

The Biggest Cloud Service Provider: Amazon Web Services (AWS)

Snehil Sarkar¹ and Sapan Shah²

Department of Information Systems, California State University Los Angeles

CIS 5100 IS/IT Architecture

Abstract

In modern times, cloud computing is the most scalable, flexible, reliable, secure, and cost-effective business solution for companies for managing applications and services through a global network. To run various business applications and meet business goals, companies have the option to rent services from cloud service providers (CSPs) instead of investing a lot in infrastructure, managing, and maintaining in-house data centers. This project paper covers concepts of cloud computing, in-depth details about AWS, and AWS Cloud Security. It also includes a thorough comparison of the big three cloud service providers.

Keywords: Cloud, Cloud Computing, IaaS, CSPs, Amazon Web Services (AWS), GCP, Azure, Microsoft Azure, AWS Cloud Security, and Google Cloud.

Introduction

Cloud computing refers to the provision of computing resources, including servers, storage, databases, networking, software, analytics, and intelligence, on demand over the internet. This technology model allows users to access and manage these resources without the need for direct, manual intervention from service providers. Most cloud computing services can be categorized into four main types: infrastructure as a service (IaaS), platform as a service (PaaS), serverless computing, and software as a service (SaaS).

In the 21st century, it has become a foundational element in modern IT, offering organizations the flexibility and efficiency to scale and manage their computing needs dynamically. To keep up with the digital transformations, each organization is undergoing profound changes in its technological landscape. Cloud computing plays a pivotal role in that as businesses are increasingly relying on cloud platforms to streamline and enhance their operations cost-effectively. Some of the major cloud service providers are Amazon Web Services, Microsoft Azure, Google Cloud Platform, IBM Cloud, Oracle Cloud, and Alibaba Cloud.

Amazon Web Services

Launched by Amazon in 2006, Amazon Web Services (AWS) has emerged as a global leader in providing on-demand cloud computing services. AWS is a blend of infrastructure as a service (IaaS), software as a service (SaaS), and platform as a service (PaaS) solution. Amazon Web Services (AWS) commands over 33% of the cloud market, maintaining a substantial lead that is nearly twice as much as its closest competitor.

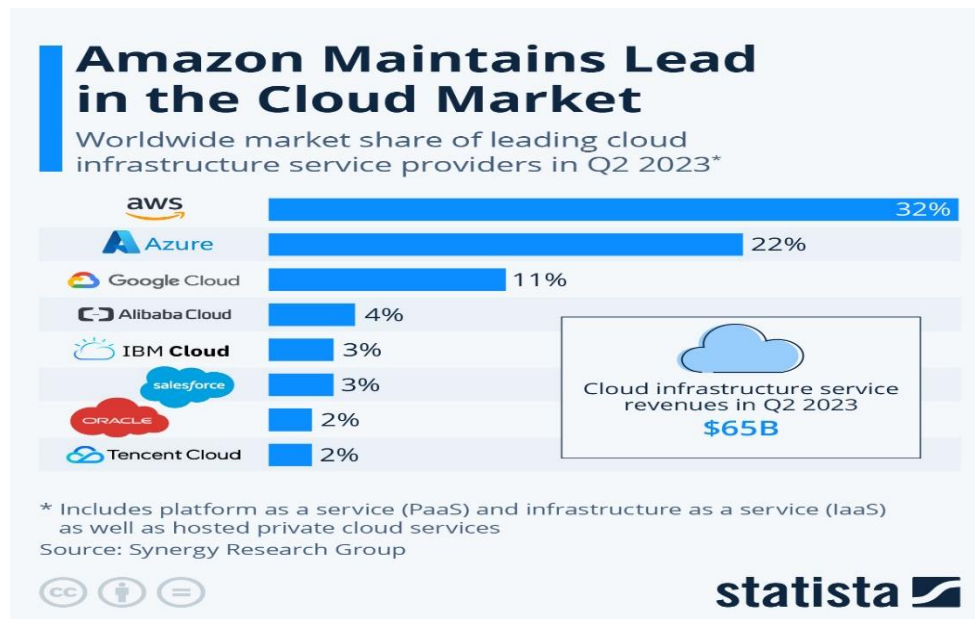


Fig 1. Graph showing Market Shares of Cloud Service Providers

Amazon Web Services provides an extensive array of cloud computing services, each offering a diverse range of configurations and options. This enables organizations to efficiently manage their businesses while optimizing costs. Some key services of AWS are as follows,

- AWS Compute Services, which includes Amazon Elastic Compute Cloud (EC2), AWS Elastic Beanstalk, AWS Fargate, and AWS Lambda, cater to the processing and running of applications.
- Amazon Storage Service, encompassing Amazon S3, Amazon S3 Glacier, and Amazon EBS, serves as a comprehensive solution for managing application data.

- Amazon Database Services, featuring Amazon Elastic Cache, Amazon Redshift, and Amazon DynamoDB, offer diverse options for addressing various data management needs.
- AWS Networking and Content Delivery Services, incorporating Amazon CloudFront, Amazon VPC, Amazon API Gateway, and AWS Route 53, ensure reliable and efficient data transfer and content distribution.
- AWS Analytic Service, represented by AWS Kinesis and Athena, facilitates organizations in extracting valuable insights from their data.
- AWS Management Services, including CloudWatch, CloudTrail, and CloudFormation, empower users to effectively control, govern, and optimize their AWS resources.
- AWS Migration Services, with offerings such as AWS DMS and Snowball, assist organizations in seamlessly moving their applications and data to the AWS cloud.

AWS goes beyond limitations tied to a particular industry or application, positioning itself as a versatile platform with broad applicability. Whether it's for web hosting, data analytics, machine learning, or the creation of IoT solutions, AWS delivers the essential infrastructure and tools needed to support a diverse range of applications. The robust ecosystem of services offered by AWS, coupled with its unwavering commitment to security and innovation has strengthened its position in the global market.

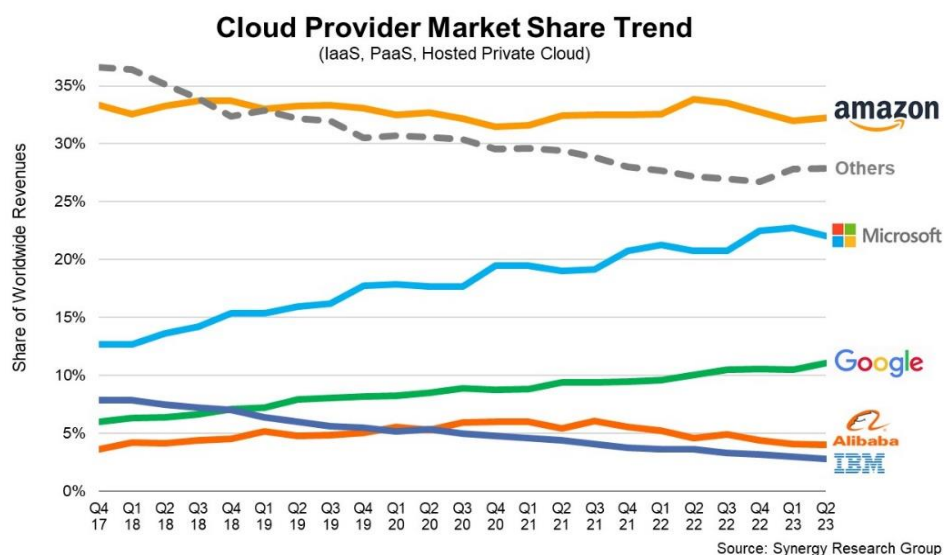


Fig 2. Cloud Service Providers Market Shares Trend

Some of the major companies that are using AWS are Netflix, Lyft, Airbnb, BMW, NASA, Pfizer and Unilever.

In the Gartner Magic Quadrant for 2023, AWS has achieved recognition as a Leader, securing the top position in terms of Ability to Execute. The report works as a fundamental guide for evaluating cloud AI developer service providers, particularly considering the ongoing evolution in the market. The work focuses on helping cloud users select the best CSP.



Fig 3. Magic Quadrant for Cloud AI Developer Services

AWS Global Infrastructure

The AWS Global infrastructure is comprised of AWS Regions and Availability Zones. AWS extends across 32 distinct regions, each featuring multiple Availability Zones (AZs). Each region has at least two Availability Zones that serve as the specific locations where compute, storage, network, and database resources are hosted resources that consumers provision within their Virtual Private Clouds (VPCs). Within each Availability Zone, there exist one or more discrete data centers, each equipped with redundant power, networking, and connectivity, and housed in separate facilities. The utilization of these Availability Zones provides users with the capability to operate production applications and databases at elevated levels of availability, fault tolerance, and scalability, exceeding the capacities offered by a single data center.

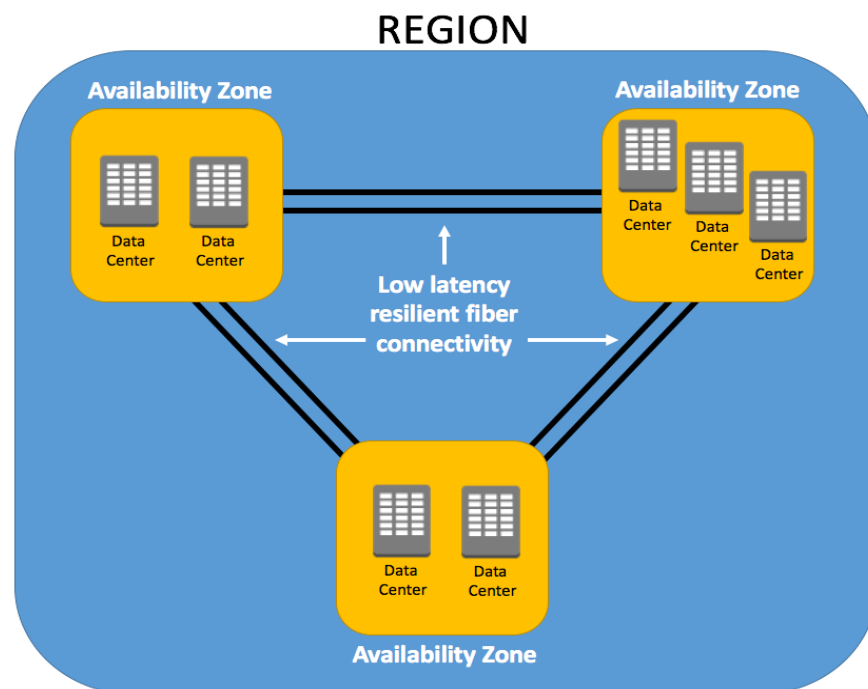


Fig 4. Structure of Region

As of now, AWS spans 32 regions, encompassing a total of 102 Availability Zones distributed across 245 countries and territories. Additionally, there are 13 Regional Edge Caches and 115 Direct Connect Locations in the AWS network infrastructure.

AWS Cloud Security

AWS prioritizes robust security measures within its cloud infrastructure, employing a multi-layered strategy to protect customer data and resources. AWS Cloud Security ensures the protection of confidential and sensitive information such as that of healthcare, military, and banking sectors.

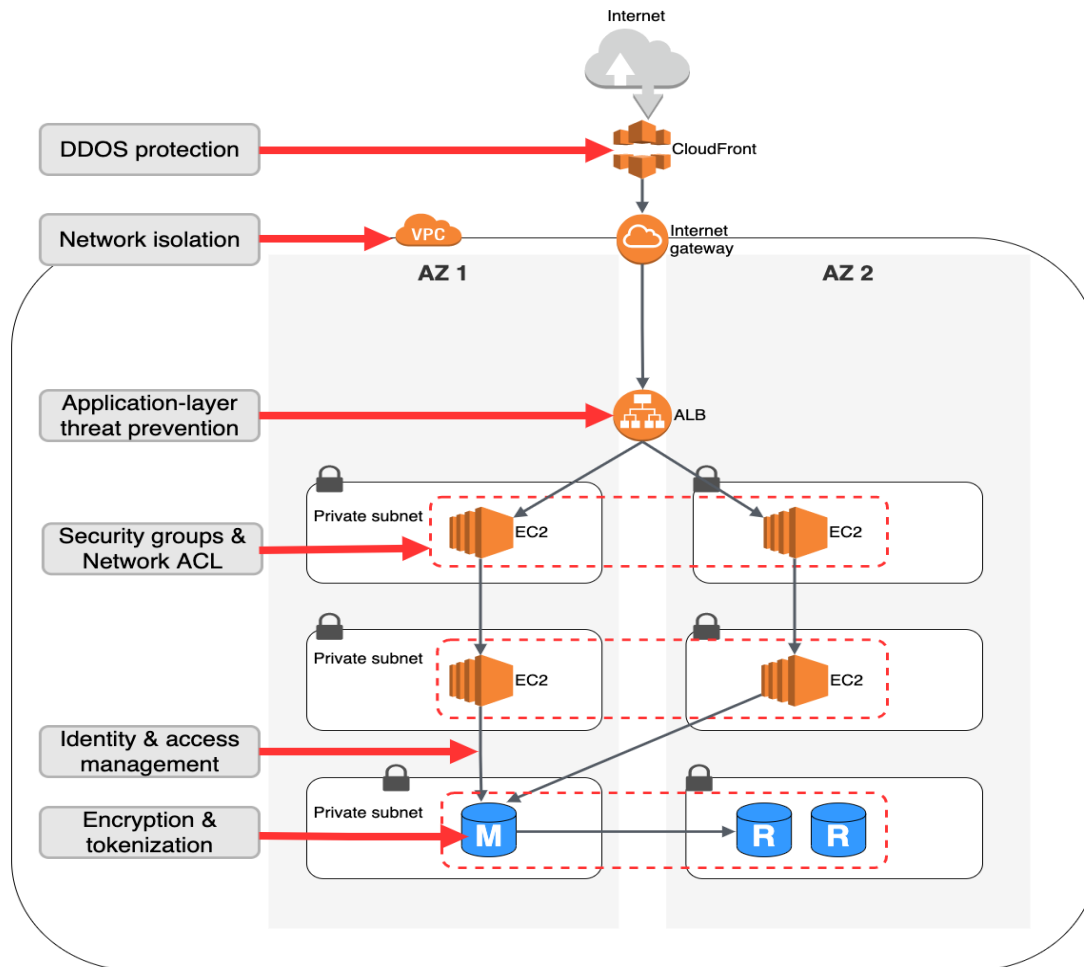


Fig 5. Defense in depth applied to a web application by AWS

Key elements contributing to AWS Cloud Security include the Shared Responsibility Model, Identity and Access Management (IAM), Encryption, Network Security, Monitoring and Logging,

Incident Response and Forensics, Compliance and Certifications, Distributed Denial of Service (DDoS) Protection, Security Automation, Security Training and Resources.

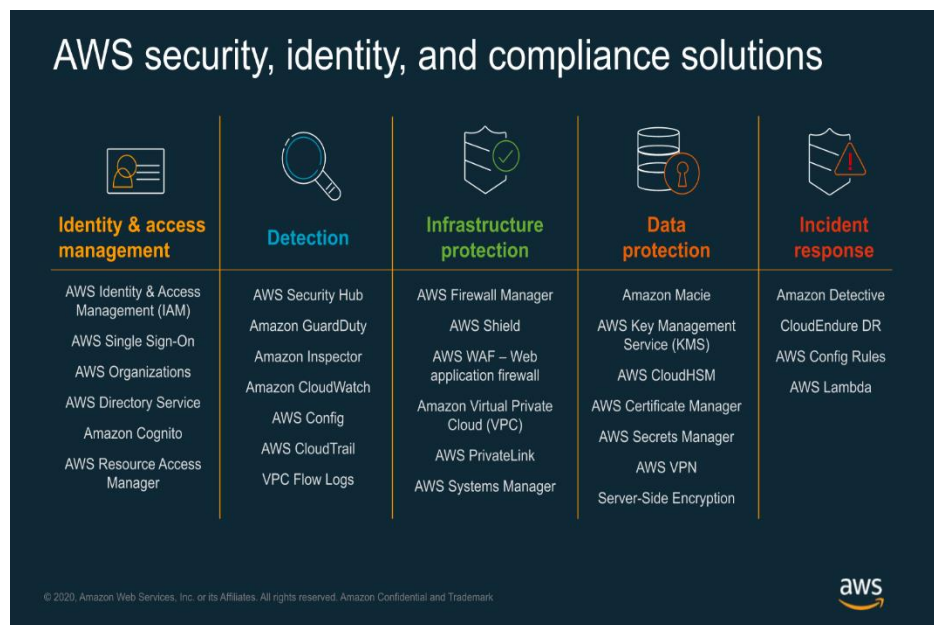


Fig 6. AWS Security, identity, and compliance solutions

Comparing the Big Three Cloud Service Providers

Comparison of cloud service providers is a difficult task as there are rapid changes taking place in the cloud environment. There are numerous cloud service providers and IaaS providers available in the market, and each of them is undergoing numerous changes, and constantly upgrading their portfolios of products and services. As one of the CSPs launches a new product or service, the other one also releases a similar product or service just with a different name. In this paper, we will shed light on the differences among three giant market competitors - Amazon Web Services, Microsoft Azure, and Google Cloud Platform.

Table 1: Comparison between AWS , Azure and GCP

	AWS	Azure	GCP
Age	It came into the market in 2006	It came into the market in 2010	It came into the market in 2008.

Market Share	32%	22 %	11%
Compute Service	Elastic Compute Cloud (EC2)	Virtual Machine	Compute Engine
Hybrid Storage	AWS Storage Gateway	Azure StorSimple	ClearSky
Bulk Data Transport	AWS Import/ Export Disk, AWS Snowball, AWS Snowmobile	Azure Import/ Export Service, Azure Data Box	Storage Trans
Object Storage	Amazon S3	Azure Blob Storage	Cloud Storage
Serverless Container Services	AWS Fargate	Azure Container Instances	Google Cloud Run
Managed Container Services	Amazon ECS Amazon EKS	Azure Kubernetes Service	Google Kubernetes Engine
Function As a Service	AWS Lambda	Azure Functions	Google Cloud Functions
Region & Availability	32 Regions 102 Availability Zone. 245+ countries and territories	60 Regions 140+ countries	39 Regions 118 Availability Zones 200+ countries
Pricing	Basic Instances such as 2vCPU+ 8GB RAM will cost around ~69USD/month	Basic Instances such as 2vCPU+ 8GB RAM will cost around ~70USD/month	Basic Instances such as 2vCPU+ 8GB RAM will cost around ~52USD/month
Discounted Program Commitment Length	Reserved Instance: 1- or 3-years Savings Plans: 1 or 3 years	Reserved VM Instance: 1 or 3 years	Committed Use Discounts: 1 or 3 years

Discounted Program Payment Options	All upfront (for the highest cost savings) Partial upfront No upfront	All upfront Monthly (with no loss of discount)	Monthly
Selection Criteria for Database	Opted when already using AWS services. (or) Need high performance and reliability.	Opted when migrating an existing database to the cloud. (or) When the focus is on privacy and adhering to compliance.	Opted when attaching a database to microservice architecture. (or) When the focus is on the high performance of workloads
Users	Netflix, Airbnb, Unilever, BMW, Samsung, MI, Zynga, etc.	Johnson Controls, Polycom, Fujifilm, HP, Honeywell, Apple, etc.	PayPal, UPS Bloomberg, etc.

Conclusion

Cloud computing has emerged as the predominant solution for businesses seeking efficient global management of applications and services. Amazon Web Services (AWS), with its significant market share, established reputation, and diverse service offerings, remains a leader among cloud service providers. When evaluating these providers, organizations commonly prioritize computation and storage services, as well as local accessibility. The act of comparing cloud services brings notable benefits, particularly in terms of cost reduction and performance enhancement. This is especially relevant for organizations operating in a multi-cloud environment or considering a shift to a multi-cloud model. By strategically choosing services from different providers, organizations can create a customized multi-cloud environment that aligns with their unique performance and financial requirements.

References

1. A. Alalawi, A. Mohsin; A. Jassim. A survey for AWS cloud development tools and services.2021 IEEE. Available at: <https://ieeexplore.ieee.org/document/9545749>
2. Saakshi Narula; Arushi Jain; Prachi. Cloud Computing Security: Amazon Web Service. 2015 IEEE. Available at: <https://ieeexplore.ieee.org/document/7079135>
3. Rawan Aljamal; Ali El-Mousa; Fahed Jubair; A comparative review of high-performance computing major cloud service providers. 2018 IEEE. Available at: <https://ieeexplore.ieee.org/document/8355463>
4. Portal.azure.com. (2017). Microsoft Azure. [online] Available at: <https://portal.azure.com/>.
5. Amazon Web Services, Inc. (2017). Amazon Web Services (AWS), Cloud Computing Services. [online] Available at: <https://aws.amazon.com/>.
6. Google Cloud Platform. (2017). Google Cloud Computing, Hosting Services & APIs | Google Cloud Platform. [online] Available at: <https://cloud.google.com>.
- 7.Synergy Research Group. [online] Available at: <https://www.srgresearch.com/articles/quarterly-cloud-market-once-again-grows-by-10-billion-from-2022-meanwhile-little-change-at-the-top>
8. Cloud Academy. [online] Available at: <https://cloudacademy.com/blog/aws-global-infrastructure/>