#### " The effect of Amazon Web Services (AWS) & AZURE on Cloud- Computing”

Nikhil Gupta1

1, Greater Noida Institute of Technology (GNIOT),India

1nikhil.ee@gniot.net.in

1. **Abstract**:- Cloud Computing has become a very famous and successful drill with the current evolution of technology. Its becoming an increasingly famous enterprise model, in which the computing resources are made obtainable to the user as they needed. Cloud computing is the on -demand delivery of compute power, database, storage, applications, and other IT resources via the internet with pay-as-you-go pricing. These resources run on server computers that are located in large data centers in different locations around the world. Here, we will be studying about Amazon Web Services (AWS), IBM, AZURE,which is one of the best cloud-service provider in the world. AWS,AZURE, is one of the most trusted and reliable sources of providing cloud-computing services. It provides a variety of services with a properly managed security as well. It is a secure cloud platform that offers a broad set of global cloud-based products. Because these products are delivered over the internet, you have on-demand access to the S3,compute, storage, network, database, and other IT resources that you might need **Keywords:** Amazon Web Services (AWS),&AZURE Cloud Computing, Reliability, Flexibility, Scalability, Compute, Database, Networ
2. **Introduction**

* Cloud computing is the on -demand delivery of compute power, database, storage, applications, and other IT resources via the internet with pay-as-you-go pricing. These resources run on server computers that are located in large data centers in different locations around the world. When you use a cloud service provider like AWS &AZURE that service provider owns the computers that you are using. These resources can be used together like building blocks to build solutions that help meet business goals and satisfy technology requirements.

**Table 1.**  AWS VS AZURE Features

|  |  |
| --- | --- |
| **Factors** | **Sub-Factors** |
| Pricing | Currencies, purchasing ways, the minimum billing cycle and pricing calculator. |
| Availability | Calculation uptime percentage and Error Rate. |
| Confidentiality | Confidentiality countermeasures. |
| Secrecy | Data in transit and data in rest. |
| Tier Account | Provided services, period of free tier and user’s data continuance. |
| SLA | SLA provided ratio of different services: Virtual Machine, Cloud Storage, DNS, CDN |

* Cloud Service Models:
* There are three main cloud service models. Each model represents a different part of the cloud computing stack and gives you a different level of control over your IT resources:
* Platform as a service (PaaS):

**Platform as a Service (PaaS) is a complete cloud environment that includes everything developers need to build, run, and manage applications—from servers and operating systems to all the networking, storage, middleware, tools, and more.**

Software as a service (SaaS):

SaaS is a licensing model in which access to software is provided on a subscription basis, where the software is located on external servers rather than on servers located in-house. Software as a Service is commonly accessed through a web browser, with users logging into the system using a username and password.

Infrastructure as a service (IaaS):

Infrastructure as a service (IaaS) provides compute, memory, storage, networking and related software, such as operating systems and databases, as a cloud service to replace traditional on-premises data center infrastructure.

**Table 2.** Cloud Computing Services

|  |  |  |
| --- | --- | --- |
| **SaaS** | **PaaS** | **IaaS** |
| CRM, Collaborative, Email, Communications, Games, Desktop, ERP. | Application deployment Database, Decision Support, WebServer, Development tool, Streaming. | Virtual Machine, Servers, storage, Load Balancer, Network,  System Management, Technical. |

## Comparing AWS and azure

This paper makes a comparison between AWS and Azure platforms using six com- parison factors that we believe to be the most important based on the customers’ point of view. Table 2 summarizes these six factors and its sub-factors.

## Amazon wed service (AWS)

AWS is a cloud service platform that offers SaaS, PaaS and IaaS with highly relia- bility, scalability and low-cost infrastructure. AWS was officially launched in 2006 . Within 12 geographic Regions world-wide, AWS operates in 334Availability Zones. Data center locations are in U.S., Europe, Brazil, Singapore, Japan, and Australia. About 11 more Availability Zones and 5 regions are expected to come online during next year [8]. Elastic Compute Cloud (EC2) from Amazon, virtual private cloud (VPC), Rout 53 (a highly available and scalable cloud Domain Name System (DNS) web ser- vice), Relational Database Service (RDS), Elastic load balancer (ELB), Simple Storage Service (S3), Elastic Block Store (EBS), Glacier, Simple Queue Service (SQS)/ Auto Scale, Security Group and Cloudfront are some of the services provided by AWS .

## Microsoft azure

Azure is a popular cloud service platform and infrastructure; it offers SaaS, PaaS and IaaS with highly reliability, scalability and low-cost infrastructure. Azure was first launched in 2008. It is available in 140 countries, including China, and supports 10 languages, 24 currencies, and the data centers available in 28 regions . Some of services that Azure offering to customers are Virtual Machine, Virtual Network, Win- dows Azure Name Resolution, Structure Query Language (SQL) Database, Traffic Manager, Storage, Scheduler, EndPoint and Content Delivery Network (CDN) .

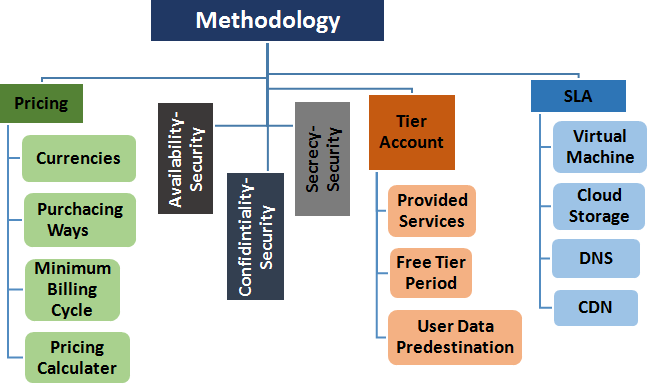
# 3 Methodology

Our research focuses on customers’ point of view and the main functional require- ments for them to go to cloud. We proposed a comparison model (see Fig. 1) with six factors to compare between two cloud platforms leaders: Amazon Web Service (AWS) and Microsoft Azure.

The six comparison factors: Pricing (currency, purchasing options, purchasing styles, the minimum billing cycle and available calculators), Free Tier, SLA, Availabil- ity, Confidentiality and Secrecy.

It is worth mentioning that neither we were able to find in literature a previous com- parison between Azure and AWS that grouped the comparisons factors the same way we did; nor we were able to see comparison with the same details we presented. Fig.1 shows how these factors are grouped to go through the comparison process between Azure and AWS.

Notice that we added the word security to all security related factors (Availability, Confidentiality, and Secrecy). This addition aims at making the comparison process easier as willbedescribedinsection .



4 Cloud Deployment Models:

The three main types of cloud deployment models are private, public, or hybrid. Selecting your desired model depends on your specific requirements.

Cloud:

A cloud-based application is fully deployed in the cloud, and all parts of the application run in the cloud. Applications in the cloud have either been created in the cloud or have been migrated from an existing infrastructure to take advantage of the benefits of cloud computing. Cloud-based applications can be built on low-level infrastructure pieces or they can use higher- level services that provide abstraction from the management, architecting, and scaling requirements of core infrastructure.

Hybrid:

A hybrid deployment is a way to connect infrastructure and applications between cloud-based resources and existing resources that are not located in the cloud. The most common method of hybrid deployment is between the cloud and existing on-premises infrastructure. This model enables an organization to extend and grow their infrastructure into the cloud while connecting cloud resources to internal syste

On-premises:

Deploying resources on-premises, using virtualization and resource management tools, is sometimes called private cloud. While on-premises deployment does not provide many of the benefits of cloud computing, it is sometimes sought for its ability to provide dedicated resources. In most cases, this deployment model is the same as legacy IT infrastructure, but it might also use application management and virtualization technologies to increase resource utilization.

**Table 3.** Some free services provided by AWS

|  |  |
| --- | --- |
| **AWS services** | **Usage Limit** |
| Amazon EC2 | 1. 750 hours per month of Linux, RHEL, or SLES t2.micro instance usage, 2. 750 hours per month of Windows t2.micro instance usage, 3. Expires 12 months after sign-up. |
| Amazon S3 | (1) 5 GB of Standard Storage, (2) 20,000 Get Requests,  (3) 2,000 Put Requests, (4) Expires 12 months after sign-up. |
| Amazon RDS | 1. 750 Hours of Amazon RDS Single-AZ db.t2.micro Instance usage, 2. 20 GB of DB Storage: any combination of General Purpose (SSD) or Magnetic, 3. 20 GB for Backups (with RDS Magnetic storage; I/Os on General Purpose [SSD] are not separately billed), (4) 10,000,000 I/Os, (5) Expires 12 months after sign-up. |
| AWS IoT | 1. 250,000 Messages (published or delivered) per month, 2. Expires 12 months after sign-up. |
| Amazon EC2 Container Registry | * 500 MB-month of Storage. * Expires 12 months after sign-up. |
| Amazon Mobile Analytics | 1. 100 Million free events per month, 2. Does not expire at the end of your 12-month AWS Free Tier term. |

**Table 4.** Some free Services provided by Azure

|  |  |
| --- | --- |
| **Azure services** | **Usage Limit** |
| App Service | Quickly build and host up to 10 web and mobile apps on any platform or device. |
| Virtual Network | Up to 50 free virtual networks. |
| Azure Active Directory | Get support for up to 500,000 directory objects and single sign-on for up to 10 apps per user. |
| Visual Studio Team Service | Free for up to 5 users. |
| Azure IoT Hub | Get up to 3,000 free messages per day allowing you to monitor and control up to 10 of your Internet of Things (IoT) devices |
| Scheduler | Get up to 3,600 job executions per month. |

5 Literature Survey

1. Literature Survey

Its been a sufficient time since cloud-computing was introduced and now, many service-providers are providing cloud services. However, problems still persist while using cloud-computing services in IT sector. Many people were not sure about its trustability since all the data of companies remain online on the cloud and anyone from anywhere can easily access that data, even leading to much damage. Before AWS & AZURE was introduced, some issues with cloud computing were:

* 1. Privacy Concern
  2. Compliance
  3. Security Concern
  4. Sustainability
  5. Higher Cost
  6. Lacking reliability in providing services

6 CHALLENGES IN CLOUD-COMPUTING

1. Its too difficult to manage the large chunk of data that arrives from multiple sources to operate your business. The pain point here lies not only in management but also in identification of efficient infrastructure that will sort data and store accordingly.
2. Organizations have to pay even if they are not using cloud-computing services, even though cloud-computing is affordable.
3. The transfer of data from one system to another possesses serious risks, if not monitored and handled properly. Even if a technology is identified, it is still prone to hacking.
4. Assiduous supervision of passwords also plays a key role in cloud security. But, many people aware of your password will be easily able to access it and can retrieve your inform

7 CONCLUSION

Cloud computing is now being used in many fields; including mobile teaching re- source push [36], to becoming a development environment in teaching [37], and as a new multiple criteria for decision making [39]. Microsoft Azure and Amazon Web Ser- vice (AWS) are two important leaders in providing cloud-computing services. The close similarity between the services functions for these infrastructures and the deeply services’ details leads to complex comparison process and hard preference decision.

The study revealed that both platforms have some similarities and differences that make it difficult to favor one over the other based on some factors. The study showed that Azure is more appropriate than AWS in terms of pricing as the minimum billing cycle used is minutes rather than hours as used in AWS. In addition, the way the pur- chasing option is computed in Azure is very suitable for organizations that already have on-premises Windows server license to save costs and get discount up to 60%. Simi- larly, Azure Hybrid purchasing options are suitable for the customers that have existing Windows server license with Software Assurance to move to cloud and pay only for the base computing rate and deploy hybrid cloud with cost-effective price. We also believe that the “Error Rate” calculation in Azure is better than that in AWS at the availability factor. This is due to the fact that the time interval in Azure (one hour) during which transactions are stored is longer than which is used in AWS (5 minutes). Furthermore, the longer the time interval will give more accurate ratio about number of (potential) errors. However, with regard to the free tier factor, it seems that AWS is better that Azure. AWS provides 1-month free trial period whereas Azure provides one month. Furthermore, AWS preserves the users’ data even if the uses do not plan to subscribe with its subscription. Both platforms are similar regarding SLA and the secu- rity factors.

As for the future, we plan to explore the actual effects of years of experience on pricing, and gender and position on secrecy.

# References

1. Grossman, R. L. (2009). The case for cloud computing. IT professional,11(2), 23-27.
2. Armbrust, M., Fox, A., Griffith, R., Joseph, A. D., Katz, R., Konwinski, A. & Zaharia, M. (2010). A view of cloud computing. Communications of the ACM, 53(4), 50-58. https://doi.org/10.1145/1721654.1721672
3. Moyo, Tumpe, and Jagdev Bhogal. "Investigating Security Issues in Cloud Computing." Complex, Intelligent and Software Intensive Systems (CISIS), 2014 Eighth International Conference on. IEEE, 2014. https://doi.org/10.1109/cisis.2014.21
4. Khaldi, Alexandre, et al. "A secure cloud computing architecture design."Mobile Cloud Computing, Services, and Engineering (MobileCloud), 2014 2nd IEEE International Con- ference on. IEEE, 2014. https://doi.org/10.1109/mobilecloud.2014.44
5. Dawoud, Wesam, Ibrahim Takouna, and Christoph Meinel. "Infrastructure as a service se- curity: Challenges and solutions." Informatics and Systems (INFOS), 2010 The 7th Interna- tional Conference on. IEEE, 2010.
6. "Top 10 Cloud Vendor Benchmark 2016: PDF Download." Top 10 Cloud Vendor Bench- mark 2016: PDF Download. N.p., n.d. Web. 16 Apr. 2016.
7. "About AWS." Amazon Web Services, Inc. N.p., n.d. Web. 16 Apr. 2016.
8. "Global Infrastructure." Amazon Web Services, Inc. N.p., n.d. Web. 16 Apr. 2016.
9. "Amazon Web Services (AWS) - Cloud Computing Services." Amazon Web Services, Inc. N.p., n.d. Web. 30 Apr. 2016. <https://aws.amazon.com/?nc2=h\_lg>. https://doi.org/10.1007/978-1-4842-2589-9\_10
10. "Azure Cloud Services by Location or Region | Microsoft Azure." Azure Cloud Services by Location or Region | Microsoft Azure. N.p., n.d. Web. 16 Apr. 2016. https://doi.org/10.1201/b17313-23
11. "Microsoft Azure: Cloud Computing Platform & Services." Microsoft Azure: Cloud Com- puting Platform & Services. N.p., n.d. Web. 30 Apr. 2016.

<https://azure.microsoft.com/en-us/>. https://doi.org/10.1002/9781119114215.ch5

1. Bermudez, Ignacio, et al. "Exploring the cloud from passive measurements: The Amazon AWS case." INFOCOM, 2013 Proceedings IEEE. IEEE, 2013. https://doi.org/10.1109/infcom.2013.6566769
2. S. Narula, A. Jain and M. Prachi, "CLOUD COMPUTING SECURITY: AMAZON WEB SERVICE", in 2015 Fifth International Conference on Advanced Computing & Communi- cation Technologies, Haryana, 2015, pp. 501 - 505. https://doi.org/10.1109/acct.2015.20
3. Tajadod, G., Batten, L., & Govinda, K. (2012, December). Microsoft and Amazon: A com- parison of approaches to cloud security. In Cloud Computing Technology and Science (CloudCom), 2012 IEEE 4th International Conference on (pp. 539-544). IEEE. https://doi.org/10.1109/cloudcom.2012.6427581
4. T. Singh, "Security in public cloud offerings: Issues and A comparative study of Amazon Web Services and Microsoft Azure", in National Conference on RTICCN-2015 at CGC- COE, Mohali(Punjab), 2015.
5. B. Rashidi, E. Asyabi and T. Jafari, "A Comparison of Amazon Elastic Mapreduce and Az- ure Mapreduce", Elixir International Journal, 2012.
6. N. Islam and A. Rehman, "A comparative study of major service providers for cloud com- puting", in The 1st International Conference on Information and Communication Technol- ogy Trends, At Karachi, Pakistan, 2013.
7. B. Rajeev, B. Vinod and K. Arun, "A Comparative Study of Amazon Web Service and Win- dows Azure", International Journal of Advanced Computer Research, vol. 3, no. 11, 2013.
8. V. Gandhi and C. Kumbharana, "Comparative study of Amazon EC2 and Microsoft Azure cloud architecture", International Journal of Advanced Networking Applications (IJANA), no. 0975-0290, 2014.
9. Nabi, M., Toeroe, M., & Khendek, F. (2016). Availability in the cloud: State of the art. Journal of Network and Computer Applications, 60, 54-67. https://doi.org/10.1016/j.jnca.2015.11.014
10. Gui, Z., Yang, C., Xia, J., Huang, Q., Liu, K., Li, Z. & Jin, B. (2014). A service brokering and recommendation mechanism for better selecting cloud services. PloS one, 9(8), e105297. https://doi.org/10.1371/journal.pone.0105297
11. Ghaffar, M. A. A., & Vu, T. T. (2015, August). Cloud computing providers for satellite image processing service: A comparative study. In Space Science and Communication (IconSpace), 2015 International Conference on (pp. 61-64). IEEE. https://doi.org/10.1109/iconspace.2015.7283781
12. Bari, Irfan, et al. "Cost and Performance Based Comparative Study of Top Cloud Service Providers." International Journal of Computer Science and Information Security 13.12 (2015): 172.
13. B. Dordevic, S. Jovanovic and V. Timcenko, "Cloud Computing in Amazon and Microsoft Azure platforms: performance and service comparison", in Telecommunications Forum Tel- for (TELFOR), 2014 22nd, Serbia, Belgrade, 2014, pp. 931 - 934. https://doi.org/10.1109/telfor.2014.7034558
14. Pricing Overview - How Azure pricing works | Microsoft Azure. (n.d.). Retrieved April 15, 2016, from https://azure.microsoft.com/en-us/pricing/.

https://doi.org/10.1007/978-1-4842-0665-2\_1

1. 12-Month Prepay Offer | Microsoft Azure. (n.d.). Retrieved April 15, 2016, from https://azure.microsoft.com/en-us/offers/ms-azr-0026p/.
2. Azure in Open Licensing | Microsoft Azure. (n.d.). Retrieved April 16, 2016, from https://azure.microsoft.com/en-us/offers/ms-azr-0111p/. https://doi.org/10.1007/978-1- 4842-1476-3\_2
3. Microsoft Azure Compute Option. (n.d.). Retrieved April 16, 2016, from https://azure.microsoft.com/en-us/pricing/microsoft-azure-compute-option/. https://doi.org/10.1007/978-1-4842-1476-3\_2
4. Microsoft Azure Hybrid Use Benefit. (n.d.). Retrieved April 16, 2016, from https://azure.microsoft.com/en-us/pricing/hybrid-use-benefit/.
5. Pricing Offers | Microsoft Azure. (n.d.). Retrieved April 16, 2016, from https://azure.microsoft.com/en-us/free/pricing-offers/.
6. Pricing Calculator | Microsoft Azure. (n.d.). Retrieved April 17, 2016, from https://azure.microsoft.com/en-us/pricing/calculator/.
7. AWS Cloud Pricing Principles – Amazon Web Services (AWS). (n.d.). Retrieved April 17, 2016, from https://aws.amazon.com/pricing/. https://doi.org/10.1007/978-1-4842-2589- 9\_10
8. How AWS Pricing Works [PDF]. (2015, June). Amazon Web Services. https://d0.awsstatic.com/whitepapers/aws\_pricing\_overview.pdf
9. Cloud Storage Pricing – Amazon Simple Storage Service (S3) – AWS. (n.d.). Retrieved April 18, 2016, from https://aws.amazon.com/s3/pricing/. https://doi.org/10.1002/9781119560395.ch3
10. Purchasing Options. (n.d.). Retrieved April 17, 2016, from https://aws.amazon.com/ec2/purchasing-options/.
11. AWS Total Cost of Ownership Calculator. (n.d.). Retrieved April 18, 2016, from https://aws.amazon.com/tco-calculator/.
12. TCO Calculator. (n.d.). Retrieved April 18, 2016, from https://awstcocalculator.com/.
13. Amazon Web Services Simple Monthly Calculator. (n.d.). Retrieved April 18, 2016, from https://calculator.s3.amazonaws.com/index.html.
14. SLA for Storage. (n.d.). Retrieved April 20, 2016, from https://azure.microsoft.com/en-us/support/legal/sla/storage/v1\_0/.