

## Introduction to Cloud Providers

The cloud computing industry is dominated by three major players: Amazon Web Services (AWS), Microsoft Azure, and Google Cloud Platform (GCP). AWS, the oldest and most mature provider, offers the widest range of services and global infrastructure, making it the default choice for many enterprises. Microsoft Azure, tightly integrated with Windows Server, Active Directory, and Office 365, is the preferred option for organizations deeply embedded in the Microsoft ecosystem. Google Cloud, while newer, excels in data analytics, machine learning, and Kubernetes management, attracting businesses focused on cutting-edge AI and open-source technologies. When comparing these providers, key factors include compute performance, pricing models, AI/ML capabilities, global reach, and compliance standards.

## compute services

AWS provides Elastic Compute Cloud (EC2) for virtual machines, offering the most instance types and customization options, including GPU-optimized and bare-metal servers. Azure's equivalent, Azure Virtual Machines, integrates seamlessly with Microsoft software like SQL Server and SharePoint, making it ideal for hybrid cloud deployments. Google Cloud's Compute Engine stands out with features like live VM migration and per-second billing. For serverless computing, AWS Lambda leads in event-driven workloads, while Azure Functions benefits from native ties to Power Automate and Logic Apps. Google's Cloud Functions is the simplest to deploy but has fewer integrations. In container orchestration, AWS Elastic Kubernetes Service (EKS), Azure Kubernetes Service (AKS), and Google Kubernetes Engine (GKE) are competitive, though GKE is often praised for its simplicity and automation.



## Storage Solutions

AWS Simple Storage Service (S3) is the industry standard for object storage, with unmatched durability and a vast ecosystem of third-party tools. Azure Blob Storage competes closely, offering cool and archive tiers at slightly lower prices, plus native integration with Azure Data Lake for analytics. Google Cloud Storage provides uniform latency across regions and strong consistency. For block storage, AWS Elastic Block Store (EBS) supports high-throughput workloads like databases, while Azure Disks includes unique features like disk bursting. Google Persistent Disk offers better performance consistency for random I/O operations. In archival storage, AWS Glacier is the most cost-effective but has slower retrieval times compared to Azure Archive Storage and Google Coldline, which prioritize faster access.

## Networking Capabilities

AWS boasts the most extensive global network with 24+ geographic regions, enabling low-latency deployments worldwide. Its Virtual Private Cloud (VPC) allows granular security controls, and Direct Connect provides dedicated private links to AWS data centers. Azure's networking shines with Virtual Network (VNet), which simplifies hybrid cloud setups via ExpressRoute, and Azure Front Door for global load balancing. Google Cloud's Premium Tier Network leverages Google's private fiber-optic backbone, offering predictable performance and lower latency than AWS or Azure for certain regions. All three providers support IPv6, DDoS protection, and CDN services (CloudFront for AWS, Azure CDN, and Cloud CDN for GCP), though AWS has the edge in edge locations.

## Databases

AWS provides the most diverse database portfolio, including RDS for relational databases, DynamoDB for NoSQL, and Redshift for data warehousing. Azure's SQL Database is a top choice for Microsoft shops, with Cosmos DB offering multi-model support and SLA-backed latency under 10ms. Google's Cloud Spanner is unique for horizontally scalable relational databases, while BigQuery dominates serverless analytics. For open-source databases, AWS Aurora (MySQL/PostgreSQL-compatible) outperforms Azure's managed PostgreSQL and Google's Cloud SQL. In-memory databases like AWS ElastiCache and Azure Cache for Redis are comparable, but GCP's Memorystore integrates better with Google's data tools.