

# Cloud Hosting Comparison

OpenVidStreamer

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# Introduction

This document provides a comparative analysis of major cloud providers with a focus on hosting .NET microservice applications, particularly considering the use of Azure Service Fabric and Azure API Gateway, along with Kubernetes.

## Cloud Providers:

### Azure

#### Strengths

- **Integration with .NET:** Azure offers native support for .NET, making it a seamless choice for .NET applications.
- **Azure Service Fabric:** A distributed systems platform that makes it easy to package, deploy, and manage scalable and reliable microservices and containers.
- **Azure API Gateway:** Manages APIs effectively with features like rate limiting, authentication, and analytics.
- **Kubernetes Support:** Azure Kubernetes Service (AKS) simplifies deploying a managed Kubernetes cluster in Azure.

#### Weaknesses

- **Cost:** Azure services can be expensive, especially when scaling up resources.

### AWS

#### Strengths

- **Market Leader:** AWS offers a broad set of features and services with global infrastructure support.
- **Elastic Kubernetes Service (EKS):** Offers managed Kubernetes service which is highly scalable and integrates well with AWS's native services.
- **AWS Lambda for Microservices:** Allows running code without provisioning or managing servers, billed only for the compute time consumed.

#### Weaknesses

- **.NET Integration:** While AWS supports .NET, it is not as seamlessly integrated as Azure.
- **Learning Curve:** AWS's vast offerings can be overwhelming and may have a steeper learning curve.

## Google Cloud Platform

### Strengths

- **Google Kubernetes Engine (GKE):** Highly reputed for its robust managed Kubernetes service.
- **Data and Analytics:** Strong offerings in data handling and analytics, which can be beneficial.

### Weaknesses

- **.NET Support:** GCP has the least native support for .NET

## Cost Comparison:

### Kubernetes Services:

#### Azure Kubernetes Service (AKS)

- **Pricing:** Azure does not charge for the Kubernetes management service. You pay only for the virtual machines and the associated storage and networking resources consumed by the Kubernetes cluster.
- **Additional Costs:** Network data processing, load balancer, and additional features like monitoring and logging might incur extra costs.
- **Compute Costs:**
  - **VM Pricing:** The compute costs in AKS depend primarily on the type and size of the VM instances we choose for the worker nodes. For instance, a typical choice might be the D2s v3 VM, which offers 2 vCPUs and 8 GB of RAM, costing approximately \$0.096 per hour.

- **Container Costs:** No additional costs for running containers; we only pay for the VMs and the resources they consume.
- **Additional Costs:**
  - **Load Balancer:** \$0.025 per hour.
  - **Disk Storage:** Premium SSDs cost \$0.12 per GB per month.

## Amazon Elastic Kubernetes Service (EKS)

- **Pricing:** AWS charges \$0.10 per hour for each Amazon EKS cluster that we create. We pay for AWS resources (e.g., EC2 instances or EBS volumes) we create to store and run your application.
- **Additional Costs:** Similar to Azure, costs include data transfer, additional storage, and optional services like detailed monitoring.
- **Compute Costs:**
  - **EC2 Instance Pricing:** Similar to Azure, the compute cost depends on the EC2 instance type. A commonly used instance type, t3.medium with 2 vCPUs and 4 GB RAM, costs about \$0.0416 per hour.

## Google Kubernetes Engine (GKE)

- **Pricing:** GKE charges for cluster management starting at \$0.10 per cluster per hour, depending on the region. This fee is applicable regardless of cluster size and is waived for clusters of three or fewer nodes.
- **Additional Costs:** we also pay for the compute, storage, and networking resources consumed by our application, similar to the other platforms.
- **Compute Costs:**
  - **Compute Engine Pricing:** Using an n1-standard-1 instance (1 vCPU, 3.75 GB RAM), costs around \$0.0475 per hour in the US regions.

## Storage Buckets:

### Azure Blob Storage

- **Pricing:** Costs vary by account type (hot, cool, archive), but generally start from around \$0.018 per GB per month for the first 50 TB (hot tier) in most regions.

- **Access Costs:** Retrieval and transaction costs also apply, especially for the cool and archive tiers.

## Amazon S3

- **Pricing:** AWS offers different storage classes (Standard, Infrequent Access, One Zone-IA, Glacier). Prices for the standard class start around \$0.023 per GB for the first 50 TB per month.
- **Access Costs:** Additional charges for requests and data retrieval apply, especially for more cost-efficient storage classes.

## Google Cloud Storage

- **Pricing:** Prices start at about \$0.020 per GB for the first 50 TB per month for the standard class, with lower costs for nearline, coldline, and archive storage.
- **Access Costs:** Like AWS and Azure, retrieval and operation costs vary by storage class and frequency of access.

## Distributed Databases:

### Azure Cosmos DB

- **Pricing:** Azure Cosmos DB charges based on Request Units per second (RU/s) and consumed storage. Prices start at about \$0.008 per hour per 100 RU/s.
- **Storage Costs:** Around \$0.25 per GB stored per month.

### Amazon DynamoDB

- **Pricing:** AWS charges for read and write throughput along with stored data. DynamoDB offers an on-demand option where you pay per request without provisioning capacity.
- **Storage Costs:** Pricing starts at about \$0.25 per GB per month for stored data.

### Google Cloud Spanner

- **Pricing:** Charges are based on nodes in the cluster and storage. Node pricing starts at about \$0.90 per node per hour.
- **Storage Costs:** Around \$0.30 per GB per month.

## Prices Overview:

Cost Item	Azure (AKS)	AWS (EKS)	Google Cloud (GKE)
Kubernetes Cluster Management	Free	\$0.10/hour per cluster	\$0.10/hour per cluster (waived for clusters with 3 or fewer nodes)
Compute Instance	D2s v3: 2 vCPUs, 8 GB RAM \$0.096/hour	t3.medium: 2 vCPUs, 4 GB RAM \$0.0416/hour	n1-standard-1: 1 vCPU, 3.75 GB RAM \$0.0475/hour
Load Balancer	Basic: \$0.025/hour	Elastic Load Balancing: \$0.0225/hour	Network Load Balancer: \$0.025/hour
Storage (SSD)	Premium SSD: \$0.12/GB/month	General Purpose SSD (gp2): \$0.10/GB/month	Standard persistent disk: \$0.040/GB/month
Data Transfer	Outbound: From \$0.087/GB	Outbound: From \$0.09/GB	Outbound: From \$0.12/GB
Additional Features	Network peering, monitoring, auto-scaling	Auto-scaling, detailed monitoring, reserved instances	Sustained use discounts, custom machine types, preemptible VMs

## Estimation of costs:

Let's make some really rough and inaccurate theoretical estimations just to see the bigger picture:

- **VM Instance Prices:** for 2 vCPU, 8 GB RAM instances:
  - Azure: \$0.096/hour.
  - AWS: \$0.0416/hour (t3.medium).
  - GCP: \$0.0475/hour (n1-standard-1).
- **Monthly Node Costs:**
  - **Azure:** 3 nodes × \$0.096/hour × 24 hours/day × 30 days = \$207.36.
  - **AWS:** 3 nodes × \$0.0416/hour × 24 hours/day × 30 days = \$89.95.
  - **GCP:** 3 nodes × \$0.0475/hour × 24 hours/day × 30 days = \$102.60.

## Additional Costs:

- **Kubernetes Cluster Management:**
  - Azure: Free.
  - AWS: \$0.10/hour × 24 hours/day × 30 days = \$72.
  - GCP: \$0.10/hour × 24 hours/day × 30 days = \$72 (waived if fewer than 3 nodes, not applicable here).
- **Load Balancing and Other Services** (estimating \$30/month for simplicity).

Service	Azure	AWS	GCP
Node Costs	\$207.36	\$89.95	\$102.60
Cluster Management	\$0.00	\$72.00	\$72.00
Load Balancers, etc.	\$30.00	\$30.00	\$30.00
Total Estimated Cost	\$237.36	\$191.95	\$204.60

## Conclusion

For my specific requirement, Azure appears to be the optimal choice due to its superior .NET integration and native support for technologies like Azure Service Fabric and API Gateway. AWS and GCP also offer competitive services, particularly in terms of Kubernetes support, but may require more effort in integrating with .NET, despite that from cost perspective AWS is the best choice.