

An analysis of Terraform as an enabler of a multi-cloud strategy

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Introduction

As cloud computing adoption continues to grow in Enterprises, increasingly "Multi-Cloud" is being promoted as a solution to issues with vendor lock-in, redundancy and access to the latest cloud service offerings. In this context, Multi-Cloud refers to the use of multiple Cloud Providers together based on the requirements of an organisation, and specifically this research project deals with the three largest (by market share) Cloud Providers: Amazon Web Services, Microsoft Azure and Google Cloud Platform. The thesis looks at Infrastructure as Code (IaC) and its impact on Multi-Cloud, investigating whether there are benefits to using an IaC tool for implementing this strategy, specifically Terraform tool created by Hashicorp.

Hypothesis

The initial hypothesis was that by using an IaC tool, one could switch cloud provider with relative ease in cases where there was a motivation due to any reason. It was hypothesised that the basic tenants of the cloud providers would be the same and that very little would have to change in the code between the different Cloud Providers; essentially one would be able to design an architecture and deploy this with low levels of effort (time and code-changes) on any other cloud provider and achieve the same results.

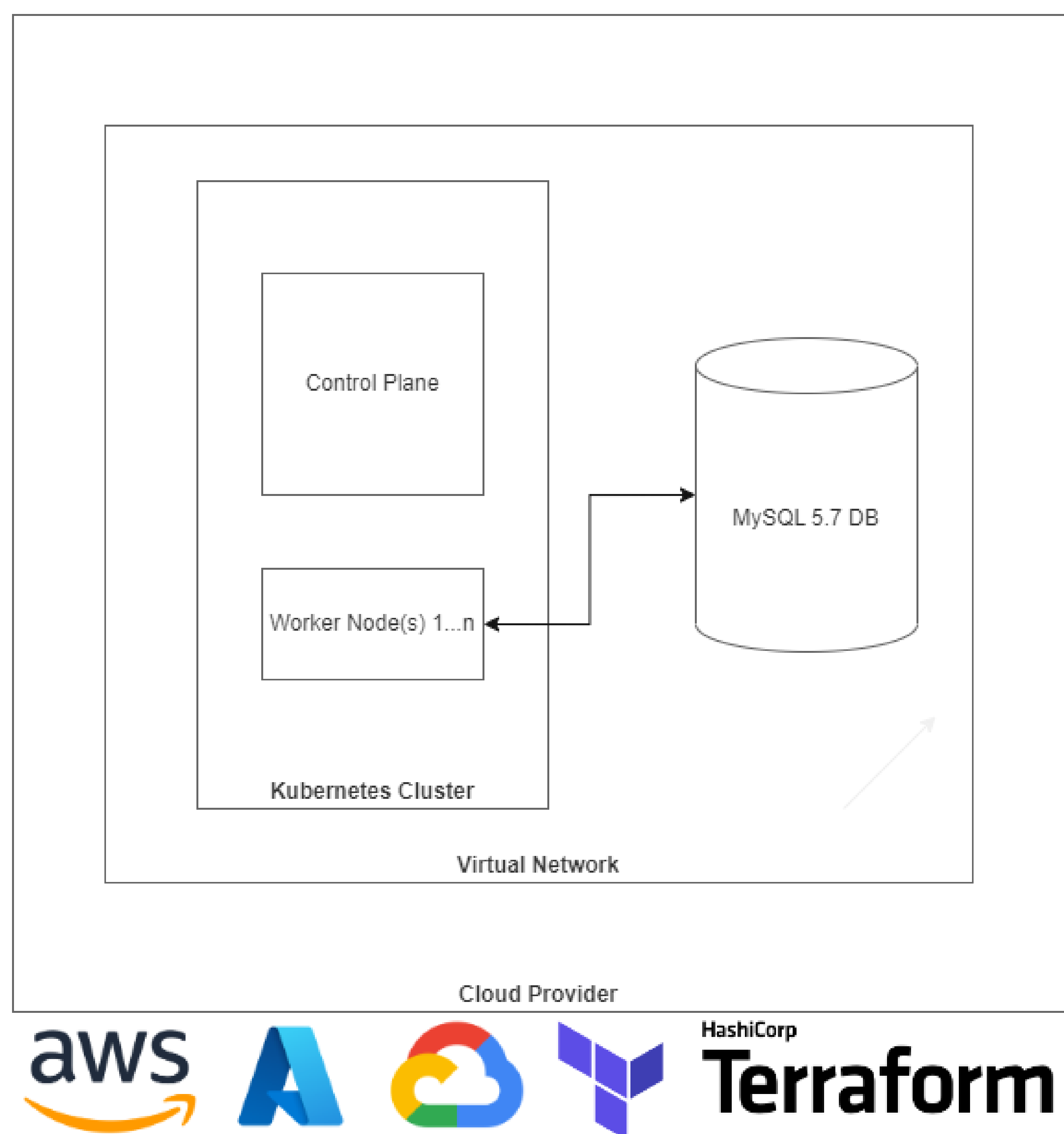
Research Questions

RQ1: "How can IaC tools support the deployment of a multi-cloud strategy?"

RQ2: "Practically, what is involved in a multi-cloud strategy?"

RQ3: "How do different Cloud Providers interact with Terraform?"

Experiment Design



Experiment & Results

The experiment involved the deployment of an architecture (shown in the diagram above) of a MySQL 5.7 database with public internet access, a virtual network and associated subnets, a Kubernetes cluster with an autoscaling node group of 1-n nodes, a WordPress workload running in the node group and connected to the database, and finally the handling of all required rules and accesses including usernames/passwords. The experiment was sufficiently complex to analyse the full use of Terraform with each of the Cloud Providers, and to support the answering each of the research questions given above.

The main result out of the research was that while Terraform is useful and offers a number of key benefits for developers and administrators, it still requires a knowledge of the relevant Cloud Provider as a key part of working with these applications is to understand the services and the Terraform providers used to interact with them. Another result was around the use of Kubernetes, and while each Managed Kubernetes Service had differences, deploying Wordpress to the Kubernetes service, allowed the use of the same code.

Conclusions

Although the initial hypothesis was proven wrong through the research project, it was found that using Terraform offered many benefits and did help to support a multi-cloud approach moreso than using each individual provider's console. In analysing what was required for a multi-cloud strategy, it was identified that deep knowledge of a Cloud Provider's service offerings, knowledge and understanding of the security aspects, and a well thought-out Architecture were all critical success factors. Finally, analysing how each of the Cloud Providers interact with Terraform were detailed through the experiments.

Overall, multi-cloud is a growing and important area of practice and research for academia and organisations alike. The use of an IaC tool, such as Terraform, allow you to essentially speak the same language as you build your infrastructure, although the individual metamodels of each of the Cloud Providers mean that you are essentially speaking a different dialect to each of them. This difference in the metamodel when describing services, infrastructure, SLAs, and SLOs mean that there is a significant workload involved in deploying a multi-cloud strategy and while IaC solves some of the problems, and reduces some of the human effort, it is not a panacea and does not replace knowledge of the Cloud Providers at this time.

QR Code for Recording

