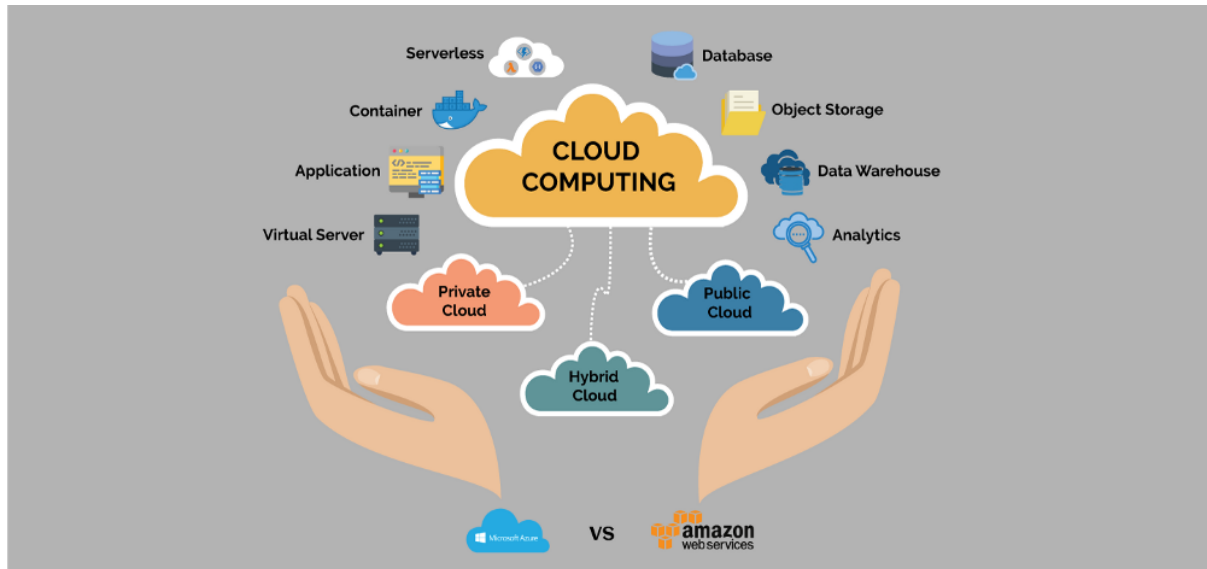


A Comparative study among different Cloud Computing Platforms

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In the past few years, cloud computing has significantly undergone a shift from value add to business necessity. The cloud adoption rate among enterprises is on a continuous rise. With many developments in technological innovations, many technology service providers have embraced cloud solutions as one of their flagship solutions. To understand how cloud solutions can transform a business, it is important to first learn what is cloud and what are its components.

One of the most important factors of cloud implementation is deciding what you're planning to implement. With cloud computing, we have now varied options spread across the three layers of the cloud computing stack: software-as-a-service (SaaS), platform-as-a-service (PaaS), and infrastructure-as-a-service (IaaS).

Software-as-a-service (SaaS)

Sitting at the top of the cloud stack is SaaS. SaaS is simply a cloud-hosted software accessed through the internet. This is the most commonly used cloud computing model. The software is being managed by the service provider who owns and hosts the software in a cloud environment, which means end users don't need to bother about the up-gradation, maintenance, or patches. SaaS-based solutions are usually highly customizable and scalable in order to best meet any kind of business needs and processes.

These kinds of applications can be managed from anywhere using any device.

Platform-as-a-service (PaaS)

PaaS offers a platform for developers where they can build their own applications. The development platform usually includes an integrated development environment (IDE), an operating system, programming language, database, and server, etc. The development tools for testing, deploying, collaborating, hosting, monitoring, and maintaining applications are also offered by the service provider. Just like SaaS, PaaS is also being hosted in the cloud and accessed through the internet. Applications developed on PaaS don't depend on a specific platform to perform. As PaaS is a service-based solution, the infrastructure and applications are managed for the customers. It is typically based on a subscription basis depending on user usage. PaaS solutions often include integration capabilities — often through Web APIs — and mobile-specific services, such as data synchronization.

Infrastructure-as-a-service (IaaS)

IaaS offers cloud computing infrastructure and storage-on-demand through the internet. The virtual infrastructure includes virtual servers, network connections, bandwidth, IP addresses etc. An organization can completely eliminate the expenses associated with managing and maintaining infrastructure as the service provider will take complete ownership. Unlike conventional hardware infrastructure, IaaS offers a high level of scalability. Companies can scale up or scale down as per their requirements. IaaS is ideal for start-ups or rapidly growing businesses, as IaaS providers offer generalized computing, storage resources and the flexibility to choose software and hardware.

According to the 2018 research by Statista; Amazon, Microsoft and IBM are the top three cloud service providers worldwide, with Amazon having a strong lead over the others. In this blog, we are going to have a deep dive into Amazon Web Services and Microsoft Azure.

Amazon Web Services (AWS)

Founded in 2006, Amazon web services is the most comprehensive cloud service provider with an extensive range of products and services. AWS has an offering for everyone, starting from individuals to small organizations to the largest enterprises. This makes AWS an undisputed leader in the cloud market. AWS included all the latest technological innovations such as IoT, AI, Blockchain, machine learning, AR and VR in their service. AWS offers a wide range of IaaS and PaaS services which includes Elastic Cloud Compute (EC2), Elastic Beanstalk, Simple Storage Service (S3) and Relational Database Service (RDS).'

Microsoft Azure

Microsoft fairly earns the second position in the world's top cloud service providers. It has built its hybrid platform 'Azure', including all the three major categories: SaaS, PaaS and IaaS, in order to meet complex business challenges in multiple industries (financial, retail, manufacturing, healthcare, gaming, government, etc.). Azure also includes IoT, AI, and Blockchain in its solutions and also allows organizations to create applications ensuring high data security. As physical servers are not required, this reduces huge costs, such as an on-site server support team. The Azure Migration Center performs cloud transfers quicker and easier. The solution is also compatible with Linux. Microsoft Azure partnerships with other vendors such as Adobe, SAP, Cisco, etc., for ensuring more integration opportunities to the users.

Google Cloud Platform

Google Cloud Platform (GCP), which is 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 engine, YouTube, and more.

Google Cloud Platform began its journey in 2011, and in less than a decade it has managed to create a good presence in the cloud industry. The initial intent of Google Cloud was to strengthen Google's own products such as Google Search engine and YouTube. But now, they have also introduced their enterprise services so that anyone can use Google Cloud Platform which shares the same infrastructure as that of Google Search or YouTube.

Let's have a detailed comparative study between AWS ,Azure and GCP based on various services they offer:

AWS Vs Azure Vs Google Cloud: Availability Zones

It has been already established that AWS was the earliest in the cloud domain which means that they have had more time to establish and expand their network. So, AWS is hosting in multiple locations worldwide. Azure and GCP are also hosted in multiple locations worldwide, but the difference occurs in the number of their respective availability zones.

- AWS has 66 availability zones with 12 more on the way.
- Azure has 54 regions worldwide and is available in 140 countries all around the world.
- Google Cloud Platform has been made available in 20 regions around the world with 3 more on their way.

Service offerings from AWS, Azure, and GCP that come under the domains of compute, database, storage, and networking are mapped below:

Services	AWS	Azure	GCP
IaaS	Amazon Elastic Compute Cloud	Virtual Machines	Google Compute Engine
PaaS	AWS Elastic Beanstalk	App Service and Cloud Services	Google App Engine
Containers	Amazon Elastic Compute Cloud Container Service	Azure Kubernetes Service (AKS)	Google Kubernetes Engine
Serverless Functions	AWS Lambda	Azure Functions	Google Cloud Functions

1. Virtual Server

A virtual server is a server that shares hardware and software resources with other operating systems (OS), versus dedicated servers. Virtual servers allow users to deploy, manage, and maintain OS and server software. Instance types provide combinations of CPU/RAM. Users pay for what they use with the flexibility to change sizes. These highly efficient virtual servers are popular in web hosting and cloud computing systems.

Amazon Elastic Compute Cloud (Amazon EC2) which is Amazon's virtual server, is a web service that offers a secure and scalable computing capacity in the cloud. It is designed to make web-scale cloud computing accessible for developers. EC2 provides complete control of computing resources and allows you to run on Amazon's highly efficient computing environment. It also decreases the time required to obtain and boot new server instances, enabling quick scale up or down your capacity depending on computing requirements. You have to pay for only the capacity you actually use.

On the other hand, Azure's virtual server 'Azure Virtual Machines' provides the flexibility of virtualization without owning or maintaining the hardware that runs it. By supporting Linux, Windows Server, SQL Server, Oracle, IBM, and SAP, Azure Virtual Machines provides virtualization for a broad spectrum of computing solutions including development and testing, running applications, and extending data center. It offers the option of open-source software configured the way you need. Based on pay for what you use model, Azure Virtual Machines are highly secured and effectively meets compliance goals.

2. Container Instances

Container instances are a recent option to run containers without managing servers. Container instances bring two out of three core elements of serverless, which are the micro-billing model and an invisible structure. They have the ease-of-use of serverless and the availability and portability of containers. A container instance is a container deployed on a cloud platform, that can scale up and down as required, and discards the user of the responsibility of managing and maintaining it.

AWS provides Amazon Elastic Container Service (Amazon ECS) which is a highly scalable and efficient container orchestration service that supports Docker containers and allows to smoothly run and scale containerized applications on AWS. Amazon ECS eliminates the need of installation and operation of own container orchestration software, manage and scale a cluster of virtual machines, or schedule containers on those virtual machines. Simple API calls helps in the launch of Docker-enabled applications, the entire state of application queries, access of features such as IAM roles, security groups, load balancers, Amazon CloudWatch Events, AWS CloudFormation templates, and AWS CloudTrail logs etc.

Similarly Microsoft Azure allows by running workloads in the Azure Container Instances (ACI) so that you can focus on designing and developing your business applications rather than managing the infrastructure that runs them. Agility with the containers can be increased on demand by deploying containers to the cloud with exceptional simplicity and speed using a single command. The applications are highly secured as ACI provides hypervisor isolation for each of the container group to ensure containers run in isolation.

3. Microservices / Container Orchestration

Applications are basically built up of independently containerized components (called microservices) which are organized at the networking level in order to make the application run as expected. This process is called Container orchestration. Amazon ECS helps you run microservices applications with native integration to AWS services and facilitates continuous integration and continuous deployment (CICD) pipelines. AWS offers a secure place to store and manage container images, orchestration that manages when and where your containers run, and flexible compute engines to power containers. Elastic Container Service for Kubernetes (EKS) helps deploy orchestrated containerized applications with Kubernetes. It offers simplify monitoring and cluster management through auto upgrades and a built-in operations console.

From Microsoft, Azure Container Instances facilitates a layered approach to orchestration, giving all of the scheduling and management capabilities needed to run a single container, while allowing orchestrator platforms to manage multi-container tasks on top of it. As the underlying infrastructure for container instances is being managed by Azure, an orchestrator platform does not require to concern itself with finding an appropriate host machine on which to run a single container. Azure provides microservices architecture on Azure Kubernetes Service (AKS) and Azure Service Fabric for always-on, scalable, distributed apps.

4. Serverless

Serverless computing is a misnomer referring to a cloud-computing execution model in which the cloud provider runs the server, and dynamically manages the allocation of machine resources.

AWS Lambda is Amazon's serverless code execution platform built on the concept of containerization. AWS Lambda uses the AWS Machine architecture to reduce the scope of containerization, allowing spin up and tear down individual pieces of functionality in the application. Functions run on Amazon Machine Instances, which are immutable web server objects that can be instantiated quickly in response to dynamic API requests. By using various AWS services and functionalities, an entire application can be built without having a true "server-side" set of code to manage.

Whereas Microsoft is a new entrant in the serverless realm. While Azure has significant PaaS functionalities for several years, they entered to the serverless app environment with Microsoft Azure Functions in the year 2016 only. The addition of Microsoft Azure Functions expanded the Azure platform with the ability to run arbitrary code in temporary execution environments.

5. Integration Service and API Management

Cloud integration service (Messaging, Eventing, API) lets your organization create integrations between cloud application, but also between cloud and on-premise applications, data and processes across your enterprise. One can create connections to well known and less known SaaS applications using a bunch of cloud adapters, publish or subscribe to the Messaging Cloud Service, or use industry standards like SOAP & REST APIs.

Amazon offers various integration services through AWS Application Integration suite comprising Amazon SNS (fully managed pub/sub messaging), Amazon SQS (fully managed message queues), Amazon MQ (managed message broker service for Apache ActiveMQ), GraphQL Serverless API management using AWS AppSync (create a flexible API to securely access, manipulate, and combine data from one or more data sources), API Gateway (create, maintain, and secure APIs at any scale) and GraphQL (query and manipulate your data easily), AWS Step Functions (build distributed applications using visual workflows), etc. for to integrate microservices, distributed systems, and serverless applications.

Azure on the other hand offers Service Bus (cloud messaging as a service (MaaS) and simple hybrid integration), Azure Queue Storage (durable queues for large-volume cloud services), Event Grid (build reactive, event-driven apps with a fully managed event routing service), API Management (publish, manage, secure and analyze your APIs in minutes) and Logic Apps (build powerful integration solutions without writing codes using visual workflows).

6. Relational Database

Azure: SQL Database, Database for MySQL, Database for PostgreSQL

AWS: RDS, Aurora

Any software applications require a database to store information. Azure and AWS both offer database services, regardless of whether you need a relational database or a NoSQL offering. Amazon's RDS (Relational Database Service) and Microsoft's equivalent SQL Server database both are highly available and enduring. RDS is an umbrella term and it includes Amazon Aurora, MySQL, MariaDB, Oracle, Microsoft SQL Server, and PostgreSQL. Aurora is a distinct offering because it is a high-end service dedicated to MySQL and PostgreSQL. Since Azure also offers those distinct services it made sense to break Aurora out from RDS.

Conclusion

AWS ,Azure and GCP offer similar kinds of services and features. So, it is not certainly a matter of debate about which provider is better. Comparing Azure and AWS is extremely difficult as both continue to launch new pricing models, products, and integrations. It all depends on what a business needs and what are the future goals.