Kobe Maristela
CS 442
2/21/2023

CS 442/642, Cloud Computing – Homework 1

Instructions:

- Maximum Score: 10 points
- Write your answers under each question in this file.
- Due date: 2/21/2021 at 11:59pm
- Submit your homework (as Word or PDF document) in Canvas, under Assignments→Homework 1. Name your file: HW1-FirstName-LastName

Questions:

1. (3 points) What is the main economic reason that allows cloud providers to make money?

   Cloud providers can make money mainly because of the economies of scale and the cost efficiencies in running the infrastructure. Cloud providers already have the computing resources, storage, and other IT services needed to run and maintain their infrastructure; however, not all customers have this luxury. Everything in building the new infrastructure and later maintaining it comes with a fixed cost that is burdensome to many. On the other hand, cloud providers already have this infrastructure in place, which allows them to reduce their costs through scale and offer their services at a lower price than if each customer were to purchase and maintain their hardware and software independently. Additionally, cloud providers can increase their profits by optimizing their infrastructure utilization more in dynamically allocating resources only when the customers need them, allowing for the minimization of idle resources, thus reducing costs. Furthermore, cloud providers can generate additional income by providing add-on services that, for instance, will take more responsibility from the customer and unto the provider. Overall, cloud providers are at an advantage when scaling their infrastructure as it costs less to build large data centers than smaller ones, which means the average customer will benefit more from using the cloud than purchasing and maintaining their hardware and software services.

2. (4 points) What is the main advantage of EBS over S3 in Amazon Web Services (AWS)? What is the main advantage of S3 over EBS?

   The main advantage of Amazon Elastic Block Store (EBS) over Amazon Simple Storage Service (S3) is that EBS is designed to be persistent and low-latency block-level storage. Like physical drives, EBS volumes are attached to EC2 instances as block devices. Furthermore, it is fast and versatile as multiple EBS can be mounted on a single EC2 instance. Additionally, EBS boasts support for most file systems, which S3 lacks. As a result, EBS is ideal for high-performance storage applications, such as databases or applications requiring frequent read-and-write operations.

On the other hand, the main advantage of S3 over EBS is that it is designed for high availability and scalability of object storage. S3 is an object-based storage service that allows users to store and retrieve large amounts of data in a scalable and cost-effective way. S3 is ideal for storing static files, such as images, videos, and documents, and distributing large data sets across multiple regions. Furthermore, S3 has the advantage of publicly sharing, in which each S3 has a globally unique URI linked to its resources. Additionally, it supports an access control mechanism that allows for the approval/denial of the service. Some limitation to note with S3 storage is that objects cannot be modified once uploaded to the S3. Any modification can only be done with a rewrite of the whole object.

3. (3 points) How does asynchronous communication in AWS SQS help with fault-tolerance?

AWS Simple Queue Service (SQS) provides a reliable and scalable way to help with fault tolerance through asynchronous communication. One technique SQS uses is the decoupling of components with the use of a message queue. As a result, each component can function independently without relying on another component. This allows for messages to be sent and received without each component being directly connected, making the system more resilient to failures. Another technique SQS uses is the ability to configure message retries and back-off periods. For instance, if a message was sent and failed to be received, SQS will automatically try to resend the message again.
Additionally, SQS can be configured to increase its back-off period, allowing for more time on the receiving end to recover before resending the message. Finally, the last technique SQS uses for fault tolerance is redundancy and load balancing. SQS distributes the messages across multiple servers and regions, ensuring that the message is not lost and is delivered successfully.