REPORT

Online Virtual Internship by The Sparks Foundation

Task # 6 – Cloud Computing

On

Comparison between different Cloud Initiatives

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INTRODUCTION

Cloud computing is the next natural step in the evolution of on-demand information technology services and products. To a large extent cloud computing will be based on virtualized resources. The idea of cloud computing is based on a very fundamental principal of `reusability of IT capabilities`. The difference that cloud computing brings compared to traditional concepts of "grid computing", "distributed computing", "utility computing", or "autonomic computing" is to broaden horizons across organizational boundaries.

Though many cloud computing architectures and deployments are powered by grids, based on autonomic characteristics and consumed on the basis of utilities billing, the concept of a cloud is fairly distinct and complementary to the concepts of grid, SaaS, Utility Computing etc. In theory, cloud computing promises availability of all required hardware, software, platform, applications, infrastructure and storage with an ownership of just an internet connection.

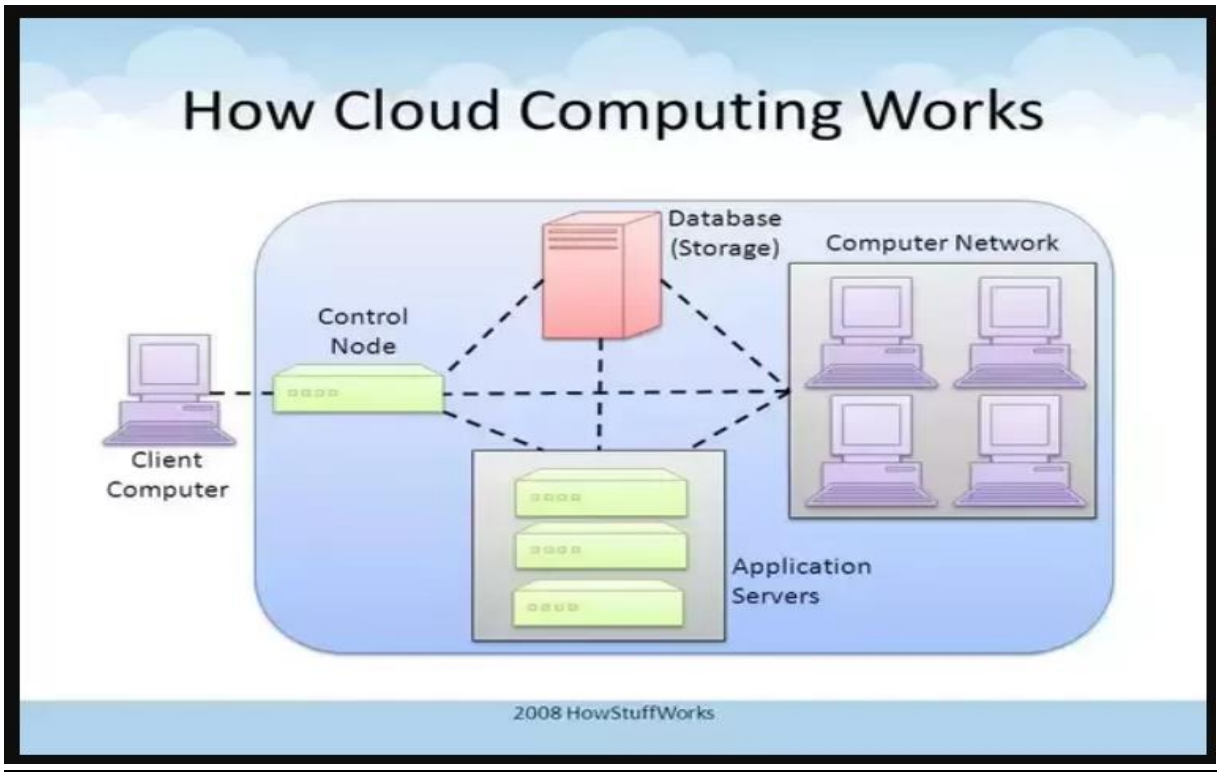
people can access the information that they need from any device with an Internet connection— including mobile and handheld phones—rather than being chained to the desktop. It also means lower costs, since there is no need to install software or hardware. Cloud computing used to posting and sharing photos on orkut, instant messaging with friends maintaining and upgrading business technology

This report will help you understand different Cloud platforms with respect to their availability, speed, easy to access, popularity, and some other features.

Coming on the topic, talking about the popularity, AWS(Amazon Web Services) stands in front as it is the oldest Cloud platform in the world as it has made trust for all its users with reliability after that comes Microsoft Azure and then comes Google Cloud Platform.

WORKING OF CLOUD COMPUTING

Cloud Computing system can be divided it into two sections: the front end and the back end. They connect to each other through a network, usually the Internet. Thefront end is the side the computer user, or client, sees.The back end is the "cloud" section of the system. On the back end there are various computers , servers and data storage systems that create the "cloud" of computing services .A central server administers the system, monitoring traffic and client demands to ensure everything runs smoothly. It follows a set of rules called protocols Servers and remote computers do most of the work and store the data.



ADVANTAGES OF CLOUD COMPUTING

1. Cloud Providers' point of view

(a) Most of the data centers today are under utilized. They are mostly 15% utilized. These data centers need spare capacity just to cope with the huge spikes that sometimes get in the server usage. Large companies having those data centers can easily rent those computing power to other organizations and get profit out of it and also make the resources needed for running data center (like power) utilized properly.

(b) Companies having large data centers have already deployed the resources and to provide cloud services they would need very little investment and the cost would be incremental.

2. Cloud Users' point of view

(a) Cloud users need not to take care about the hardware and software they use and also they don't have to be worried about maintenance. The users are no longer tied to some one traditional system.

(b) Virtualization technology gives the illusion to the users that they are having all the resources available.

(c) Cloud users can use the resources on demand basis and pay as much as they use. So the users can plan well for reducing their usage to minimize their expenditure.

(d) Scalability is one of the major advantages to cloud users. Scalability is provided dynamically to the users. Users get as much resources as they need. Thus this model perfectly fits in the management of rare spikes in the demand.

CLOUD PLATFORMS

1.AWS(Amazon Web Service)

Amazon Web Services (AWS) is a subsidiary of Amazon providing on-demand cloud computing platforms and APIs to individuals, companies, and governments, on a metered pay-as-you-go basis. These cloud computing web services provide a variety of basic abstract technical infrastructure and distributed computing building blocks and tools. One of these services is Amazon Elastic Compute Cloud (EC2), which allows users to have at their disposal a virtual cluster of computers, available all the time, through the Internet. AWS's version of virtual computers emulates most of the attributes of a real computer, including hardware central processing units (CPUs) and graphics processing units (GPUs) for processing; local/RAM memory; hard-disk/SSD storage; a choice of operating systems; networking; and pre-loaded application software such as web servers, databases, and customer relationship management (CRM).

The AWS technology is implemented at server farms throughout the world, and maintained by the Amazon subsidiary. Fees are based on a combination of usage (known as a "Pay-as-you-go" model), hardware, operating

system, software, or networking features chosen by the subscriber required availability, redundancy, security, and service options. Subscribers can pay for a single virtual AWS computer, a dedicated physical computer, or clusters of either. As part of the subscription agreement, Amazon provides security for subscribers' systems.

In simple words AWS allows you to do the following things-

1. Running web and application servers in the cloud to host dynamic websites.
2. Securely store all your files on the cloud so you can access them from anywhere.
3. Using managed databases like MySQL, PostgreSQL, Oracle or SQL Server to store information.
4. Deliver static and dynamic files quickly around the world using a Content Delivery Network (CDN).
5. Send bulk email to your customers.

How AWS works?

AWS operates on different services depending upon the user's needs Services can be Storing databases, networking,security,Analytics, etc.Amazon EC2 provides you virtual servers so that you can operate the system anytime you need .Amazon Elastic Block Store provides block level storage volume for data storage which you can apply on creation of an EC2 vm.

Amazon has a Simple Storage Service known as S3 which provides you data storage for backup or analytics.

2. AZURE

Microsoft Azure, formerly known as Windows Azure, is Microsoft's public cloud computing platform. It provides a range of cloud services, including compute, analytics, storage and networking. Users can pick and choose from these services to develop and scale new applications, or run existing applications in the public cloud.

The Azure platform aims to help businesses manage challenges and meet their organizational goals. It offers tools that support all industries -- including e-commerce, finance and a variety of Fortune 500 companies -- and is compatible with open source technologies. This provides users with the flexibility to use their preferred tools and technologies. In addition, Azure offers 4 different forms of cloud computing: infrastructure as a service (IaaS), platform as a service (PaaS), software as a service (SaaS) and serverless.

How does Microsoft Azure work?

Once customers subscribe to Azure, they have access to all the services included in the Azure portal. Subscribers can use these services to create cloud-based resources, such as virtual machines (VM) and databases.

In addition to the services that Microsoft offers through the Azure portal, a number of third-party vendors also make software directly available through Azure. The cost billed for third-party applications varies widely but may involve paying a subscription fee for the application, plus a usage fee for the infrastructure used to host the application.

Microsoft provides five different customer support options for Azure:

- Basic
- Developer
- Standard
- Professional Direct
- Premier

These customer support plans vary in terms of scope and price. Basic support is available to all Azure accounts, but Microsoft charges a fee for the other support offerings. Developer support costs $29 per month, while Standard support costs $100 per month and Professional Direct support is $1000 per month. Microsoft does not disclose the pricing for Premier support.

3. **Google Cloud Platform**

Google Cloud Platform (GCP), offered by Google, is a suite of cloud computing services that runs on the same infrastructure that Google uses internally for its end-user products, such as Google Search, Gmail and YouTube. Alongside a set of management tools, it provides a series of modular cloud services including computing, data storage, data analytics and machine learning. Registration requires a credit card or bank account details.

Google Cloud Platform provides infrastructure as a service, platform as a service, and serverless computing environments.

In April 2008, Google announced App Engine, a platform for developing and hosting web applications in Google-managed data centers, which was the first cloud computing service from the company. The service became generally available in November 2011. Since the announcement of the App Engine, Google added multiple cloud services to the platform.

Google Cloud Platform is a part [4] of Google Cloud, which includes the Google Cloud Platform public cloud infrastructure, as well as G Suite, enterprise versions of Android and Chrome OS, and application programming interfaces (APIs) for machine learning and enterprise mapping services.

How does GCP work?

GCP provides a numerous features like other cloud services like :Compute Services, Storage Services, Networking, Big Data Services, Security and Identity Management, Management Tools, Cloud AI,etc.

Google uses Platform as a Service to deploy Java, PHP, and other applications.

It provides an online file storage web service for storing and accessing data.

It uses VPC (Virtual Private Cloud) ,CLB(Cloud Load Balancing) and CDN(Content Delivery Network for IP allocation , routing, distributing workloads on different users,etc.

Cloud IOT Core allows you to easily and securely connect, manage, and ingest data from devices that are connected to the Internet.

COMPARISION BETWEEN AWS , AZURE AND GCP

Comparison of Compute Services : AWS vs AZURE vs GCP

Service	Amazon Web Services	Google Cloud Platform	Microsoft Azure
Compute Services	Elastic Compute Cloud (EC2)	Compute Engine	Virtual Machines Virtual Machine Scale Sets
PaaS	Elastic Beanstalk	App Engine Standard Environment App Engine Flexible Environment	Cloud Services
VPS	Lightsail		Virtual Machine Images
Docker / Kubernetes containers	EC2 Container Service Kubernetes (EKS)	Kubernetes Engine Container Engine	Container Service Container Service (AKS)
Integrate systems and run backend logic processes	Lamda	Cloud Functions (Beta)	Functions Event Grid
Automatically scale Instances	Auto Scaling	Instance Groups	Virtual Machine Scale Sets AutoScaling

Comparison of Storage Services: AWS vs AZURE vs GCP

Vendor	Storage Services	Database Services	Backup Services
AWS	• Simple Storage Service (S3) • Elastic Block Storage (EBS) • Elastic File System (EFS) • Storage Gateway • Snowball • Snowball Edge • Snowmobile	• Aurora • RDS • DynamoDB • ElastiCache • Redshift • Neptune • Database migration service	• Glacier
Azure	• Blob Storage • Queue Storage • File Storage • Disk Storage • Data Lake Store	• SQL Database • Database for MySQL • Database for PostgreSQL • Data Warehouse • Server Stretch Database • Cosmos DB • Table Storage • Redis Cache • Data Factory	• Archive Storage • Backup • Site Recovery
GCP	• Cloud Storage • Persistent Disk • Transfer Appliance • Transfer Service	• Cloud SQL • Cloud Bigtable • Cloud Spanner • Cloud Datastore	• None

Google vs Azure vs AWS Pricing Comparison

Pricing is difficult to parse with each of these companies, but there are some similarities and distinctions. All three offer a free tier of service with limited options, and they all charge on-demand for the resources you use.

AWS Pricing

There isn't a whole lot of transparency here, although the platform does provide its customers with a cost calculator. The pricing structure is so complex, we recommend using a third-party management app to help you navigate through your options and contain costs. They do offer 750 hours of EC2 service per month for up to 12 months as part of their free tier.

Azure Pricing

This is another platform where it will benefit you to obtain expert guidance. The pricing options are mainly situational in an effort to cater to the unique needs of each customer. Like AWS, Azure offers 750 hours of the Windows or Linux B1S addition of their primary compute platform, Virtual Machines, per year (it's free to try, which is nice for any business who wants to test the cloud "waters").

Google Pricing

Pricing is one area where Google tries to stand apart from the crowd by making their pricing structure a little less opaque and more customer-friendly. They strive to beat the list prices offered by most cloud services providers and give steep discounts and other incentives to win business. Google's free tier incentive include one F1-micro instance per month for up to one year. If you're looking for an easy to navigate, budget-friendly service that shows promising growth potential, this is the platform for you.

Pro and Con Comparison of AWS vs Azure vs Google

Here's a brief breakdown of the key points in our comparisons. Each is strong on utilizing AI and other advanced tech, they provide ample storage and features, and they are all strong on security and data protection.

Pros and Cons of AWS

This company has the benefit of age and experience when it comes to cloud-based enterprise solutions. Although their pricing structure is difficult to maneuver, they offer more of each service you're looking for, regardless of the type or size of your organization. However, the size and sheer scale of the Amazon platform makes it difficult to get much professional attention.

- **Compute:** Amazon seems perched to dominate based on sheer size and variety, notably from their flagship offering, Elastic Compute Cloud (EC2). In every computing function and service, scale dominates all. This might be considered the department store of cloud-based enterprise solutions, with lots to choose from but not a lot of personalized service.
- **Storage:** Again, this is the platform if you're looking for range and options for on- and off-premises storage and databases. Although AWS only provides a basic system backup service, the range of storage solutions offer several innovations. They don't offer a true hybrid model, but their server Gateway allows you to create one.
- **Tools:** This company is second to none when it comes to the depth and breadth of tools and technology. They're at the forefront of addressing AI and machine learning tech issues and pushing the boundaries of face, voice, and object recognition further.
- **Pricing:** As far as pricing goes, AWS is the most difficult to gauge. However, the large scale archival storage is especially cost-effective.

Pros and Cons of Azure

Azure's commitment to advancing the open-source community and integration with the software and apps that many companies are already using makes it ideal for startups and developers. That means configuration and integration are effortless, and there are fewer concerns about compatibility. They offer a vibrant community, support, and a reputable name that's synonymous with corporate computing.

- **Compute:** This is currently the only platform of the big three to offer a hybrid cloud model. That gives companies the best of both worlds when it comes to scalability and security. They are best known for the Virtual Machines service and AI optimization that's incorporated into almost every feature and function.
- **Storage:** The best advantage of hybrid cloud platforms is demonstrated in its storage solutions. Companies are able to take advantage of off-site storage for non-essential functions and some applications. It's also the only platform among the three that offers more than one backup service and a website recovery function – surprising given the strong demand for backup redundancy as a cloud storage feature – and it has the highest number of SQL-supported databases.
- **Tools:** Through a combination of MS compatibility and open source availability, this platform is flexible and agile operation. You can scale up or down at-will, and all of your legacy data will still have a safe home. You'll also benefit from their extensive investment in AI and machine learning tools.
- **Pricing:** Pricing is flexible, but you may need to do your homework evaluating the best pricing options on a project-by-project basis.

Pros and Cons of Google

Google Cloud is still growing, and a number of their basic features are still in the beta phase. However, if you're already based predominantly in the virtual world, Google will help you step up your game. They're also committed to creating technology that's carbon neutral to support resource conservation, which provides extra incentive for companies looking for greener tech.

- **Compute:** Their basic compute platform, creatively called Google Compute, is the highlight of their roster of services. They support both Windows and Linux, and you can custom configure your platform or a get pre-defined machine type. The focus of GCP is on Kubernetes deployment, which is an area of expertise for Google.
- **Storage:** Storage solutions is where Google is lacking, mainly due to an absence of backup options. However, they do offer both SQL and NoSQL support.
- **Tools:** The available tools and functions seem to be a work in progress. Google Cloud is off to a strong start, but they still have a way to go if they want to catch up with AWS.
- **Pricing:** In addition to their AI development, Google stands out for making it easier to work advanced tech into your budget. With this platform, you'll get basic prices for basic services that are still innovative and unique in their own way.

CONCLUSION

Although AWS leads in public cloud market share, but it would be incorrect to claim it provides the top solutions. Microsoft Azure and Google Cloud Platform sure have their added advantages if you're looking for easy business solutions or foolproof security. The idea is – there's no universal best when it comes to Cloud Service Provider, it all derives down to what best suits your requirements.