



## A Comparative Study Of Various Cloud Computing Tools

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<p>CC License CC-BY-NC-SA 4.0</p>	<p><b>Abstract</b></p> <p>Cloud computing has emerged as a transformative paradigm in the field of information technology, offering scalable and flexible solutions for diverse computing needs. However, selecting the right cloud computing tool to trust with organization infrastructure, critical applications, and secure data can be a difficult process. In this research paper, we managed a comparison of cloud service features after the comparison, it's simple to select a certain cloud service from the available features by comparison with three selective cloud computing tools Amazon Web Services, Microsoft Azure, and Google Cloud Platform.</p> <p><b>Keywords:</b> Cloud Computing, Amazon Web Services, Microsoft Azure, and Google Cloud platform.</p>
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### Introduction:

Cloud computing has become the foundation of modern IT infrastructure, offering organizations the flexibility, scalability, and efficiency required to meet the demands of a dynamic and interconnected world. There are many Cloud computing tools present but a few popular tools among them are Amazon Web Services (AWS), Microsoft Azure, and Google Cloud Platform (GCP). Each is designed to address specific needs within the cloud environment. This introduction provides a brief overview of these three major cloud computing tools, highlighting their functionalities and contributions to the evolution of cloud technology. Creating a detailed comparison of cloud computing tools across various parameters is challenging due to the vast number of tools and their diverse features. For this reason, here we have highlighted three Cloud computing tools Amazon Web Services (AWS), Microsoft Azure, and Google Cloud Platform (GCP). However, I can provide a general overview based on some of the specified parameters such as virtual machine capabilities, global infrastructure, and pricing models are meticulously examined to provide a comprehensive understanding of their comparative strengths and considerations. This introduction provides a brief overview of the top three cloud computing tools, highlighting their functionalities and contributions to the evolution of cloud technology.

### 1. Amazon Web Services (AWS):

AWS is an integrated development environment (IDE) that runs in the cloud. It supports various programming languages and allows collaborative coding.

Available online at: <https://jazindia.com>

**Key Services:** AWS provides a comprehensive suite of services, including computing power (EC2), storage (S3), databases (RDS), machine learning (SageMaker), and more.

**Strengths:** Extensive service catalog, global infrastructure, strong community support, and a mature ecosystem.

**Considerations:** Pricing can be complex, and beginners might find it overwhelming due to the vast number of services.

## 2. Microsoft Azure:

**Key Services:** Azure offers services like virtual machines (VMs), Azure Blob Storage, Azure SQL Database, and Azure AI services.

**Strengths:** Integration with Microsoft products, hybrid cloud capabilities, and a growing list of services.

**Considerations:** Interface might be perceived as less intuitive, and certain services may have a steeper learning curve.

## 3. Google Cloud Platform (GCP):

**Key Services:** GCP includes services like Compute Engine, Cloud Storage, BigQuery, and TensorFlow for machine learning.

**Strengths:** Strong focus on data analytics, machine learning, and a global network infrastructure.

**Considerations:** Smaller market share compared to AWS and Azure, but gaining popularity.

## Comparison of Different Cloud Computing Tools:

In this section, we compare three different tools i.e. AWS, Azure, and GCP based on different parameters like services offered. We have provided a high-level comparison table based on some key features commonly considered when evaluating cloud computing platforms as we know the cloud computing environment is dynamic, and new features may be introduced over time, affecting the comparison. Here's a simplified comparison of three popular cloud computing tools AWS, Azure, and Google Cloud Platform (GCP) across different categories in a table format.

Feature	AWS	Azure	GCP
Market Share	Largest	Second largest	Smaller, but growing
Global Data Centers	Extensive global presence	Global presence with specific compliance	Global network with a smaller footprint
Platforms	Multi-Platform	Multi-Platform	Multi-Platform
Programming Language	Multiple	Multiple	Multiple
Availability	High	High	High
Graphical Support	Limited	Limited	Limited
Application Model	Various	Various	Various
Communication Model	Network Communication	Network Communication	Network Communication
TCP/IP Support	Yes	Yes	Yes
Compute Services	EC2, AWS Lambda, ECS, EKS, Fargate	Virtual Machines, Azure Functions, AKS, Azure Container Instances	Compute Engine, Cloud Functions, Kubernetes Engine
Storage Services	S3, EBS, Glacier, EFS	Azure Blob Storage, Azure Files, Azure Managed Disks	Cloud Storage, Persistent Disks, Cloud Filestore
Database Services	RDS, DynamoDB	SQL Database, Cosmos DB, Table Storage	Cloud SQL, Cloud NoSQL, Cloud Bigtable, Cloud Firestore, Datastore
Networking	VPC, CloudFront, Route 53, ELB	Virtual Network, Azure CDN, Azure DNS, Azure Load Balancer	VPC, Cloud CDN, Cloud DNS, Load Balancing
Machine Learning / AI	SageMaker, Rekognition, Comprehend	Azure ML, Cognitive Services, Text Analytics	AI Platform, Vision AI, NLP API

Feature	AWS	Azure	GCP
<b>Serverless Computing</b>	AWS Lambda, API Gateway	Azure Functions, Logic Apps	Cloud Functions, Cloud Run
<b>Identity and Access Management</b>	IAM, Cognito,	Azure Active Directory	Cloud Identity, Identity-Aware Proxy
<b>Monitoring and Management</b>	CloudWatch, AWS Management Console	Azure Monitor, Azure Portal	Cloud Monitoring, Cloud Console
<b>Developer Tools</b>	CloudFormation, AWS CLI	Azure DevOps, ARM	Deployment Manager, Cloud SDK
<b>DevOps Tools</b>	CodePipeline, CodeBuild, CodeDeploy	Azure DevOps, Azure Pipelines	Cloud Build, Cloud Source Repositories
<b>Hybrid and Multi-Cloud</b>	Outposts, VMware Cloud on AWS,AWS organizations	Azure Arc, Azure Hybrid Benefit,Azure Policy	Anthos, Multi-Cloud Networking Multi Cloud Interconnect
<b>Cost Management</b>	AWS Cost Explorer, Budgets	Azure Cost Management, Azure Advisor+Billing	Cloud Billing Reports, Cost Management Tools
<b>Pricing Models</b>	Complex, pay-as-you-go	Variable, pay-as-you-go	Variable, pay-as-you-go
<b>Security Services</b>	AWS WAF, AWS Shield, Macie	Azure Security Center, Azure Sentinel	Cloud Security Command Center, Key Management Service
<b>IoT Services</b>	AWS IoT Core, FreeRTOS	Azure IoT Hub, Azure IoT Central	Cloud IoT Core, IoT Edge
<b>Support and Documnetation</b>	Extensive documentation,large support plans	comprehensive documentation, various support options,	clear documentation and support options,
<b>Security and Compliance:</b>	comprehensive set of security features and compliance certificate	enterprise-grade security and compliance,	Robust security features and compliance certifications
<b>Ease of Use</b>	steeper learning curve for beginners.	user-friendly interface	simple and developer-friendly

- **Platforms:** Indicates the supported operating systems or platforms.
- **Programming Language:** Primary programming languages supported.
- **Availability:** Level of uptime and reliability.
- **Graphical Support:** Availability of graphical user interfaces (GUI).
- **Application Model:** Predominant model for deploying applications.
- **Communication Model:** Communication methods between components.
- **TCP/IP Support:** Support for TCP/IP protocol
- **Compute Services:** Services for executing code.
- **Storage Services:** Solutions for storing and retrieving data.
- **Database Services:** Managed database solutions.
- **Networking:** Services for managing network resources.
- **Machine Learning / AI:** Tools for artificial intelligence and machine learning.
- **Serverless Computing:** Services for serverless application deployment.
- **Identity and Access Management:** Solutions for managing user access.
- **Monitoring and Management:** Tools for monitoring and managing various resources.
- **DevOps Tools:** Services for development and operations.
- **Hybrid and Multi-Cloud:** Features related to hybrid and multi-cloud deployments.
- **Cost Management:** Tools for managing and optimizing costs.
- **Security Services:** Services focused on security and compliance.

It's important to note that the choice between AWS, Azure, and GCP depends on various factors, including specific project requirements, existing technology stacks, and organizational preferences. Many organizations

adopt a multi-cloud strategy, leveraging services from multiple providers to meet different needs and enhance redundancy.

#### **Analysis of the Comparison on AWS, Azure and GCP:**

All three support multi-platform, and multiple programming languages, are highly available, and provide limited Graphical support. When evaluating cloud computing tools consider factors such as ease of use, integration with other services, cost, performance, and specific features relevant to your use case. The choice between Amazon Web Services (AWS), Microsoft Azure, and Google Cloud Platform (GCP) depends on your specific requirements, preferences, and the context of your organization. There isn't a one-size-fits-all answer, as each cloud provider has its strengths. Here are some general suggestions based on certain considerations:

#### **If you have existing Microsoft infrastructure:**

**Suggestion:** Consider Azure.

**Reasoning:** Azure integrates well with Microsoft products and services, making it a usual choice for organizations already invested in Microsoft technologies.

#### **If you prioritize a broad and mature service offering:**

**Suggestion:** Consider AWS.

**Reasoning:** AWS has the most extensive and mature set of services, covering a wide range of use cases. It is a popular choice for enterprises with diverse requirements.

#### **If you emphasize data analytics, machine learning, and AI:**

**Suggestion:** Consider GCP.

**Reasoning:** GCP is known for its strengths in data analytics, machine learning, and artificial intelligence. It may be the preferred choice for organizations focused on innovation and data-driven insights.

#### **If you have diverse needs and consider multi-cloud:**

**Suggestion:** Consider a multi-cloud strategy.

**Reasoning:** Many organizations opt for a multi-cloud approach to utilize the strengths of different providers and avoid vendor lock-in.

#### **If you are price-sensitive:**

**Suggestion:** Compare pricing models and choose based on your specific usage patterns.

**Reasoning:** Pricing can vary, and it's important to understand the cost implications based on your actual usage. Each provider offers a pricing calculator to estimate costs.

#### **If you prioritize global reach and presence:**

**Suggestion:** AWS or Azure.

**Reasoning:** AWS has the most extensive global infrastructure, followed closely by Azure. Consider the geographic distribution of data centers and services.

#### **Future Work:**

This paper enhances our understanding of various cloud computing tools. In the future, we plan to expand our analysis to include more elements, such as how service providers reproduce data and identify some of the top security threats associated with cloud data, with data loss being the most serious security concern. Cloud computing will be one of the most in-demand occupations in software development, with implications for cloud infrastructure security. The industry lacks the necessary skills to ensure integrity, which is a serious worry.

#### **Conclusions:**

This paper provides an overview of the cloud functionalities provided by three major cloud computing tools. We compare the most popular cloud computing tools, including Amazon, Azure, and GCP. We can see that none of them is perfect for all perspectives and arrangements since this paper explains the many sorts of gaps between these providers in terms of various attributes. This study focuses on the primary services provided by various cloud providers, such as storage, computation, and network services. Data storage, servers, databases,

networking, and software, as well as other tools and applications are some examples of the resources. In recent years, any commercial organization has shifted its operations to the cloud, which has shown to be profitable and attracted the interest of many others. The information gathered in this research paper will help cloud customers choose the significant cloud provider according to their needs as well as the services provided by the selected cloud provider.

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