

Survey on Best Cloud Computing Service Provider

Dhruv Basnotra¹, Geetanshu Ahuja²

¹Department of CSE, ITM University, Gurgaon

²ITM University, Gurgaon

Abstract: Cloud computing is one of the major emerging areas of computer science. It is providing excellent business solutions to entrepreneurs. This paper shows the comparison between various vendors who provide cloud computing on the basis of services, price, feature, language the application can be written in hence making a survey to help the entrepreneurs to make a comparison based on their requirements. The paper also gives features or characteristics of cloud along with its advantages and disadvantages and basic introduction about the structure as well architecture to built the basic understanding of reader.

1. INTRODUCTION

Cloud itself is a set of hardware, networks, storage, services and interfaces that enable, the delivery of computing as a service. It is appeared that the network based services are provided by real server hardware which are in fact served by the virtual hardware. Somewhat like cloud becoming larger or smaller without being physical object. To get into much detail about the architecture the user or the customer should have a brief idea about the history. The idea of cloud computing emerged in 1950s when large scale mainframe computers were connected to client / terminal computers and these terminals were only used in communication and had no processing capabilities. Later the concept of time-sharing was also introduced. [1] In 1990's the telecommunication companies starts using the concept of cloud when they switched from primarily dedicated point to point data to VPN (Virtual Packet Data) in which it enables computer to send and receive across shared or public networks as if they were connected directly to the private network. These companies used cloud symbol as a demarcation point for the responsibility of the user and the service provider [2] After having a brief idea about history of cloud computing it is necessary to have an idea about its characteristics too which are being followed by any cloud computing service provider. First characteristic is the elasticity and scalability meaning the service needs to be available all the time and should be designed to scale upward for high periods of demand and downward for lighter ones, this ability to scale is achieved by elasticity. API is the second characteristic which provide instructions on how to applications or data resources communicate with each other. The third characteristic is the self-service provision according to which customers are able to easily able to get or communicate with the cloud services.

Followed by this characteristic is the billing and metering service which provides a built in service to bill the customers. For producing the bill the service should be metered. Another characteristic is the security which improves the centralization of data. The complexity of security is great as data is distributed over a wide area. After the characteristics it is important that the user gets aware of the benefits of cloud computing. Cloud computing has helped greatly to boost the IT efficiency of company. It has also helped companies to save operational cost (as reduces cost of hardware maintenance), and given an ability to grow and shrink IT capacity on demand almost instantly (a cloud based service can instantly meet the demand because of vast capacity of the service 's remote servers).

Now lets look at some of the disadvantages. There is a serious problem of privacy because the users data is always accessible with the service providers and it could be accidentally or deliberately be altered or even deleted. The issue of compliance arises sometimes due to the regulations like FISMA in US & Data Protection Directions in EU (European Union) provided by different countries due to which the user has to choose or adopt a costlier deployment mode Eg. hybrid deployment mode, With the change in landscape of compiling legal issues like security, sharing of proprietary, data resources, trademark infringement. One of main problems of cloud computing is over the issue of "possession of data" as disruption occurs as there are different set of rights for possessor of data and different set of rights for custodian. Many cloud computing platforms are proprietary. These platforms are built on specific standards and protocols and tools developed according to a Vendor. This can make migration of client from one platform to another difficult. The platform issue (Vendor Lock In) can be subdivided in 3 parts:-

- Platform Lock In – In this platform can be built on one of the several virtualization platforms eg. VMWARE or XEN and because of this things can get very complicated for the user while migrating.
- Data Lock In- Due to the issue of ownership of data over the cloud it causes a problem when user decides to move the data off of a cloud.

- Tools Lock In- Some times tools used to manage a type of cloud environment
- Are not compatible with virtual and physical infrastructure of other.

2. CLOUD COMPUTING ARCHITECTURE

All Cloud computing can be divided in 2 parts front end and back end The front end includes client’s compiler or any application that tries to access the cloud computing application The back end generally includes various computers, servers and data storage systems.

A central server monitors the traffic and client demands to ensure everything runs smoothly. It is done according to a particular set of rules known as protocols and a special kind of software known as middleware.After taking a look into cloud architecture lets look into cloud infrastructure. First lets start with hypervisor(Fig1).Hypervisor(a low-level program) is used for managing the virtual machine. It helps us to share a single physical occurrence of cloud resource amongst several users. The maintenance and configuration of the infrastructure is done with the help of management software. Deployment and integration of a program or an application on the cloud is done with the help of deployment software. Cloud services over the internet are connected with the help of a network which makes it one of the major components of the cloud infrastructure. It can be so that the network is delivered as an utility over the internet that is the network routes and protocols can be customized by the client. Due to the server vendor is able to provide services for monitoring resources, allocation and deallocation of resources and maintain security etc. It also helps the vendor to compute resource sharing. For storage purposes a distributed file system is used. So that in case of a failure the resources or data can be extracted from another place making the system more reliable.

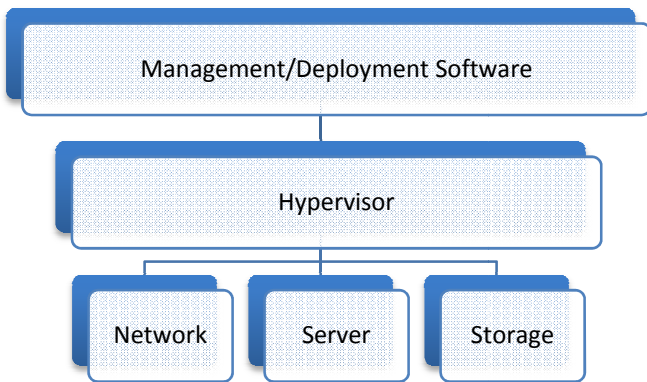


Fig1. Cloud Infrastructure

3. AVAILABLE SERVICE MODELS

The vendors provide services according to various service models for e.g. IaaS, PaaS, SaaS.

3.1 IaaS

IaaS cloud offer resources like file-based storage, firewalls, load balancers, IP addresses etc. These resources are offered on demand. To deploy the application the users of the cloud have to install images of the operating system and their application software on the infrastructure of the cloud.

Some benefits of the IaaS model are :-

The first benefit is complete access of the computing materials via Administrative Access to the virtual machines. IaaS gives the authority to the consumer for means of accessing computing resources via administrative access to the virtual machine. This can be done by Customer giving an administrative command to the cloud computing service provider to start or run the virtual machine or to save data on cloud computing service provider’s server. Consumer can also issue an administrative command to virtual machine they own for starting the b server or installing new applications. Another use of this model is the Flexible as well as efficient leasing of Computer Hardware. Resources such as virtual machines, bandwidth, monitoring services, IP addressing, storages etc., all are made handy to the customers or consumers on hire. The customer or the consumer pays according to the time he uses the resources.

With the help of the administrative control to the virtual machine, the consumer can operate upon any software, even a custom OS. The third benefit of this model is the interoperability, portability which can be maintained with the legacy applications. It is viable that the user continues to keep legacy between applications and workloads between IaaS clouds. Lets take an example, network applications such as e-mail server, web server that usually runs on the server hardware owned by the consumer can also be ran on Virtual machines in IaaS cloud.

However there are also many issues associated with this model, First comes the security issues associated with the legacy software. IaaS gives the permission to the consumer or the client to run legacy software in provider’s infrastructure, due to which it consumers can face all sort of the security threats which are associated with that legacy software. The Virtual machine might become outdated with respect to security updates because IaaS gives the flexibility to consumer so that he can operate the virtual machines in several states such as suspended, running, and off state. One of the main issue of data privacy may arise when the consumer uses the common disk resources to save his data which is provided by

the cloud provider and due to some error the provider is not able to erase the data when he leave the resources.

3.2 PaaS

In this the cloud provider typically delivers a computing platform for e.g. operating system, database or a web server. developers can run their software without complexity of buying prerequisite software and hardware. The major drawback of using PaaS is vendor lock-in with respect to a cloud service provider. For example, a program which is written in Python using Google's App Engine is likely to work or operate only in that environment. Hence giving rise to the issue of vendor lock-in in PaaS (Platform as A Service).

3.3 SaaS

In this model users are given permission to work in application software and databases. Application software are installed and updated by the cloud providers. The infrastructure of the cloud and platform where the application runs are not managed by the cloud user. Some of the applications this model are Billing and invoicing system, Customer Relationship Management (CRM) applications, Human Resource (HR) Solutions etc. SaaS has also demonstrated that it is valuable in terms of efficiency, performance, scalability, and much more. As Software as a Service application deployment is available to the user with extremely less or no client side software installation due to which the user can enjoy the advantages like no requirement for strenuous software packages at client side, client side has a extremely less or no risk of configuration on its side, low distribution cost. Another benefits of this model is the efficient usage of software licenses.

The client or the customer can have a single license for a large number of computers running and located at different destinations which would reduce the licensing cost. Also, there is no need for license servers because of the fact that the software operates in the provider's infrastructure. However there are also some issues associated with this this model. First being the risks associated with the browser. If the consumer or the client visits a website which contains viruses or is malicious then the browser becomes infected, and the following access to SaaS application might harm or compromise the consumer's data. For prevention from such type of risks, the client can use multiple number of browsers and allot a specific browser to access SaaS applications or could use a virtual desktop while approaching the SaaS applications. Another issue the user may face with this model is of network dependency. The availability of the SaaS application depends upon the network as it needs a continuous access to it. Network reliability is an important factor in SaaS model and sadly it can neither be guaranteed by the cloud provider nor by the consumer.

4. CLOUD COMPUTING SERVICE PROVIDER

4.1 Microsoft Azure

Microsoft Azure is a platform as a service (PaaS). It allows users to create enterprise-class applications. The Azure service platform is comprised of three cloud centric products: Windows Azure, SQL Azure and Azure app fabric controller. Azure provides the facility of virtual services that is this service provides the customer an environment which helps him to create and manage virtual machines running in the windows azure cloud. Along with virtual services it also gives the user a feature of mobile service, this service provides the user a solution for building and deploying apps and storing data for mobile devices.

The customer can also integrate his app to social networking sites. Azure also provides the user services for data management helping him to store his business data in SQL databases, or using NoSQL tables via REST. The user can also bring data in its original form and mix and match with other data services for innovative and modern application. To speed up his cloud service experience an additional feature of cache is added which helps the user speed up his cloud based applications and reduce database load. To protect the users data a backup service is provided. This service protects users server data by using automated and manual backup to windows Azure. Whether the user's data is big or small it depends on him where to store his data.

4.2 Amazon EC2

Amazon Elastic Compute Cloud web service is a service that allows to the application programs to run in the Amazon.com. Amazon cloud computing service works as a Virtual Machine. To use amazon service, user creates an AMI(Amazon Machine Image) which contains the operating system, application program and settings, then this AMI is uploaded to Amazon S3(Amazon Simple Storage Service) and user then registers himself with Amazon cloud computing service(EC2) and after this whole process user can request for virtual machine according to his demand. EC2 provides the user feature of flexibility through which It enables an organisation to build an application by using programming models, operating system, database to which they are familiar with.

User don't have to learn new skills to develop their applications. User can easily move their applications to the AWS cloud. Along being flexible it is cost effective too. Amazon EC2 provides the user with storage, bandwidth, resources according to his demand and he could also increase or decrease his resources instantly. The ability to respond quickly to change can help to reduce costs. EC2 is scalable and elastic which gives it an ability to scale computing resources up and down easily. Instead of setting up hardware and allocating resources. API calls are used to allocate

resources. Another important feature which amazon has kept in mind is of security User can encrypt personal and business data in the AWS cloud. Each service in AWS is architected to be secure. Amazon also provides physical security to its data centers few people know about its data center

4.3 IBM Smartcloud

IBM SmartCloud is based on software as a service(SaaS).IBM include social business tools in the cloud: file sharing, mail, calendar, profile. In IBM SmartCloud, the user could efficiently manage and send emails with features that include type-ahead, spell check. Along with an enhanced mail service IBM Smartcloud also provides calendar with time manage system which helps the user to schedule his meetings, appointments and reminders. Above mentioned features can be accessed through mobile too. Mobile access exists for Android, Apple, BlackBerry, Nokia and Windows, it hasability to send and receive mail, calander invitation from anywhere by using the users mobile. Another feature which

IBM has added in its buffet of features is of Collaboration and Instant messaging(IM)that is IBM provides real time communication, by which the user could see who is online, and he could evn text them, share documents with other users in SSL encrypted environment.

4.4 Google Compute Cloud

Google Compute Cloud is a Infrastructure as a Service(IaaS).Google search engine, gmail, youtube run on Google compute cloud. Google Compute cloud gives the user a facility to create a 64 bit x86 Linux-based virtual machine, and Google also offers variety of machine types. In case if virtual machine suffer any failure or goes offline, Data on persistent disks retain. In Google compute cloud, the user pays by minutes he uses(with a 10 minute minimum charge).After 10 minutes instance are charged in 1 minute increments. Google Compute Cloud disk support upto 10TB.GCE's persistent disk includes the price of input/output.

Table1. Comparison between various service provider

Models	Amazon Web Service	Google Compute Cloud	Microsoft Azure	IBM SmartCloud
Deployment Model	Amazon EC2 is a Public Cloud	Google Compute cloud is a Public Cloud	Microsoft Azure is a Public Cloud	IBM SmartCloud is a Hybrid And Private Cloud
Service Model	Amazon service is a IaaS(Infrastructure as a Service) and	Google Cloud is a IaaS(Infrastructure as a Service)	Azure is a both IaaS(Infrastrucure as a Service)and PaaS(Platform as a Service)	IBM cloud is a IaaS(Infrastructure as a Service), PaaS(Platform as a Service)and SaaS(Software as a Service).
Product Description	Amazon Elastic Compute Cloud web service that allow to run application programs in the Amazon.com. It works as a Virtual Machine.	Google compute engine run large scale workloads on virtual machine hosted by google's infrastructure.	Microsoft Azure allow users to create enterprise-class applications.	IBM include social business tools in the cloud:filesharing, mail, calendar, profile.
Industries	Dow Jones, LinkedIn, Expedia, Unilever, Sunpower.	Google cloud computing service is using by Institute for System Biology, BuildFAX.	Microsoft Azure is using by Icertis, Webzen, Telenor, Totota, Milliman, BMW Latin America.	Banking and finance, Education, Insurance, media and Entertainment., Internet and Communcation.
Features	1.Amazon enables an organisation to build an application by using programming models, operating system, database to which they are familiar with.	1.Google Compute Cloud disk support upto 10TB. 2.In Google compute cloud, the user pay by minutes he uses(with a 10 minute minimum	1.Microsoft provides the user a solution for building and deploying apps and storing data for mobile devices. 2. Microsoft Provides the	1.In IBM SmartCloud, the user can efficiently manage and send emails 2.IBM provides calendar with time management system

	2. Amazon EC2 provides the user storage, bandwidth, resource according to his demand 3. User can encrypt personal and business data in the AWS cloud	charge). After 10 minutes instances are charged in 1 minutes increments. 3. The user could scale up and down according to his demand.	user to store his business data in SQL databases, or using NoSQL tables. 3. Microsoft provides facility to speed up the users cloud based applications and reduce database load.	3. IBM has ability to send and receive email, calendar invitation from anywhere by using mobile. 4. IBM provides real time communication
Runtime	.NET, Java, PHP, Python, Ruby.	Python	.NET, Java, PHP, Python, Ruby, Node.	Java, Node, Ruby.
Cost	\$0.11 Per Hour	\$0.07 Per Hour	\$0.02 Per Hour	Pricing depends on the operating system. RedHat Linux OS will cost \$0.30 Per Hour at copper level and \$1.46 Per Hour at Platinum level

5. CONCLUSION

All the cloud computing service providers, provides their best to customers. Amazon, Microsoft and Google all provides their best services to customers. As Google is new in cloud computing service, yet it compete to Amazon in many features. As Google and Microsoft does not provides any form of service level agreement because the services is still being developed. While Amazon provides the service level agreement. As Google and Microsoft's cloud services allow customers to to run penetration test on their security controls. All the three vendors said they allow customers the option of choosing the location for where their data is stored. As Amazon EC2 charges the usage of instances by

hour. while GCE machine types are charged a minimum of 10 minutes, Google provides 10TB block storage than which is 10 times than provided by Amazon. Google virtual machine boot time is faster than Amazon. Microsoft Azure can fulfill any user need.

REFERENCES

- [1] Strachey, Christopher, "Time Sharing in Large Fast Computers". *Proceedings of the International Conference on Information processing, UNESCO*. paper B.2.19: 336–341, 1959
- [2] July, 1993 meeting report from the IP over ATM working group of the IETF". 1993 meeting report from the IP over ATM working group of the IETF". 1993.