensive research on the different cloud services, Amazon Web services proves to be the better cloud service for our project. It has an extensive list of services which can be used to develop a customized application. Examples of such services that can be used in developing the Student Project management Dashboard are SES (Amazon Simple Email Service) and SNS (Amazon Simple Notification System). Since most teams have no experience in using a cloud service, AWS should strongly be considered because of its well documented web services and easy to use user-interface (AWS Management and console).

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