

# The Most Prominent Cloud Computing Service Providers

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## 1 Introduction

Cloud computing is the on-demand availability of computer system resources, especially data storage (cloud storage) and computing power, without direct active management by the user. In general, the term is used to describe data centres accessible over the Internet to many people. Large clouds, predominant today, often have functions distributed from central servers over multiple locations. If the connection to the user is relatively close, an edge server may be designated. Clouds can be restricted to a single organisation (company clouds) or are accessible to multiple organisations (public cloud).

## 2 Comparative Evaluation

### i. the most prominent Cloud Computing Service Providers

Amazon Elastic Compute Cloud (EC2) is part of Amazon.com's Amazon Web Services (AWS) cloud computing network, which allows users to rent virtual machines from which to run their own computer applications [1]. By offering a web service from which a user can boot an Amazon Machine Image (AMI) to configure a virtual machine that Amazon calls a 'instance' containing any desired software, EC2 facilitates scalable implementation of applications [3].

The Google Cloud Platform (GCP) is a suite of cloud computing services provided by Google that operates on the same infrastructure used internally by Google for its end-user products, such as Google Search, Gmail, file storage, and YouTube. It offers a series of modular cloud services, including computation, data storage, data analytics and machine learning, in addition to a collection of management tools [2].

Microsoft Azure, commonly referred to as Azure, is a cloud computing service developed by Microsoft through Microsoft-managed data centres to develop, test, deploy, and manage applications and services. It offers as-a-service applications (SaaS), as-a-service platform (PaaS) and as-a-service infrastructure (IaaS) and supports several different programming languages, tools and frameworks, including software and systems that are Microsoft-specific and third-party [4].

### ii. Comparison and discussion security

Amazon EC2 is responsible for protecting the infrastructure that runs Amazon EC2 services in the Amazon EC2 Cloud. Amazon EC2 also provides its user with services in order for them to use securely. There are third-party auditors regularly test and verify the effectiveness of amazon ec2 security [3].

Google cloud uses their own infrastructure to build its internet services. The security of the infrastructure is designed in progressive layers starting from the physical security of data centers, continuing on to the security of the hardware and software that underlie the infrastructure, and finally, the technical constraints and processes in place to support operational security [2].

Microsoft Azure provides various type of security for different kind of users such as Azure Information Protection and Azure DDoS Protection [4].

### **Performance and scalability**

In the case of performance and scalability, amazon ec2 improve its scalability by taking some steps. These steps can be described as ease server load, reduce read load by adding more read replicas, reducing write requests, introduce a more robust caching engine, and lastly scaling the server.

Google Cloud had provided some s that can efficiently help their user in building scalable products like Compute Engine virtual machines and Google Kubernetes Engine (GKE) that allow the user to realize the rise and reduce of their resource consumption [2]. Cloud monitoring that helps the user in making data-driven scaling decision. Besides, Google Cloud's serverless platform ensures that users always pay just for what they use.

Microsoft azure offer Azure Auto scale that can scale automatically to meet the requirements of the user to fulfil the workload [4]. This function ensures that the capacity will scale out during workload reach peak and return normal when there is less workload needed.

### **Pricing model**

The pricing model offered by Microsoft Azure is not varied as amazon ec2 and google cloud. Microsoft Azure offers a 'Pay as you go' basis and reserved instances .Pay as You Go model is a simple pricing model that ease user because users can decide once they want to begin the service or stop the service. Meanwhile, a reserved instance is a pricing model that more suitable for users who dealing with big data and processing many calculations in a year.

There is some price model for amazon ec2 and google clouds such for instance categories, on-demand instances, reserved instances, block storage, and more. The instance categories are comparable between amazon ec2 and google cloud because they offer identical instance categories. However, the pricing model of google cloud and amazon ec2 is not comparable for most of the pricing models such as on-demand instances, reserved instances, block storage, and rating frequency. This is due to the difference of instances provided by google cloud and amazon ec2.

### **Auto-scaling**

All amazon ec2, google cloud, and Microsoft Azure provides auto-scaling. By using auto-scaling, amazon ec2's users can maintain optimal application performance and availability in any condition. Furthermore, users only need to pay for the resources that they need only. When demand drops, this Auto-Scaling will help users automatically remove any excess resource capacity to prevent users from overspending.

Auto-scaling from google cloud required users to host the application on a manage instance group. The number of instance group will automatically increase or decrease with the target value specified by the users.

Finally, auto-scaling from Microsoft azure works by performing automatic scaling actions such as scaling up or down and scaling in or out. This mechanism will support the suitable amounts of resources depends on the workload requires.

### **Monitoring tools / service provided**

For the aspect of administration, amazon ec2 has Application Discovery Service, System Manager, and Personal Health Dashboard. For Microsoft Azure, it provides Log Analytic, Operation Management Suite, Resource Health, and Storage Explorer. Lastly, Google cloud-only provides a cloud

console. The billing service for amazon ec2 and Microsoft azure are the identical which is Billing API. In contrast, google cloud used Cloud Billing API as their billing services.

Different cloud computing service provides different cloud advisor capabilities. Amazon ec2 provides CloudWatch, X-Ray, and Management Console [1]. Cloud advisor capabilities of Google cloud is different from amazon ec2. Stack driver monitoring, cloud shell, debugger, trace, and error reporting are the example monitoring tools provided by Google Cloud. For Microsoft Azure, it provides a portal, monitor, and application insight on its cloud advisor capabilities.

<b>Aspect</b>	<b>Amazon EC2</b>	<b>Google Cloud Platform</b>	<b>Microsoft Azure</b>
<b>Service model</b>	Amazon Web Services (AWS) is a evolving cloud computing platform provided by Amazon that includes a mixture of infrastructure as a service (IaaS), platform as a service (PaaS) and packaged software as a service (SaaS) offerings. AWS services offer an organization tools such as compute power, database storage and content delivery services [1].	Google Cloud's platform using app engine as a service (PaaS). Using App Engine, Google can handle most of the management of the resources [2].	Azure offers three of the core services models. It is depending on which of Azure services you use for, you can take advantage of IaaS, PaaS, and SaaS on Microsoft's cloud platform [4].
<b>Virtual Machine</b>	<ul style="list-style-type: none"> <li>➤ Amazon using Elastic Compute Cloud (EC2) instances.</li> <li>➤ Setting up EC2 can configure CPU, storage, memory and network resources [3].</li> <li>➤ Types of instance: <ul style="list-style-type: none"> <li>• General Purpose</li> <li>• Compute Optimized</li> <li>• Memory Optimized</li> <li>• Accelerated Computing</li> <li>• Storage Optimized</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>➤ Google Cloud's virtual machine using instance which is hosted by Google's infrastructure. User can create instance using Google Cloud Console, 'gcloud' command-line tool, or the Compute Engine API [2].</li> <li>➤ There are several instances: <ul style="list-style-type: none"> <li>• Instances and projects</li> <li>• Instances and storage options</li> <li>• Instances and networks</li> <li>• Instances and containers</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>➤ Azure Virtual Machine operate to perform general tasks or tasks requiring additional compute, memory, or storage capacities [4].</li> <li>➤ Azure Virtual Machine Types: <ul style="list-style-type: none"> <li>• General purpose VMs</li> <li>• Compute optimized VMs</li> <li>• Memory optimized VMs</li> <li>• Storage optimized VMs</li> <li>• VMs for Graphics Processing (GPUs)</li> <li>• High performance compute</li> </ul> </li> </ul>
<b>Storage</b>	<ul style="list-style-type: none"> <li>• Amazon Simple Storage Service (S3) provides scalable object storage for data backup, collection and analytics.</li> <li>• Amazon Elastic Block Store provides block-level storage volumes for persistent data storage when using EC2 instances. Amazon Elastic File System offers managed cloud-based file storage [3].</li> <li>• A business can also migrate data to the cloud via storage transport devices, such as AWS Snowball and Snowmobile, or use AWS Storage Gateway to enable on-premises apps to access cloud data [1].</li> </ul>	<ul style="list-style-type: none"> <li>• Google provide consistent, scalable, large-capacity data storage in Cloud Storage [2].</li> <li>• Standard Cloud Storage provides maximum availability [2].</li> <li>• Cloud Storage Nearline provides low-cost archival storage ideal for data accessed less than once a month [2].</li> <li>• Cloud Storage Coldline provides lower-cost archival storage ideal for data accessed less than once a quarter [2].</li> <li>• Cloud Storage Archive provides the lowest-cost archival storage for backup and disaster recovery ideal for data to access less than once a year [2].</li> </ul>	<p>Azure storage services</p> <ol style="list-style-type: none"> <li>1. IaaS <ul style="list-style-type: none"> <li>➤ Disks</li> <li>➤ Files</li> </ul> </li> <li>2. PaaS <ul style="list-style-type: none"> <li>➤ Containers</li> <li>➤ Tables</li> <li>➤ Queues</li> </ul> </li> </ol>
<b>OS environment</b>	<ul style="list-style-type: none"> <li>➤ Amazon Linux</li> </ul>	<ul style="list-style-type: none"> <li>➤ CentOS</li> <li>➤ Container-Optimized OS (COS)</li> <li>➤ Debian</li> <li>➤ Red Hat Enterprise Linux (RHEL)</li> <li>➤ SUSE Linux Enterprise Server (SLES)</li> <li>➤ Ubuntu LTS</li> </ul>	<ul style="list-style-type: none"> <li>➤ Windows Azure</li> <li>➤ osFamily</li> <li>➤ osVersion</li> </ul>

### 3 Opinion

	Google Cloud Platform	Microsoft Azure	Amazon EC2	Alibaba Cloud
Advantages	<ul style="list-style-type: none"> <li>• <b>Better Pricing</b></li> <li>• <b>The Art Security</b></li> <li>• <b>Redundant Backups</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>Ability to Scale</b></li> <li>• <b>Better Privacy</b></li> <li>• <b>Effective Cost</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>Easy to use</b></li> <li>• <b>No limits</b></li> <li>• <b>Provide Speed and Agility</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>Simplicity</b></li> <li>• <b>Number VM processor</b></li> </ul>
Disadvantages	<ul style="list-style-type: none"> <li>• <b>Lack of Services</b></li> <li>• <b>Lack of Innovation</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>Requires Platform Expertise</b></li> <li>• <b>Single vendor plan</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>Technical Support Fee</b></li> <li>• <b>General cloud Issue</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>System</b></li> <li>• <b>Low Market</b></li> </ul>

**Lai leng shuen-** For me, I choose google cloud because google cloud provides variety and versatility in their services. Custom machine type is a feature of the Google compute engine that lets me easily create machine types that customize to my own needs.

**Syawal-**In my opinion, I will choose Amazon EC2 as my cloud platform. This is because, Amazon EC2 Is easy to use compared to other cloud platforms. Every feature and tool in Amazon EC2 are been expressed clearly without any distraction. Amazon EC2 always come out with new features rapidly and always update their cloud platform to give maximum function to their user.

**Fakhrul-** based on my experience, for my software creation, I am going to choose Google Cloud. It works well for a variety of aspects, such as safety, pricing, and efficiency. Setting up and building a free account is really simple for Google cloud. For me to use the facilities, there is no upfront expense.

**Fadthun-** I would choose Amazon EC2 as my cloud platform because of the speed capacity. For handling big data, you surely need a very high-speed cloud to store all your data. Amazon EC2 always comes out quickly with new features and always upgrades their cloud platform to give their customers full functionality.

### 4 Conclusion

This report evaluates the most prominent Cloud Computing Service Providers. First, Amazon Elastic Compute Cloud (Amazon EC2) is a web service that offers stable and resizable cloud computing capabilities. Second, Google Cloud Platform is a network infrastructure provider for the deployment and execution of web applications. Third, Microsoft Azure is a public cloud computing platform that can be used for services such as analytic, virtual computing, storage and networking with solutions including Infrastructure as a Service, Platform as a Service and Software as a Service. We give the comparison of these three from the information we got.

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