

Cloud Analysis



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Introduction

In this document I will look into cloud platforms. I will research the different options of cloud computing and platforms and which one would be the best for my Concert Meetup application. I will also look into how to deploy my application on these cloud platforms

What is a cloud platform?

A cloud platform is the operating system and hardware of servers in a data centre that are configured to provide cloud computing services to customers. Businesses can rent access to computing resources on demand with pay-as-you-go pricing, instead of having to buy, install and manage their own data centres, servers and software (*What Is a Cloud Platform?*, n.d.). Some of the different cloud platforms are Amazon Web Services (AWS), Microsoft Azure and Google Cloud Platform.

Cloud computing refers to computing services provided through the internet. Cloud computing is any technology that allows users to access cloud-based computing resources (e.g. CPU, RAM and storage) and pay for scalable resources on a pay-per-use basis. It is offered as Infrastructure as a Service (IaaS), Platform as a Service (PaaS) or Software as a Service (SaaS) (*What Is the Difference Between the Cloud, Cloud Computing, Cloud Services, and Cloud Platforms?*, n.d.). IaaS contains the basic building block for cloud IT and typically provides access to networking features, computers and data storage space. It provides the highest level of flexibility. PaaS removes the need for organisations to manage the underlying infrastructure and allows them to focus on deployment and management of their applications. SaaS provides a completed product that is run and managed by the service provider, usually this is an end-user application. There is no need to think about how the service is maintained or how the underlying infrastructure is managed, only how the piece of software is used. A common example of a SaaS application is web-based email (*Types of Cloud Computing - SaaS Vs PaaS Vs IaaS*, n.d.).

Function as a Service (FaaS) is a cloud computing service that allows customers to run code in response to events, without managing the complex infrastructure typically associated with building and launching microservices applications. This allows developers to focus solely on individual functions in their application code. It is focused on event-driving computing, application code or containers only run in response to events or requests. Benefits of FaaS are that developers can focus more on the code instead of the infrastructure. Another benefit is cost, as payment is only necessary when an action occurs. When no code runs, no costs are incurred. It can also automatically scale up and down as needed (*What Is Function as a Service (FaaS)?*, n.d.).

What are the benefits of using a cloud platform?

Some benefits of using a cloud platform instead of self-hosting applications include greater elasticity. This means the application can easily scale up and down. When self-hosting scaling out is possible by increasing the servers, this means it's not as easy as when using a

cloud platform. The initial costs of using a cloud platform are also less, because there is no need to invest in expensive servers and hardware. It also speeds up deployment, by enabling deployment anywhere in the world in a matter of minutes. It is also safer and more reliable. Cloud providers invest in security technologies to defend their platforms from threats and outages, providing stronger security than most organisations can implement for their own data centres. They are more reliable because distributed cloud platforms involve multiple servers and sites around the world for greater reliability and faster disaster recovery (*What Is a Cloud Platform?*, n.d.).

What cloud platforms are available?

There are multiple different cloud platforms available. The three most popular cloud providers are Amazon Web Services (AWS), Microsoft Azure and Google Cloud Platform (GCP).

There are multiple necessary components of the Concert Meetup application that need to be deployed. The front end for the application is a SPA React web app. This is the client interface that needs to be hosted. The backend of the Concert Meetup application is based on a microservices architecture; these microservices will be deployed as a kubernetes cluster. Each microservice also has its own database, to store the data that is necessary for each service. This means a total of 3 SQL databases. To save the images of the artists of the concert and profile pictures of users cloud object storage should be used. Doing this is possible with both Azure, AWS and GCP.

For this project Azure will be used for hosting, because students get 100\$ in free credits and the backend is made in .NET and Azure is very compatible with .NET. There is also a lot of documentation available on the microsoft learn website.

What is Kubernetes?

Kubernetes takes care of scaling and failover for an application and provides deployment patterns. If traffic to a container is high, kubernetes can load balance and distribute the network traffic so that the deployment is stable. Kubernetes containers are self healing, this means it restarts containers that fail, replaces containers and kills containers that don't respond to health checks.

Kubernetes is a platform that manages container-based applications and their associated networking and storage components. A kubernetes cluster is divided into two components: a control plane which provides the core Kubernetes services and orchestration of application workloads, and nodes, which run the application workloads.

How to host the Concert Meetup application on the cloud?

Let's start with the frontend. The frontend is a React SPA. There are multiple different ways to deploy a React app on Azure; it can be deployed through Azure Blob Storage, Azure App Service and Azure Kubernetes Services (AKS). The easiest way to deploy the app would be through Azure Blob Storage, however deploying the app through CI/CD would be more difficult. Deploying the app as a static web app comes with easy deployment using Github Actions, automating the deployment by deploying the new app each time code is pushed to the branch that is setup in the workflow.

The application will be deployed as a kubernetes cluster. The backend services will be deployed as normal services, with the gateway being deployed as a load balancer. This gives it a public IP address, making it accessible from outside the network. The frontend React SPA application will also be added to the cluster, so it can be connected to the backend more easily. This will also be deployed as a load balancer, giving it a public IP address as well. The frontend can then use the IP address of the gateway to make calls to the backend.

A horizontal auto scaler will be added to the services, to automatically scale up the parts of the application when load increases. CronJob will be added to schedule certain pods to be scaled up during the weekend, when the expected demand of the application increases, because concerts are most popular during the weekend.

All of this will be done as the last step of the CI/CD pipeline.

Conclusion

To deploy a microservices application Kubernetes will be used. This kubernetes cluster will be hosted on Azure because of its integration with .NET and the free credits for students. The entire application will be deployed automatically using a CI/CD pipeline.