**Cloud Computing**

Nafi Ahmed1[0000-1111-2222-3333], Usha Sree2[1111-2222-3333-4444]

 , Mehedi Hasan3[2222-3333-4444-5555] and Dachiyani Mogan4[3333-4444-5555-6666]

Universiti Teknologi Malaysia (KL) alan Sultan Yahya Petra, Kampung Datuk Keramat, 54100 Kuala Lumpur

My.utm.my

**INTRODUCTION:**

In recent times, cloud computing has emerged as a phenomenon with inside the IT revolution because it raises quickly and sharply. The use of Cloud is not always restrained to a selected business domain. By implementing this we can assist so many software applications. It has been carried out and used to support numerous software programs and platforms. It has the capability to switch the IT enterprise making the software program even extra effective, appealing and price much less than conventional software program. Now for individuals or companies there is no need to build their personal infrastructure to work on all the internet services, rather than this they can buy them from CSPs as IaaS, SaaS or PaaS. We have various CSPs as Amazon Web Services (AWS), Microsoft Windows Azure, Google Cloud Platform (GCP).

**1.Comparative Evaluation**

**1.1. Service model (IaaS, PaaS, SaaS)**

**Infrastructure-as-a-service (IaaS):** In this service it includes some features as reliability, redundancy, backup, etc. Amazon S3, Apache HBase, etc are the examples of IaaS.

**Platform-as-a-service (PaaS):** PaaS provides services for developers to develop their own applications. The services are included as integrated development environment (IDE), an operating system, programming language, database, and server etc. same as SaaS this is also accessed using internet. The software and hardware tools are available through internet. Microsoft windows Azure, Google App Engine are the examples.

**Software-as-a-service (SaaS):** SaaS can be accessed using internet and it is a sim-ple cloud-hosted software. This is the service frequently used in cloud computing model. The software of this will be control by the service provider who admitted and provide the software in cloud environment. The software is available via third-party through internet.

**1.2. Virtual Machine (VM) instance types offered (such as micro, small, medium, large etc.)**

Virtual machines are the primary cloud-based compute service. For Azures it possesses support for Linux, SQL server, oracle server, IBM, Windows server etc. And it gives the flexibility of virtualization. AWS has an extremely large catalogue of the available instances which includes high performance computing options and GPU. Google cloud platform the virtual machines are large. We can create the instances using G-cloud command-line tool, compute engine API, etc.

**1.3. Storage**

Firstly, the Amazon Simple Storage Service, which stores data in the form of ob-jects. To determine the object names the URI pathnames are used. The user should decide whether to choose these regions to enhance latency, reduce costs or address regulatory requirements. Conversely, Windows Azure stores data in blobs, tables and queues. Data can be accessed over the internet via HTTP/HTTPS and the RESTful protocol. The Azure database uses the Microsoft SQL Server to provide a Database Management System (DBMS) inside the Cloud. Second, GCP Storage technologies. Google Cloud provide three types of storage solutions, they are datastore, google cloud SQL.

**1.4. OS environments offered.**

Amazon Web Services (AWS), a developer can access a variety of different in-stance types, some with very specific hardware configurations. The developer can code against and control IT infrastructure. The developer can use various AWS SDKs (Software Development Kit) to integrate their applications with AWS APIs easily, thereby removing the coding complexity relating to authentication, retries, error handling, etc. For example, Windows Azure supports net frame-work-built applications, Visual Basic, C++ etc. and general-purpose programs. The GAE (Google App Engine) environment was established over Google servers according to the programming language selected and used for developing and deploying Cloud applications.

**1.5. Security**

Security and privacy are two types of preventive measure, and reactive measures. Preventive measures refer to the data protection, privacy and firewall etc. Reactive measures include mechanisms to counter for threat that have sticked in the internet. Salesforce.com provides the moderate security as it provides adequate prevention measures. And AmazonEC2 provides the intrusion detection and monitoring features.

**1.6. Performance and scalability**

It is one of the key features of cloud computing is dynamic scaling to end users computing requirements. Maximum of the current providers support auto scaling and load balancing features. But Microsoft Azure do not auto scale to end users’ requirements.

**1.7. Pricing model**

In this we have two main types of pricing model, they are pay-as-you-go and sub-scription model. pay-as-you-go refers as the user can pay for the services and can be used. In subscription it means, the user will subscribe to less prices for certain period. In this the user will pay even if the user has not used the services for that period.

**1.8. Auto-Scaling/Elasticity**

The main reason of this to match the resources arranged with actual number of resources needed at certain point of time. Monitoring tools/service provided

**1.9. Monitoring tools/services provided**

For AWS we use Java, Java, PHP, python, AMI (Amazon machine image), ruby. And for GCP we use Java, python, web2spy, pylons, etc. For Azure Java, Python, PHP, Basic.

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| --- | --- | --- | --- |
|  | **AWS** | **GCP** | **Azure** |
| **IaaS** | Amazon Elastic Compute | Google Compute Engine | Virtual Machines |
| **PaaS** | Elastic Beanstalk | Google App Engine | App Service & Cloud Services |
| **Scalability** | good | good | Basic |
| **Tools** | Java, PHP, python, AMI (Amazon machine image), ruby | Java, python, web2spy, pylons… | Java, Python, PHP, Basic. |
| **Pricing**  | Pay as you go and then subscription | Pay as you go | Pay as u go and then subscription |
| **Virtualization** | Xen hypervisor | Application container  | Microsoft CLR VM |
| **Object Storage** | Amazon Simple Storage Service | Google Cloud Storage | Blob Storage |
| **File Storage** | Amazon Elastic File System | ZFS (Zettabyte File System) | Azure File Storage |
| **RDBMS** | Amazon Relational Database Service | Google Cloud SQL | SQL Database |
| **NoSQL: Key–Value** | Amazon Dynamo DB | Table StorageGoogle Cloud Datastore &Google Cloud Bigtable | Table Storage |
| **NoSQL: Indexed** | Amazon Simple DB | Google Cloud Datastore | Azure Cosmos DB |
| **Virtual Network** | Amazon Virtual Private Cloud (VPC) | Virtual Private Cloud | Virtual Networks (VNets) |

1. Opinions

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| --- | --- | --- |
| **Vendor** | **Strengths** | **Weaknesses** |
| **AWS** | • Dominant market position• Extensive, mature offerings• Support for large organizations• Extensive training• Global reach | • Difficult to use• Cost management• Overwhelming options |
| **Microsoft Azure** | •Second largest provider• Integration with Microsoft tools and software• Broad feature set• Hybrid cloud• Support for open source | •Issues with documentation• Incomplete management tooling |
| **Google** | • Designed for cloud-native businesses• Commitment to open source and portability• Deep discounts and flexible contracts• DevOps expertise | • Late entrant to IaaS market• Fewer features and services• Historically not as enterprise focused |

**2.**



 Figure1: cloud computing

One cloud service provider’s weakness may be the other’s strength, so it is better to use each one and then come to a decision. According to our opinion, AWS should be the best as it is the oldest, so it is more established, and it has the greatest number of regions and availability zones. It also has the largest of market share (32%). AWS also provides the highest number of services including compute, storage, databases, analytics, networking, mobile, developer tools, management tools, IoT, security, and enterprise applications.

**Conclusion:**

In today’s world where all the companies are quickly creating and record their data, so for these companies to store their data and get infrastructure/platform/software as a service from cloud service providers the cloud environment is necessary. There are numerous CSPs in the worldwide, all these are providing their best. This report provides a short list of guidelines that need to be considered before selecting a CSP.

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