Resilience in Multi-Cloud Kubernetes

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Cloud deployments are increasingly common for application developers. Application reliability is paramount, and massive amounts of money can be lost in just a few minutes of downtime. There are a number of cloud providers on the market - most popularly Azure, Amazon Web Services (AWS), and Google Cloud Platform (GCP). Deployment approaches for cloud applications generally stay within a single cloud provider. These deployments are most often zonal, regional, or multi-regional, where the application may be replicated across zones and regions to provide reliability against zonal and regional failures. These deployment approaches do not handle the scenario where a cloud provider has a global failure. Multi-cloud deployments are used to handle this failure scenario.

The goal of this project is to compare the resilience of applications deployed across multiple clouds - multi-cloud applications - against more standard deployment approaches. A multi-cluster Kubernetes application using Istio was developed for testing resilience. Deployment was attempted on a single bare metal server due to financial limitations, but was unsuccessful. Evaluation against the theoretical design was performed using binary and graph resilience metrics, and analysis of its intended behaviour in disaster scenarios. The multi-cloud application was found to be more resilient than the single cloud approach by all metrics.