cloud STACK | COLLABORATION CONFERENCE

Evaluating Cloud Costs: Hyperscalers vs. On-Premises CloudStack

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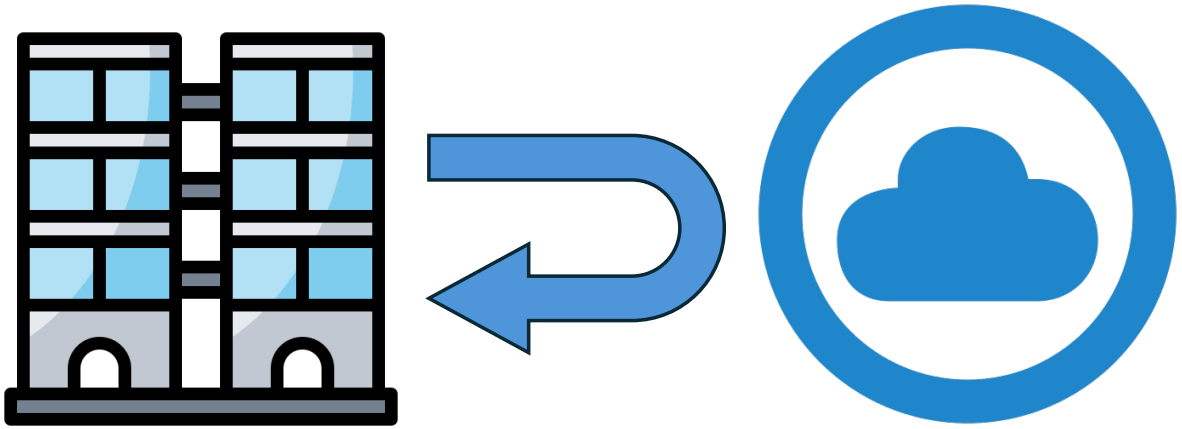
About Me

- **Technical Marketing Manager** @ ShapeBlue
  Bridging the gap between technology and business to make cloud solutions a breeze.
- **Apache CloudStack Committer**
  Contributing to the open-source community with a passion for innovation and collaboration.
- **Cloud and Infrastructure Veteran**
  Over 27 years of IT expertise, from Linux systems to cloud architecture.
- **Guitar Enthusiast** 🎸
  Playing riffs and troubleshooting systems with the same energy!
- **Polyglot** 🌐
  English, Italian, Spanish, and Portuguese Speaker. (So, no language barriers in support requests!)

Agenda

- Why Repatriate your Workloads?
- Costs Considerations / Assumptions
- Functionalities
- Sample Use Case
  - Architecture Overview
- Cloud Pricing
  - Costs Using Hyperscalers
  - Costs Using On-premises
  - Side-by-Side Comparison
- Q&A

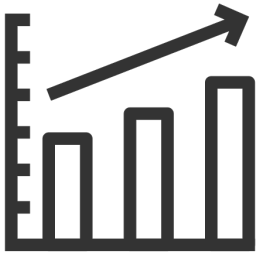


Why are Hyperscalers so Popular?

- Unmatched Scalability and Flexibility
- Innovative, Full-Stack Offerings
- Global Reach and Performance
- Ideal for Startups and Early-Stage Growth
- Extensive Support Ecosystem

Why Repatriate Your Workloads?

Cost Efficiency



Cost Predictability

Avoiding Vendor Lock-in

Compliance

Data Security and Control

Performance Optimization

Costs Consideration and Assumptions

- Data Centre Facilities, Hardware, and Employee Costs Included for On-Premises CloudStack
- Research Based on Hyperscalers' Public Prices
- Outgoing Data Transfer Costs Not Included
- Average Price of On-Premises Infrastructure
- Using a Uniform Instance Type Across the Comparison
- All Calculations are Assumption-Based

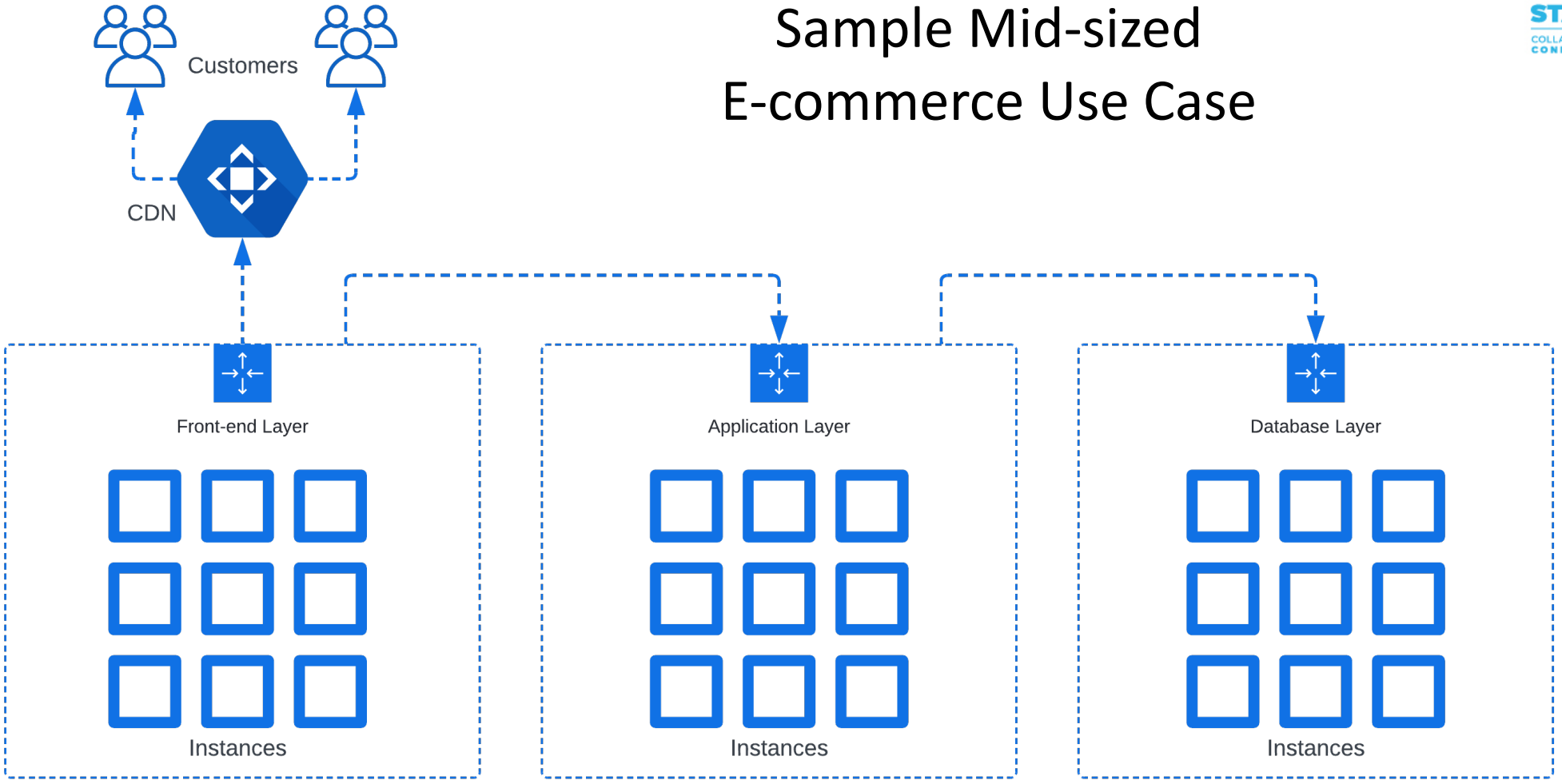
Functionalities

Functionalities

Feature	AWS	Azure	GCP	Apache CloudStack
Compute Instances	EC2	Azure Virtual Machines	Google Compute Engine	CloudStack Instances
Container Service	EKS / ECS	AKS	GKE	CKS
Object Storage	S3	Azure Blob Storage	Google Cloud Storage	Object Storage Framework
Block Storage	EBS	Azure Disk Storage	Persistent Disk	Volume Management
Shared File System	EFS	Azure Files	Filestore	Shared Filesystem
Virtual Private Network	VPC	Azure Virtual Network	VPC	VPC
Dedicated Connection	Direct Connect	ExpressRoute	Cloud Interconnect	CloudStack Site-to-Site VPN
Identity and Access Management	IAM	Azure Active Directory	Cloud IAM	Domains, Accounts, and Roles
Infrastructure Provisioning	CloudFormation	Azure Resource Manager	Deployment Manager	Terraform / OpenTofu Integration
Backup Management	EBS Snapshots	Azure Backup	Cloud Backup	B&R Framework

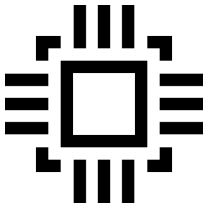
Sample Use Case

Sample Mid-sized E-commerce Use Case



Architecture Overview

- Frontend Layer
  - vCPUs: 4,000
  - Memory: 16 TB
- Application Layer
  - vCPUs: 6,000
  - Memory: 24 TB
- Database Layer
  - vCPUs: 2,000
  - Memory: 8 TB



Compute Instance Type

- 4 vCPUs
- 16 GB Memory

Component	Instances
Frontend Layer	1,000
Application Layer	1,500
Database Layer	500
Total Instances	**3,000**

Costs Using Hyperscaler

Hyperscalers Compute Pricing

- Pricing Model
  - Saving Plans
- Preference by Region
  - Frankfurt
- Operating System
  - Linux
- Disk Size
  - 100GB (**)

Hyperscaler	Instance Type	Price per hour (*)
Amazon AWS	m5a.xlarge	USD 0.103
Microsoft Azure	D4a v4	USD 0.114
Google Cloud Platform	n2-standard-4	USD 0,129

(*) Source: Official Hyperscalers Pricing List with discount applied

https://calculator.aws/
https://azure.microsoft.com/en-us/pricing/calculator/
https://cloud.google.com/products/calculator

(**) Microsoft Azure includes 100GB of disk space for this specific Instance Type

Hyperscalers Compute Cost Estimation

- Long-term commitment
  - 3 years
- Payment Option
  - Monthly Payment
- Discount Rate
  - AWS: 62%
  - Microsoft Azure: 62%
  - Google Cloud Platform: 57%

Hyperscaler	Monthly Cost	Total for 3 Years
Amazon AWS	USD 225,660.00	USD 8,123,760.00
Microsoft Azure	USD 250,536.00	USD 9,019,296.00
Google Cloud Platform	USD 282,357.48	USD 10,164,869.28

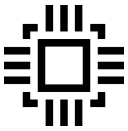
Costs Using On-premises

On-Premises Costs

- Hardware Investments
  - Compute Hosts
  - Storage
  - Networking
- Data Centre Facilities
  - Co-location
- Infrastructure Deployment & Operation

Compute Capacity Plan

- *Total Instances: 3,000*
- *CPU Overprovisioning Factor: 3*
- *Memory Overprovisioning Factor: 1*
- *CPU Cores per Host: 112*
- *Memory per Host: 1TB*
- *Cluster Size: 16*
- *Spare per Cluster: 1*



Compute Instance Type

- 4 vCPUs
- 16 GB Memory

Based on CPU Cores:

*Total vCPUs = **3,000** x **4** = **12,000***

*CPU per Compute Server = **112** x **3** = **336***

*Spares = [**12,000** / **336** / **16**] = **2,23** ≅ **3***

*Hosts = [**12,000** / **336**] + **3** ≅ **38***

Based on Memory:

*Total Instance Memory = **3,000** x **16 GB** = **48,000***

*Memory per Compute Host = **1 TB** x **1** = **1,024***

*Spares = [**48,000** /**1,024** / **16**] ≅ **3***

*Hosts = [**48,000** / **1,024**] + **3** ≅* **50**

Storage Capacity Plan

- Instances: **3,000**
- Instance Disk Size: **100 GB**

Storage Requirements:

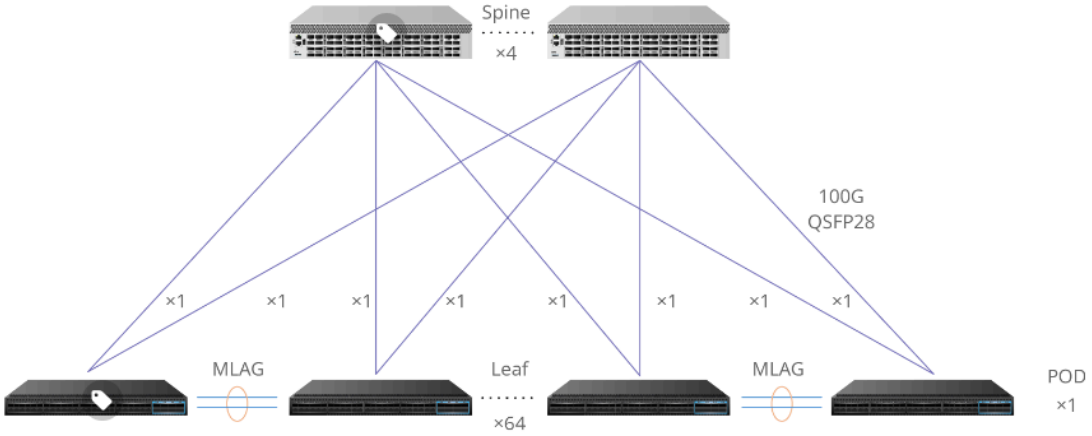
*Instance Disk Needs: **3,000** x **100 GB** =* **300 TB**

Networking Capacity Plan

- **Hosts: 50**
  - 4x 25 Gbps SFP ports per Host
    - 2 x for Backend (Storage)
    - 2 x for Frontend
- **Storage:**
  - 4x 100Gbps SQSFP28 ports

6x Switches for Spine/Leaf:

- 16 x 100Gbps QSFP28 breakout interfaces
  - Up to 64 10/25-ports
- 3.2 Tb switching capacity
- VXLAN/EVPN
- BGP4
- 1RU

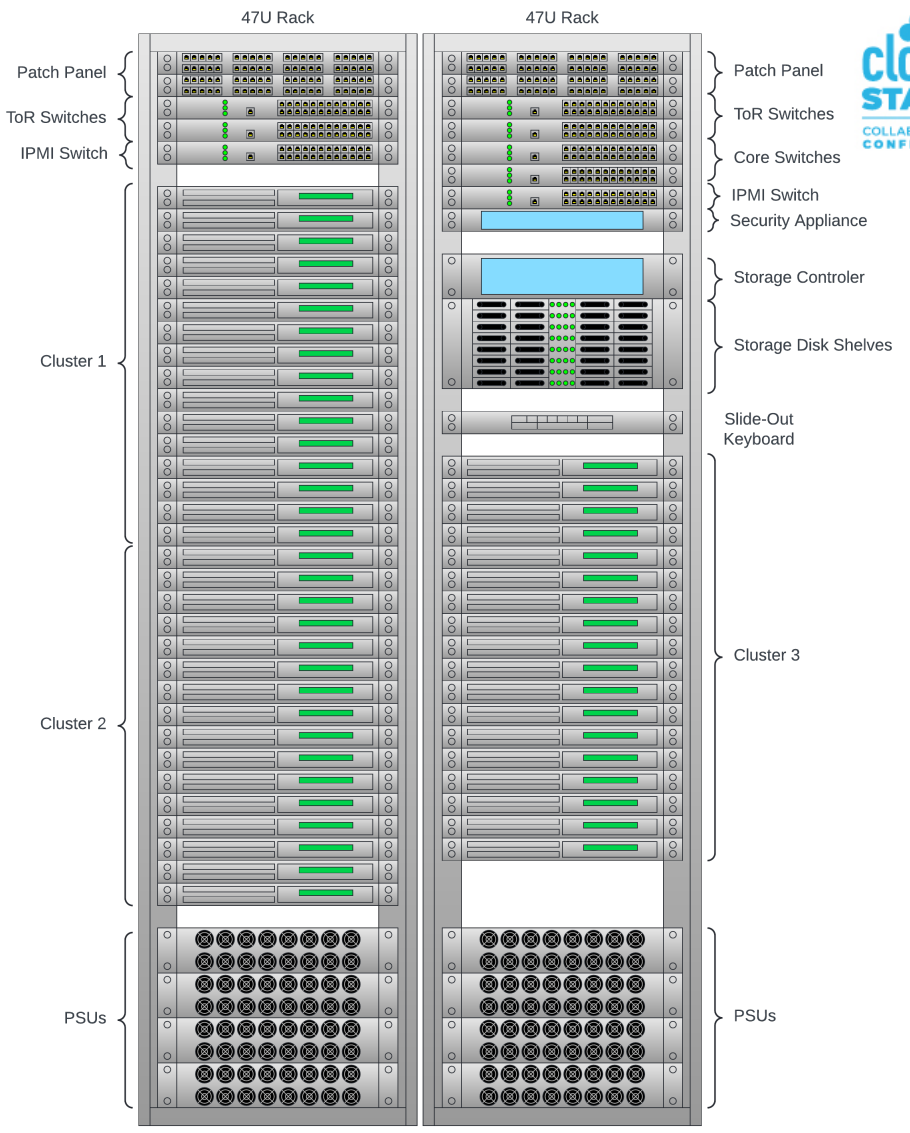


Data Centre Rack Layout

2x 47RU Rack (32 kW) (**94** RU Available)

- 50 x 1RU Compute Hosts
- 4 x 1RU ToR/Leaf Switches
- 2 x 1RU Core/Spine Switches
- 1x 6RU Storage Appliance
- Other devices
  - 4x 1RU for Patch Panels
  - 7x 2RU PSUs
  - 2x 1RU KVM Switch
  - 1x 1RU Side-out keyboard
  - 1x 1RU Security Appliance

Total: **86** RU



On-Premises CAPEX Costs

Description	Quantity	Unit Price	Total*
Compute Host (1RU, 1TB Memory – 16 x 64GB, 4x25Gb Ports, 1x Intel 6746E Processor, 2x SSD 512GB)	50	USD 15,000.00	USD 750,000.00
NFS Storage (48x 15.35TB SSD disks, 4x 100Gb NICs)	1	USD 100,000.00	USD 100,000.00
ToR/Leaf Switch (16-port 100Gb)	4	USD 12,000.00	USD 48,000.00
Core/Spine Switch (16-port 100Gb)	2	USD 12,000.00	USD 24,000.00
IPMI Switch 48 x 1Gb	2	USD 1,500.00	USD 3,000.00
		Total:	**USD 925,000.00**

* Average price based on a recent survey with 4 European distributors.

On-premises OPEX

One-off Costs

Description	Quantity	Unit Price	Total
Co-location Rack Setup	2	USD 7,500.00	USD 15,000.00
Full Rack in Tier 3 Data Centre (deployment)	6	USD 4,000.00	USD 24,000.00
Software Stack Deployment Team for a period of 3 months (**)	1	USD 108,000.00	USD 108,000.00
Other Costs for a period of 3 months(***)	12	USD 6,600.00	USD 79,200.00
		Total:	**USD 226,200.00**

Recuring Costs

Description	Quantity	Unit Price	Cost per Month	Total for 36 months
Full Rack in Tier 3 Data Centre(*)	2	USD 12,000.00	USD 24,000.00	USD 864,000.00
Software Stack Operations Team(**)	12	USD 6,000.00	USD 72,000.00	USD 2,592,000.00
Other Costs (***)	12	USD 2,200.00	USD 26,400.00	USD 950,400.00
		Total:	**USD 122,400.00**	**USD 4,406,400.00**

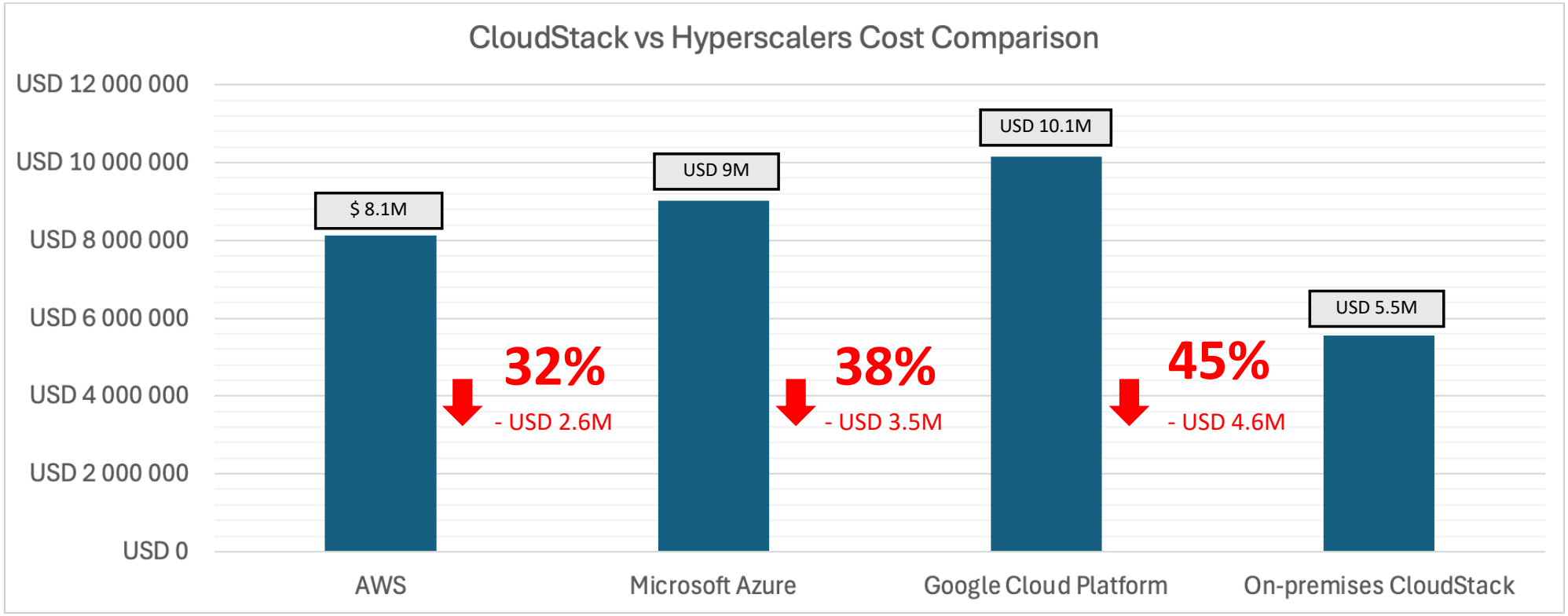
** Full Rack Colocation average pricing (Tier 3 Datacentre) in Frankfurt area included 32kW per rack.*

*** Engineering team to deploy and operate Storage, Network and CloudStack Infrastructure. Source: Glassdoor.*

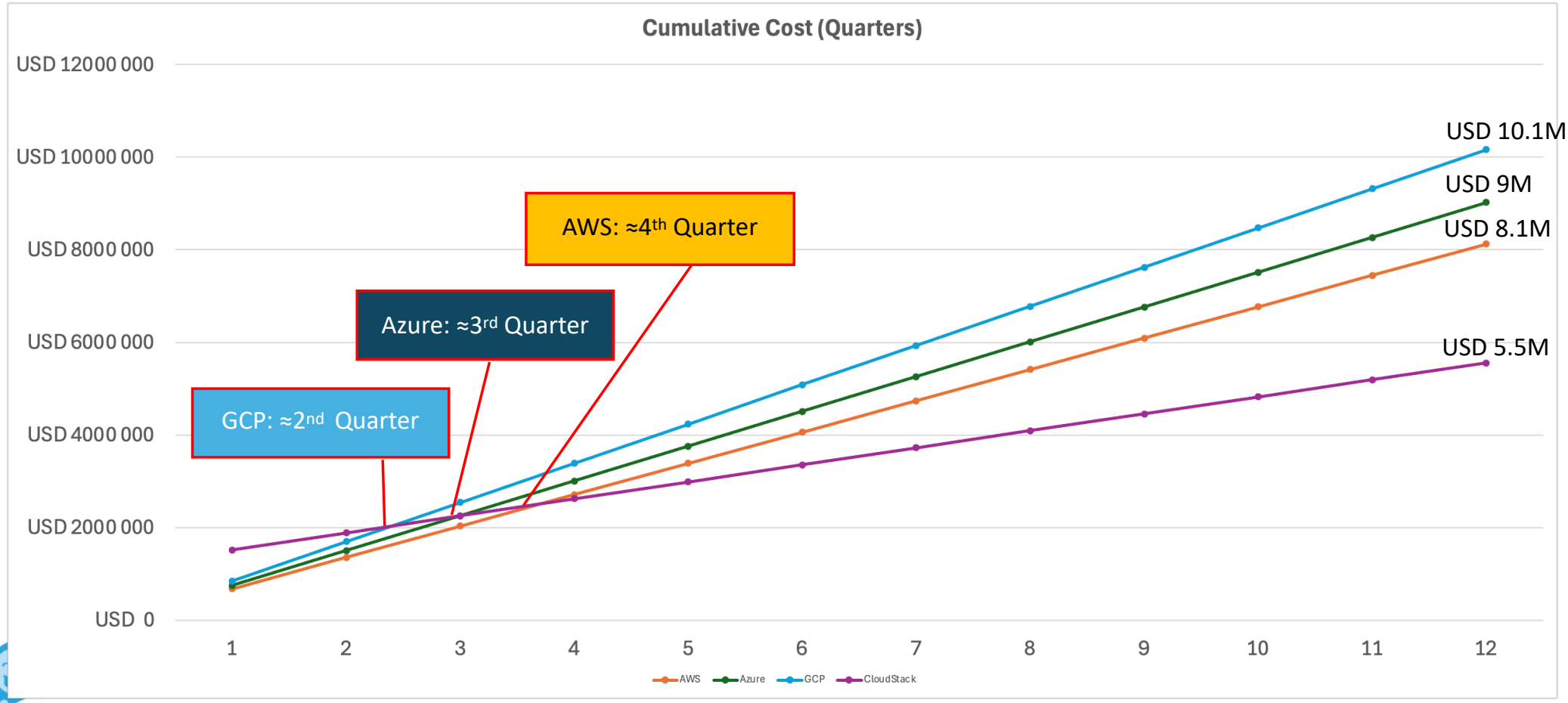
**** Other costs include estimated expenses for office space, employee benefits and bonuses, software tools, training, insurance, and hardware replacement.*

Comparison

Comparison for 3 Years of Engagement



Break-Even Point

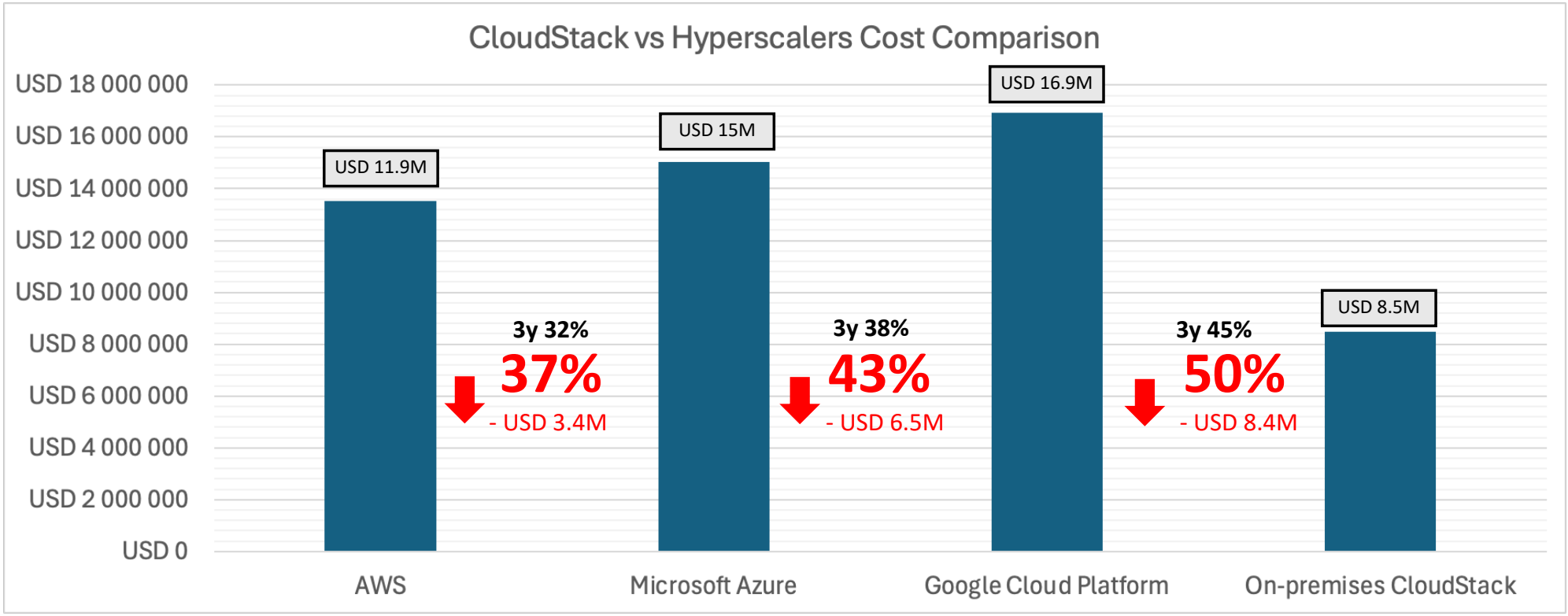


Hardware Replacement Cycle Overview

Average Usage of Servers, Storage, and Networking

Asset	Years
Compute Hosts	~ 3-5
Storage Appliance	~ 5-7
Networking	~ 5-10

Comparison for 5 Years of Engagement



Download Cloud Cost Calculator

Key Takeaways

Cost Efficiency

Vendor Independence

Data Control

Q&A

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