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Migration Business Case

Example Corp

Migration Evaluator

January 2024
v2.5.0

Agenda

- Analysis & Insights
- Financial Summary
- Business Value
- Deployment Summary
- Storage Assessment
- Supplementary AWS Services
- Next Steps

Migration Customer Journey

Assess


Rapid discovery


TCO report


Business case
Mig. Evaluator/OLA


Migration Readiness Assessment


Accelerators


Briefings & workshops


Immersion day

Mobilize

Portfolio


Discovery & planning


Migration plan

Migrate


Migration & modernization experience


Skills/center of excellence

People

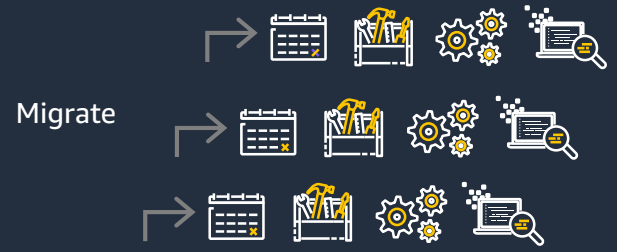

Landing zone


Operating model


Security & compliance

Platform

Migrate & Modernize


Migrate


Operate & optimize


Modernize

Create a case for change

Build readiness through experiences

Accelerate transformation at scale

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Analysis & Insights

On-Premises Overview

On-Premises Environment 655 Total Instances

- Windows Servers In Scope:	**179**	- Linux Servers In Scope:	**375**
- Provisioned Storage (TB):	**761**	- Assumed Storage Utilization (TB):	**381**
- Windows Desktops In Scope:	**50**	- SQL Servers:	**19**
- Excluded From Assessment Scope:	**51**	- Enterprise Edition	12
- Zombie Machines	51	- Standard Edition	7
- Windows Desktops	0	- Web Edition	0

Executive Summary

Scoping

- Collected data
- 18 days data collection
- Results based on a scope of 554 servers and 50 desktops

Insights

- 7% zombies
- 93% of servers right-sized
- 45% servers used less than 20% of time

Results

- Right-sized & optimized models
- 63% estimated cost savings
- $996,207 annualized spend on AWS

Next Steps

- Server Dependency Mapping
- Storage Assessment
- Licensing Health Check

Detailed Assessment Overview

Assumptions & Modeling Details

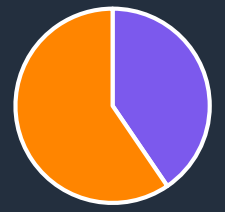
- Cost model: 3 YR / 1 YR NURI
- Region: Virginia
- Right-sized
- Zombies removed from scope
- Licensing optimized
- Application/Environment groupings provided

Infrastructure	Count
VMware	634
Hyper-V	1
Bare Metal	20
Total	**655**

Environment & Licensing	
Windows Servers	197
Windows Desktops	50
Linux	298
RHEL	110
Zombies	51 (8%)
Total	**655**

SQL Servers	Count
Enterprise	12
Standard	7
Web	0
Total	**19**

Time In-Use



Time In Use %	
In-Use	40.47%
Idle	59.53%

Zombies

Zombies	
Zombies	51
Utilized	604

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Financial Summary

Financial Overview

		Option 1	Option 2	Option 3	Option 4
	On-Premises Cost Estimate	3 YR NURI - LI	3 YR NURI - BYOL SQL	3 YR NURI - BYOL WS & SQL	1 YR NURI - BYOL WS & SQL
Compute	$1,831,506	$890,763	$677,369	$504,818	$704,282
Amazon WorkSpaces	-	$32,340	$32,340	$32,340	$32,340
Storage	$828,648	$374,231	$374,231	$374,231	$374,231
Network	-	$16,280	$16,280	$16,280	$16,280
Infrastructure Total	**$2,660,154**	**$1,313,614**	**$1,100,220**	**$927,670**	**$1,127,134**
AWS Business Support	-	$88,481	$77,811	$68,537	$79,157
Annual Total	**$2,660,154**	**$1,402,095**	**$1,178,031**	**$996,207**	**$1,206,290**
Annual Savings		47%	56%	63%	55%

- Modeled to **Shared Tenancy**
- **Reserved Instances** (RIs) with Windows & SQL Server License included (LI)
- Assumed storage utilization = 50% of provisioned storage
- Servers running Windows Desktop OS modeled to Amazon WorkSpaces

- Modeled to **Shared Tenancy**
- **Reserved Instances** (RIs) with Windows Server license included (LI)
- **BYOL SQL Server** - Requires active Software Assurance (SA)
- Assumed storage utilization = 50% of provisioned storage
- Servers running Windows Desktop OS modeled to Amazon WorkSpaces

- Mixed Tenancy - SQL and Windows Server modeled to **Dedicated Hosts with BYOL** when cost **effective**
- Remaining modeled to **Shared Tenancy**
- All **Reserved Instances** (RIs)
- Assumed storage utilization = 50% of provisioned storage
- Servers running Windows Desktop OS modeled to Amazon WorkSpaces

- Mixed Tenancy - SQL and Windows Server modeled to **Dedicated Hosts with BYOL** when cost **effective**
- Remaining modeled to **Shared Tenancy**
- All **Reserved Instances** (RIs)
- Assumed storage utilization = 50% of provisioned storage
- Servers running Windows Desktop OS modeled to Amazon WorkSpaces

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Financial Summary - 3 YR NURI - BYOL

Option	Compute *(annual)*	Amazon WorkSpaces *(annual)*	Storage *(annual)*	Network *(annual)*	Total *(annual)*	Savings Plan Rate Estimate *(per hour)*
Shared Tenancy	$677,369	$32,340	$374,231	$16,280	**$1,100,220**	$77.33
Mixed Tenancy (Recommended)	$504,818	$32,340	$374,231	$16,280	**$927,670**	$57.63

BYOL Quantities

Product	Shared Tenancy	Mixed Tenancy
Win Server Datacenter Cores	n/a - Win License Included	344
Win Server Standard Cores	n/a - Win License Included	0
SQL Server Enterprise Cores	56	56
SQL Server Standard Cores	28	28
Windows 10/11 Licenses	0	0

*Cores are listed as total cores, NOT core packs

Modeling:

- Pricing Model: 3 Year No Upfront RI (NURI)
- Region: Virginia; Currency: USD
- Storage Assumptions:
  - Storage Utilization = 50% of Provisioned Storage (based on historical averages)
  - All Amazon EBS volumes are modeled to General Purpose SSD (gp3) with baseline performance of 3000 IOPS & 125 MBps throughput for SSD.
- Networking Assumptions: Standard data transfer costs based on workload size using AWS benchmarks
- Licensing:
  - Windows Server: License Included on Shared Tenancy; BYOL on Mixed Tenancy
  - SQL Server: Bring Your Own License (BYOL)
  - Amazon WorkSpaces: BYOL Windows 10 or Windows 11 Desktop licenses

Financial Summary - 3 YR NURI - LI

Option	Compute *(annual)*	Amazon WorkSpaces *(annual)*	Storage *(annual)*	Network *(annual)*	Total *(annual)*	Savings Plan Rate Estimate *(per hour)*
Shared Tenancy	$890,763	$32,340	$374,231	$16,280	**$1,313,614**	$101.69

Modeling:

- Pricing Model: 3 Year No Upfront RI (NURI)
- Region: Virginia; Currency: USD
- Storage Assumptions:
  - Storage Utilization = 50% of Provisioned Storage (based on historical averages)
  - All Amazon EBS volumes are modeled to General Purpose SSD (gp3) with baseline performance of 3000 IOPS & 125 MBps throughput for SSD.
- Networking Assumptions: Standard data transfer costs based on workload size using AWS benchmarks
- Licensing:
  - Windows Server: License Included
  - SQL Server: License Included
  - Amazon WorkSpaces: License Included

Financial Summary - 1 YR NURI - BYOL

Option	Compute *(annual)*	Amazon WorkSpaces *(annual)*	Storage *(annual)*	Network *(annual)*	Total *(annual)*	Savings Plan Rate Estimate *(per hour)*
Shared Tenancy	$867,964	$32,340	$374,231	$16,280	**$1,290,816**	$99.08
Mixed Tenancy (Recommended)	$704,282	$32,340	$374,231	$16,280	**$1,127,134**	$80.40

BYOL Quantities

Product	Shared Tenancy	Mixed Tenancy
Win Server Datacenter Cores	n/a - Win License Included	344
Win Server Standard Cores	n/a - Win License Included	0
SQL Server Enterprise Cores	56	56
SQL Server Standard Cores	28	28
Windows 10/11 Licenses	0	0

*Cores are listed as total cores, NOT core packs

Modeling:

- Pricing Model: 1 Year No Upfront RI (NURI)
- Region: Virginia; Currency: USD
- Storage Assumptions:
  - Storage Utilization = 50% of Provisioned Storage (based on historical averages)
  - All Amazon EBS volumes are modeled to General Purpose SSD (gp3) with baseline performance of 3000 IOPS & 125 MBps throughput for SSD.
- Networking Assumptions: Standard data transfer costs based on workload size using AWS benchmarks
- Licensing:
  - Windows Server: License Included on Shared Tenancy; BYOL on Mixed Tenancy
  - SQL Server: Bring Your Own License (BYOL)
  - Amazon WorkSpaces: BYOL Windows 10 or Windows 11 Desktop licenses

Financial Summary - 1 YR NURI - LI

Option	Compute *(annual)*	Amazon WorkSpaces *(annual)*	Storage *(annual)*	Network *(annual)*	Total *(annual)*	Savings Plan Rate Estimate *(per hour)*
Shared Tenancy	$1,081,358	$32,340	$374,231	$16,280	**$1,504,209**	$123.44

Modeling:

- Pricing Model: 1 Year No Upfront RI (NURI)
- Region: Virginia; Currency: USD
- Storage Assumptions:
  - Storage Utilization = 50% of Provisioned Storage (based on historical averages)
  - All Amazon EBS volumes are modeled to General Purpose SSD (gp3) with baseline performance of 3000 IOPS & 125 MBps throughput for SSD.
- Networking Assumptions: Standard data transfer costs based on workload size using AWS benchmarks
- Licensing:
  - Windows Server: License Included
  - SQL Server: License Included
  - Amazon WorkSpaces: License Included

Financial Summary - 1 YR AURI - LI

Option	Compute *(annual)*	Amazon WorkSpaces *(annual)*	Storage *(annual)*	Network *(annual)*	Total *(annual)*	Savings Plan Rate Estimate *(per hour)*
Shared Tenancy	$1,041,988	$32,340	$374,231	$16,280	**$1,464,839**	$118.95

Modeling:

- Pricing Model: 1 Year All Upfront RI (AURI)
- Region: Virginia; Currency: USD
- Storage Assumptions:
  - Storage Utilization = 50% of Provisioned Storage (based on historical averages)
  - All Amazon EBS volumes are modeled to General Purpose SSD (gp3) with baseline performance of 3000 IOPS & 125 MBps throughput for SSD.
- Networking Assumptions: Standard data transfer costs based on workload size using AWS benchmarks
- Licensing:
  - Windows Server: License Included
  - SQL Server: License Included
  - Amazon WorkSpaces: License Included

Cloud-Native VDI with Amazon WorkSpaces

Modernize your legacy VDI with Amazon's cloud-native virtual desktops and streamed app services. Key benefits of migrating to Amazon's cloud-native services include reducing VDI solution costs, improving uptime, increasing IT productivity, and greater desktop provisioning/deprovisioning agility. Amazon WorkSpaces is a persistent desktop service. Non-persistent VDI is available with Amazon AppStream 2.0.

Amazon WorkSpaces Always On		Count	Avg. Monthly User Cost	Annual Cost
Standard	2 vCPU, 4 GB RAM	20	$33	$7,920
Performance	2 vCPU, 8 GB RAM	14	$45	$7,560
Power	4 vCPU, 16 GB RAM	11	$70	$9,240
Power Pro	8 vCPU, 32 GB RAM	5	$127	$7,620
Additional EBS Storage		0 GB		$0
Estimated Annual TCO				**$32,340**

On-Prem VDI Input Costs	Included with Amazon WorkSpaces
Physical Servers for User Hosts	**Yes**
Physical Servers Management Plane	**Yes**
Storage for Root Volumes	**Yes**
Storage for User Volumes	**Yes**
Networking – Access Gateways	**Yes**
VDI software	**Yes**
Database servers	**Yes**
Microsoft software	**Yes**
Hypervisor software	**Yes**
Datacenter operations	**Yes**
Server & VM Administration	**38% savings**
Storage Administration	**88% savings**

Modeling Details

- Region: Virginia
- Costs in USD
- 50 License Included Windows Desktops (modeled to Windows 10 Experience)
- Amazon WorkSpaces Storage Included; mapped based on lowest cost & best-fit
- Amazon WorkSpaces Auto Stop hourly pricing is also available
- GPUs (if any) excluded from the assessment, but can be included upon further input

If you would like to explore the broad portfolio of options to help you reduce costs, please let us know and we will engage you with one of our experts from our AWS End User Computing Team.
Review the 2022 Forrester Study, to learn how Amazon WorkSpaces customer reduce infrastructure costs.

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Seamlessly Migrate with VMware Cloud™ on AWS

Reduce migration effort from months to weeks

Accelerate your business transformation goals with a managed service that combines compute, network and storage capabilities in a fully supported, ready-to-run service from the creators of the software, VMware and the leading public cloud provider, AWS.

There is no new hardware to deploy, no refactoring, and no retraining or skill acquisition needed. You can leverage your existing investments and achieve better scalability, flexibility, and agility.

Parameter	Count	Cost
VMware Cloud on AWS	577 Servers, 8 Hosts, 1 Clusters	$600,166†
VMware Cloud Storage	366.72 TB	Included
FSx Storage	0	$0
EC2 Instances	19	$89,349
EBS Storage	29.48 TB	$28,980
Bring Your Own SQL Licenses	58	N/A
Annual Cost		**$718,495**

† Directional cost estimate based on Migration Evaluator collection. VMware Cloud on AWS can collect further data to optimize.

Modeling Details

- CPU oversubscription of 4:1
- BYOL SQL per physical core
- Scope: active/in-use servers
- Region: Virginia
- 3YR NURI (Annualized)
- Host matches:
  - i3en.metal (8)

Amazon FSx Cost

- Capacity Ratio:
  - 80% - SSD
  - 20% - Standard
- Throughput assumption included
- Transit Gateway:
  - 30% of storage cost

If you would like to explore this option further, please let us know and we will engage you with one of our experts from our VMware Cloud on AWS team.
Review the 2022 Forrester Study, to learn how VMware Cloud on AWS customers reduce infrastructure costs.

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Cost effective database management with Amazon RDS

Amazon Relational Database Service (Amazon RDS) is a collection of managed services that makes it simple to set up, operate, and scale Microsoft SQL Server databases in the cloud. RDS allows you to create, configure, and manage a database with minimal administrative effort. RDS also includes features such as automatic backups and software patching. RDS also provides support for replication and failover, ensuring that your database is always available.

Service	Count	Cost
RDS Instances [1]	21	$416,563
RDS Storage (EBS GP3)	28,540 GB	$27,398
Total RDS cost		$443,961
Remaining Infrastructure to EC2+ EBS [2]	526 Instances	$1,145,880
Total Annual Cost		**$1,589,841**

[1] Directional cost estimate based on Migration Evaluator collection. RDS Team can collect further data to optimize. To find the least expensive cost model, recommendations may include a mix of purchase options.

[2] EC2 and EBS modelling is based on a 1 Year No Upfront Reserved Instances Cost Model. Microsoft Windows Desktops are excluded from this modelling

This estimate is based on right sized compute and memory provisioning discovered through the Migration Evaluator assessment for Microsoft SQL Servers (Enterprise/Standard/Express/Web)

Note: SQL Server Developer Edition is excluded from this modeling.

Assumptions

- RDS Database Engine: Microsoft SQL Server
- Deployment Option:
  - Multi-AZ for Production servers
  - Single-AZ for Non-Production servers
- Storage Utilization = 50% of Provisioned Storage (based on historical averages)
- SQL Server License Included
- Database server characteristics including IOPS, Throughput, and feature restrictions in RDS have not been considered in this modelling.
- Costs in USD
- Region – Virginia

If you would like to explore this option further, please let us know and we will engage you with one of our experts from our AWS Relational Database Service team.

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Business Value

Scope and Assumptions for Business Value

Business value estimates are based on industry benchmarks derived from Hackett's Global 1000 study for organizations of similar size and industry. These estimates reflect a directional perspective on annual value benefits.

General Input

Item	Value
Organization annual revenue (USD)	$26,601,540
Organization number of employees	160
% of workloads in scope	100%

Staff Productivity

Item	Value
Total number of storage admin & DBA FTEs	1
Total number of server & VM admin FTEs	1
Fully burdened annual cost per IT FTE (USD)	$135,000

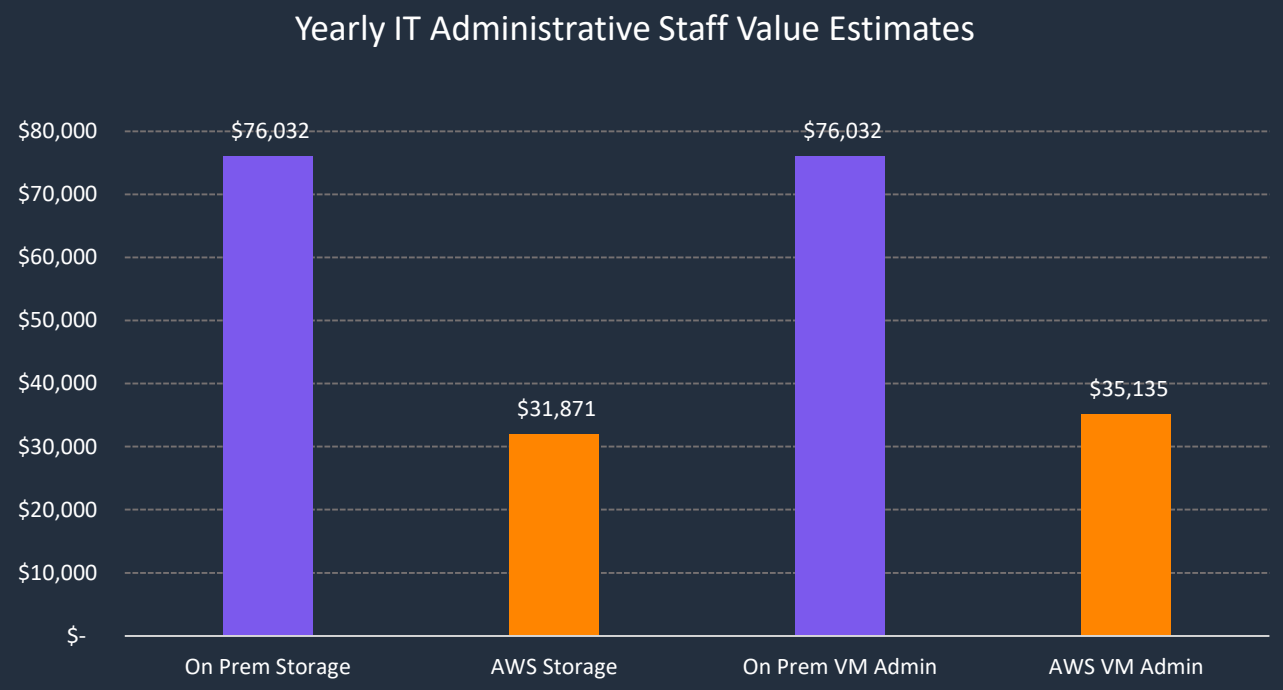
Operational Resilience

Item	Value
Average annual unplanned downtime (hours)	44
Availability	99.50%

Business Agility

Item	Value
Total number of application development FTEs	3

Staff Productivity Summary



Cost Benefit %	**56%**
Cost Benefit $	**$85,058**

Our G1000 survey results showed that companies in your peer set (similar size and industry) yielded two key drivers for this estimate:

- The same Storage Administrator could manage 139% more TBs of storage on AWS than On Prem.
- The same VM Administrator could manage 116% more VMs on AWS than On Prem.

We assumed a landed FTE salary of $135,000 per year.

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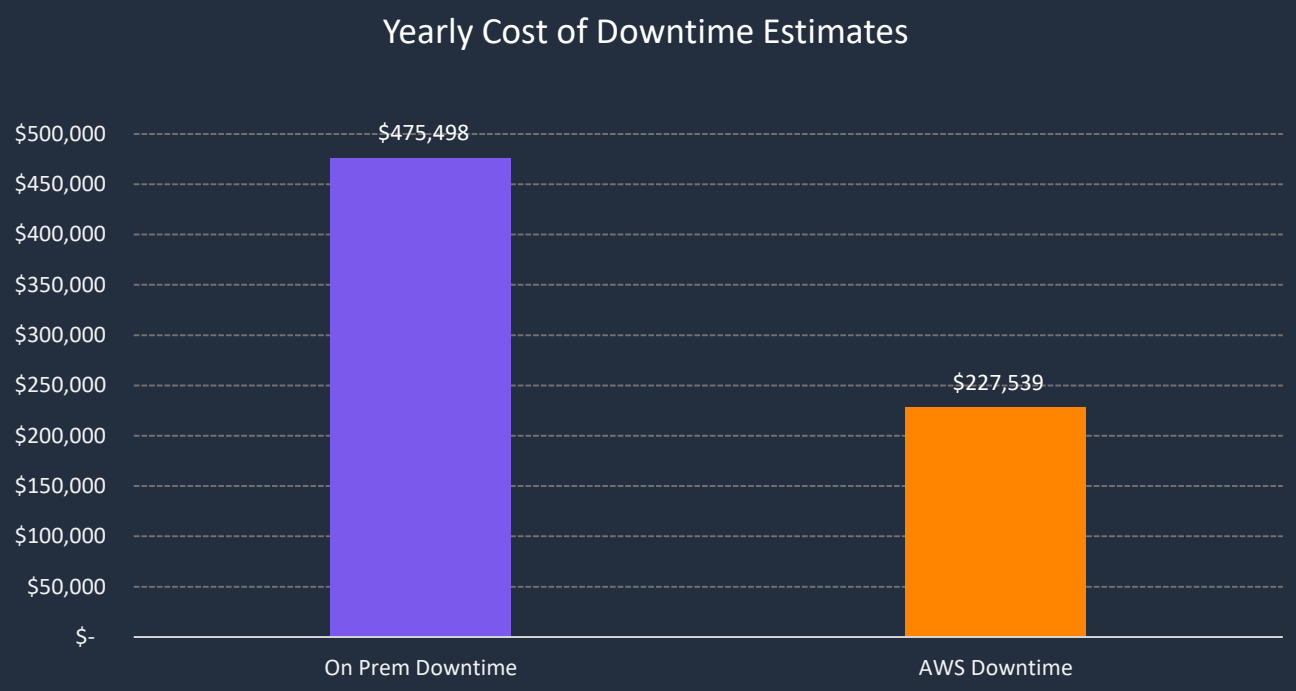
Operational Resilience Summary

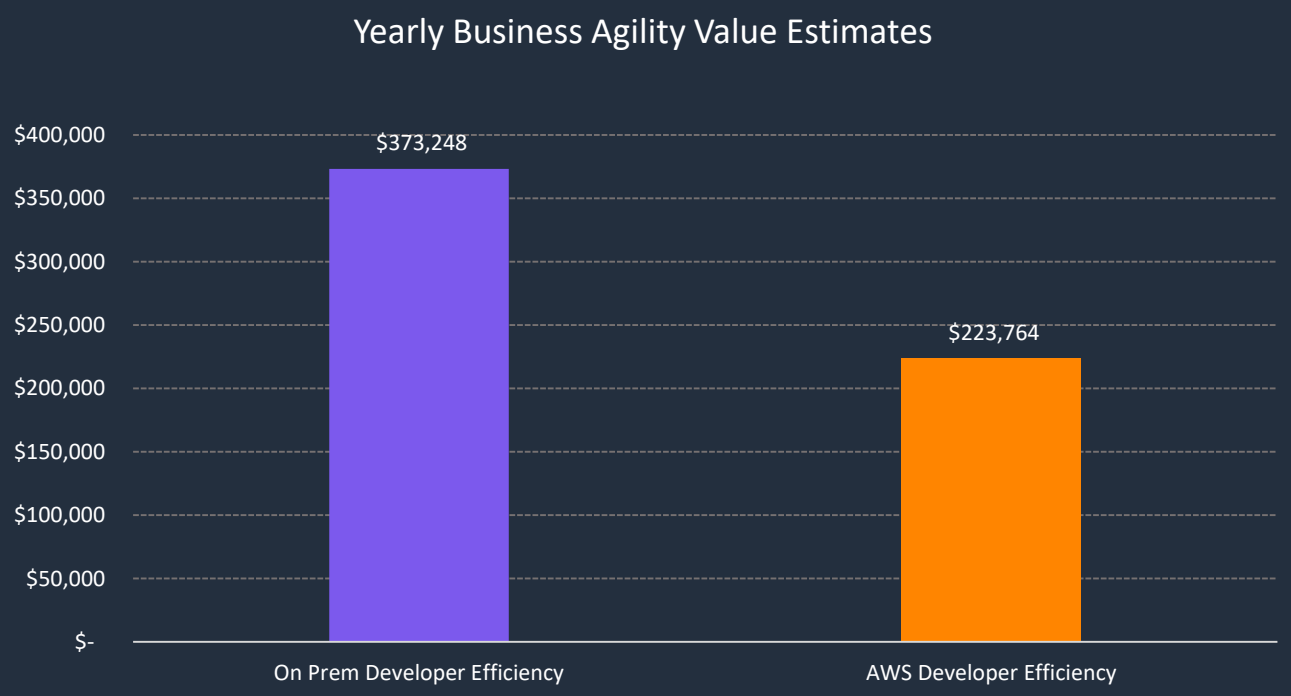


Cost Benefit %	**52%**
Cost Benefit $	**$247,959**

Our G1000 survey results showed that companies in your peer set (similar size and industry) experience a reduction of unplanned downtime of 116% after migrating to AWS.

Value is calculated as the loss abatement indicated by the G1000 survey and the heuristic from the Ponemon Institute study. Reducing unplanned downtime decreases lost sales, lost productivity, and reputational impacts of these events.

Business Agility Summary



Cost Benefit %	**40%**
Cost Benefit $	**$149,484**

Our G1000 survey results showed that companies in your peer set (similar size and industry) yielded the key driver for this estimate:

- The same Application Developer becomes 40% more efficient.

We assumed a landed FTE salary of $135,000 per year.

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Business Value

Hackett's Global 1000 study results showed that companies in your industry were able to yield improvements in three key areas after migrating to AWS. These estimates reflect a directional perspective on value benefits beyond cost savings.

Staff Productivity

- 116% more Virtual Machines (VMs) managed by a VM Administrator at AWS
- 139% more TBs managed by a Storage Administrator at AWS

Operational Resilience

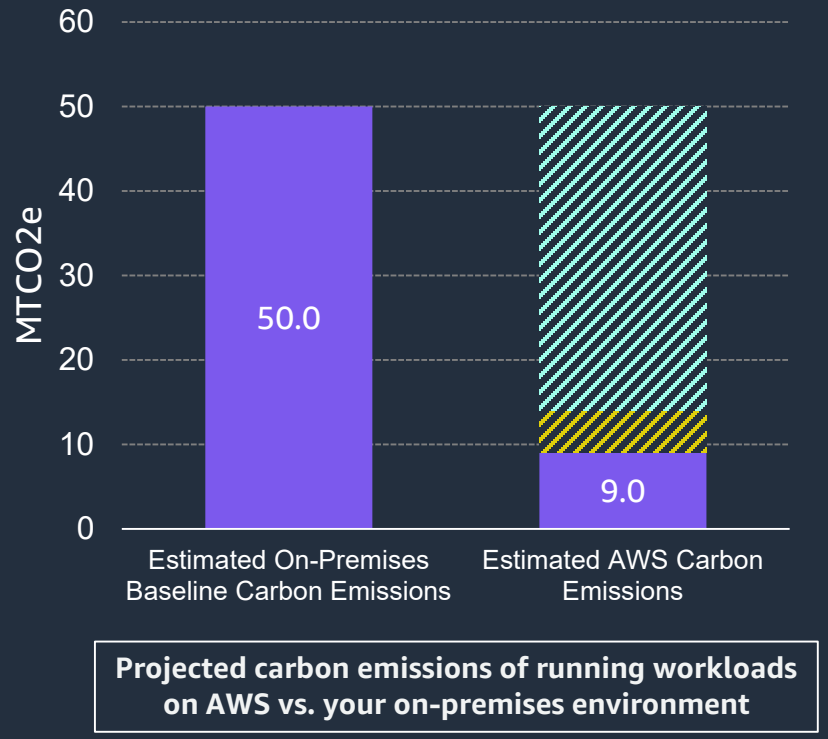
- 52% reduction in unplanned downtime
- 32% reduction in monthly critical incidents

Business Agility

- 7% application developer efficiency allowing for increased innovation
- 40% reduction in time to market for feature releases

Sustainability: Directional Carbon Footprint

AWS can help lower the carbon footprint of your average on-premises data center workload.



Projected carbon emissions of running workloads on AWS vs. your on-premises environment

Up to **41.0** MTCO2e

Carbon emission reduction in year one vs. your on-premises environment

Up to **82.0%**

Carbon emission reduction in year one vs. your on-premises environment

- **72.0%** of the carbon reduction is attributable to higher server utilization, more efficient servers, and efficient data centers.
- **10.0%** of the carbon reduction is attributable to renewable energy usage.

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The unit of measurement for carbon emissions is metric tons of carbon dioxide-equivalent (MT CO2e), an industry-standard measure. This report covers AWS Scope 1 & Scope 2 emissions. A comparable AWS region may supplement data in these calculations due to limited carbon emission information being available for new or GovCloud regions. These are fictitious numbers for the purpose of example/illustration.

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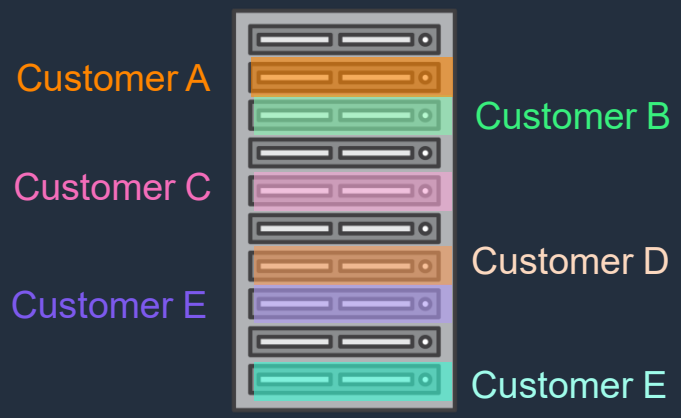
AWS Deployment Summary

EC2 Instances: Shared Tenancy and Dedicated Hosts

Shared Tenancy



Multi-tenant servers host instances for multiple customers

AWS determines which host instances run on

You ***pay per-instance***

Dedicated Hosts

Single-tenant servers host instances dedicated to ***one AWS customer***

Launch instances to same physical server through targeted ***placement***

You ***pay per-host, per-hour***

EC2 Deployment Summary

Shared Tenancy Blueprint

Region	EC2 Fam	Instance Type	QTY
Virginia	c5	c5.2xlarge	10
Virginia	c5	c5.large	2
Virginia	c5	c5.xlarge	4
Virginia	c5a	c5a.2xlarge	30
Virginia	c5a	c5a.4xlarge	19
Virginia	c5a	c5a.8xlarge	1
Virginia	c5a	c5a.large	112
Virginia	c5a	c5a.xlarge	36
Virginia	c6a	c6a.xlarge	1
Virginia	c6i	c6i.2xlarge	14
Virginia	c6i	c6i.8xlarge	2
Virginia	c6i	c6i.large	13
Virginia	c6i	c6i.xlarge	23
Virginia	m5	m5.2xlarge	2
Virginia	m5	m5.4xlarge	1
Virginia	m5	m5.large	4
Virginia	m5	m5.xlarge	1
Virginia	m5a	m5a.4xlarge	2
Virginia	m5a	m5a.large	45
Virginia	m5a	m5a.xlarge	8
Virginia	m5zn	m5zn.2xlarge	7
Virginia	m5zn	m5zn.large	30
Virginia	m5zn	m5zn.xlarge	24
Virginia	m6a	m6a.large	7
Virginia	m6a	m6a.xlarge	2
Virginia	m6i	m6i.large	2
Virginia	m6i	m6i.xlarge	4
Virginia	r5	r5.4xlarge	1
Virginia	r5	r5.8xlarge	1
Virginia	r5	r5.large	8
Virginia	r5	r5.xlarge	1
Virginia	r5a	r5a.2xlarge	1
Virginia	r5a	r5a.4xlarge	2
Virginia	r5a	r5a.8xlarge	1
Virginia	r5a	r5a.large	54
Virginia	r5a	r5a.xlarge	1
Virginia	r6i	r6i.2xlarge	1
Virginia	r6i	r6i.large	5
Virginia	r6i	r6i.xlarge	1
Virginia	t2	t2.xlarge	11
Virginia	t3	t3.large	7
Virginia	t3	t3.medium	3
Virginia	t3	t3.small	1
Virginia	t3a	t3a.large	39
Virginia	t3a	t3a.medium	3
Virginia	t3a	t3a.small	2
Virginia	x2iezn	x2iezn.2xlarge	1
Virginia	z1d	z1d.large	4
Virginia Total			554
Grand Total			554

Mixed Tenancy Blueprint

Region	Tenancy	Deployed On		OS Lic Model	OS Lic's Used	QTY	Instances Packed
Virginia	Dedicated	DH	c5	WS BYOL	DC Cores	2	45
Virginia	Dedicated	DH	c6i	WS BYOL	DC Cores	2	35
Virginia	Dedicated	DH	m5	WS BYOL	DC Cores	1	30
Virginia	Dedicated	DH	m5zn	WS BYOL	DC Cores	2	36
Virginia	Dedicated	DH	r5	WS BYOL	DC Cores	1	26
Virginia	Dedicated Total					8	172
Virginia	Shared	Instance	c5.2xlarge	Linux		10	0
Virginia	Shared	Instance	c5.large	Linux		1	0
Virginia	Shared	Instance	c5.xlarge	Linux		3	0
Virginia	Shared	Instance	c5a.2xlarge	Linux		30	0
Virginia	Shared	Instance	c5a.4xlarge	Linux		19	0
Virginia	Shared	Instance	c5a.large	Linux		77	0
Virginia	Shared	Instance	c5a.xlarge	Linux		32	0
Virginia	Shared	Instance	c6i.8xlarge	Linux		2	0
Virginia	Shared	Instance	c6i.large	Linux		7	0
Virginia	Shared	Instance	c6i.large	WS LI		6	0
Virginia	Shared	Instance	m5.2xlarge	Linux		2	0
Virginia	Shared	Instance	m5.4xlarge	Linux		1	0
Virginia	Shared	Instance	m5.large	Linux		3	0
Virginia	Shared	Instance	m5.xlarge	Linux		1	0
Virginia	Shared	Instance	m5a.4xlarge	Linux		2	0
Virginia	Shared	Instance	m5a.large	Linux		29	0
Virginia	Shared	Instance	m5a.xlarge	Linux		8	0
Virginia	Shared	Instance	m5zn.large	Linux		4	0
Virginia	Shared	Instance	m5zn.xlarge	Linux		3	0
Virginia	Shared	Instance	m6a.large	Linux		7	0
Virginia	Shared	Instance	m6a.xlarge	Linux		1	0
Virginia	Shared	Instance	m6i.large	Linux		1	0
Virginia	Shared	Instance	m6i.xlarge	Linux		3	0
Virginia	Shared	Instance	r5.4xlarge	Linux		1	0
Virginia	Shared	Instance	r5.8xlarge	Linux		1	0
Virginia	Shared	Instance	r5.large	Linux		3	0
Virginia	Shared	Instance	r5.xlarge	Linux		1	0
Virginia	Shared	Instance	r5a.2xlarge	Linux		1	0
Virginia	Shared	Instance	r5a.4xlarge	Linux		1	0
Virginia	Shared	Instance	r5a.8xlarge	Linux		1	0
Virginia	Shared	Instance	r5a.large	Linux		45	0
Virginia	Shared	Instance	r6i.2xlarge	Linux		1	0
Virginia	Shared	Instance	r6i.large	Linux		3	0
Virginia	Shared	Instance	r6i.xlarge	Linux		1	0
Virginia	Shared	Instance	t2.xlarge	WS LI		10	0
Virginia	Shared	Instance	t2.xlarge	WS LI		1	0
Virginia	Shared	Instance	t3.large	Linux		2	0
Virginia	Shared	Instance	t3.large	WS LI		3	0
Virginia	Shared	Instance	t3.large	WS LI		2	0
Virginia	Shared	Instance	t3.medium	Linux		3	0
Virginia	Shared	Instance	t3.small	Linux		1	0
Virginia	Shared	Instance	t3a.large	Linux		22	0
Virginia	Shared	Instance	t3a.large	WS LI		15	0
Virginia	Shared	Instance	t3a.large	WS LI		2	0
Virginia	Shared	Instance	t3a.medium	Linux		3	0
Virginia	Shared	Instance	t3a.small	Linux		1	0
Virginia	Shared	Instance	t3a.small	WS LI		1	0
Virginia	Shared	Instance	x2iezn.2xlarge	Linux		1	0
Virginia	Shared	Instance	z1d.large	Linux		1	0
Virginia	Shared	Instance	z1d.large	WS LI		3	0
Virginia	Shared Total					382	0
Virginia Total						390	172
Grand Total						390	172

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Potential SQL Server Core Reductions – Shared Tenancy

Product	On-premises Cores	Cores on Right-sized Instances	Cores after applying CPU Optimization	Cores after SQL Consolidation	Final AWS Cores
SQL Enterprise	86	56	56	40	**40**
Incremental reduction		30	0	16	46
SQL Standard	36	28	28	20	**20**
Incremental reduction		8	0	8	16

These SQL Server core reductions may lead to savings on future SQL Server purchases and Software Assurance renewals.

1) Right-sized Instances
Recommended AWS instances are “right-sized” based on each server’s technical specs and utilization.

2) CPU Optimization
The core count of the recommended AWS instance may be further reduced based on the server’s CPU utilization using AWS’s Optimize CPUs. Find more information on AWS’s “Optimize CPU” functionality here. This applies to BYOL SQL Server cores only.

3) SQL Consolidation
SQL Server licensing requires a minimum of 4 core licenses per server. Therefore, 2 core SQL Servers consume 2 additional SQL Server cores licenses that are not used. By consolidating 2 core SQL Servers into 4 core servers, no licenses are wasted and the total required licenses is reduced.

End-of-Support Migration Program (EMP)

When a Windows Server or SQL Server version reaches end-of-support, Microsoft will no longer release updates to address bugs and security vulnerabilities. EMP for Windows Server provides a way to future-proof your legacy applications by decoupling them from the underlying version of Windows Server operating system. This means that the applications running on a version of Windows Server either out of support or nearing end of support can simply be moved to the latest supported version of Windows Server, without any code changes.

WS Version	Servers	% of Estate	OS Support Cycle	EOS	T-Days	Risk
<= WS 2008 R2	5	3%	Unsupported (2008/R2)	01/14/20	(1,319)	High
WS 2012	0	0%	Extended Support (2012/R2)	10/10/23	46	Med
WS 2012 R2	0	0%	Extended Support (2012/R2)	10/10/23	46	Med
WS 2016	95	48%	Extended Support (2016)	01/12/27	1,236	Med
WS 2019	96	49%	Mainstream Support until 01/2024	01/09/29	1,964	Low
WS 2022	0	0%	Mainstream Support until 10/2026	10/14/31	2,972	Low
WS Total:	**196**	**100%**				

SQL Version	SQL Instances	% of Estate	DB Support Cycle	EOS	T-Days	Risk
<= SQL 2008 R2	0	0%	Unsupported (2008/R2)	07/09/19	(1,508)	High
SQL 2012	0	0%	Unsupported (2012)	07/12/22	(409)	High
SQL 2014	6	32%	Extended Support (2014)	07/09/24	319	Med
SQL 2016	13	68%	Extended Support (2016)	07/14/26	1,054	Med
SQL 2017	0	0%	Extended Support (2017)	10/12/27	1,509	Med
SQL 2019	0	0%	Mainstream Support until 01/2025	01/08/30	2,328	Low
SQL 2022	0	0%	Mainstream Support until 01/2028	01/11/33	3,427	Low
SQL Total:	**19**	**100%**				

Not all applications are eligible for the End-of-Support Migration Program. If you would like to explore this option further based on your specific use case, please let us know and we will engage you with one of our experts from our AWS EMP team.

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Storage Assessment

File/NAS Storage Overview

Array Name	Array Vendor	Family/ Model	Total Provisioned Capacity (TB)	Total Used Capacity (TB)	Access Protocols	Peak IOPS	Peak Throughput (MBps)
Array1	NetApp	FAS	209	181	NFS, CIFS and MIXED	843.1133	2.8844
Array2	NetApp	FAS	373	326	NFS, CIFS and MIXED	872.3567	2.5566
Array3	NetApp	FAS	192	126	NFS, CIFS and MIXED	798.2811	2.58
Array4	NetApp	FAS	97	82	NFS, CIFS and MIXED	963.6622	2.1957
Array5	NetApp	FAS	300	286	NFS, CIFS and MIXED	924.3767	3.9319
Array6	NetApp	FAS	311	279	NFS, CIFS and MIXED	490.0656	2.6532
Array7	NetApp	FAS	363	299	NFS, CIFS and MIXED	945.5545	3.3587
Array8	NetApp	FAS	359	300	NFS, CIFS and MIXED	1,003.8578	2.3481
Array9	NetApp	FAS	102	83	NFS, CIFS and MIXED	906.26	3.1385
Array10	NetApp	FAS	26	4	NFS, CIFS and MIXED	729.9213	9.3389
Array11	NetApp	FAS	119	92	NFS, CIFS and MIXED	1,053.6178	3.3933

Discovery Details and Assumptions

- **Discovery Period**: 7 Days
- **NAS Array/s**: NetApp
- **File Servers:** N/A

- All NAS Volumes have been mapped to Amazon FSx for NetApp ONTAP.
- Inactive volumes have been mapped to Capacity Pool.
    - Inactive volumes are those where IO operations were not detected during the discovery period.
- Detailed volume/shares level mapping is shared in a separate excel sheet.

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These are fictitious numbers for the purpose of example/illustration.

Sample: Amazon FSx for NetApp ONTAP (Single-AZ)

Collector data has been leveraged for storage analysis. Amazon FSx for NetApp ONTAP file system automatically replicates your data within AWS Availability Zone (AZ) for Single-AZ and across AZs for Multi-AZ to enable high availability and durability. The prices below are based on a **Single-AZ** Amazon FSx for NetApp ONTAP deployment.

Parameter	Pricing *(Monthly)*
SSD storage *Usable SSD capacity: 68.31 TiB* *Price: $0.125 per GiB-month*	$8,744
Additional SSD IOPS *Additional SSD IOPS over-provisioned: 0 IOPS* *Price: $0.017 per GiB-month*	$0
Capacity pool storage *Average capacity pool storage: 690.69 TiB* *Price: $0.022 per GiB-month*	$15,489
Throughput capacity *Provisioned throughput: 128 MB/s* *Price: $0.72 per MBps-month*	$92
Total monthly cost	**$24,325 ($0.031 per GiB-month)**
Total annual cost	**$291,900 (List Price)**

Modeling

- Total used storage capacity: 759 TB (including system and metadata)
- Percentage of data on SSD storage: 9%
- Percentage of data on capacity pool: 91%
- Savings from compression + deduplication: Like to like
- IOPS: 3,478
  *SSD provides 3 IOPS per GiB: 160K per FS
- Throughput capacity: 128 MB/s
- Region: US East (N. Virginia)
- # of FSx filesystems: 1
- Protocols: NFS, CIFS and iSCSI

These are fictitious numbers for the purpose of example/illustration.

Block Storage Volumes - Overview

Volume Type	Total Volumes	In Scope	Array Vendor	Total Provisioned Capacity (GB)	Total Used Capacity (GB)
Virtual Machine Volumes	400	268	NetApp	76,419.00	62,977.21
Physical/Bare Metal Volumes	15	5	NetApp	9,374.08	9,374.08

Discovery Details and Assumptions

- **Discovery Period**: 7 Days
- **SAN Array/s**: Dell EMC Unity
- **Virtualization Platform**: VMware
- **Region:** US-EAST-1

- Only active volumes are in scope of target mapping. Inactive volumes have been mapped to Amazon Elastic Block Storage (EBS) SC1, but no pricing is provided.
    - Inactive volumes are those where IO operations were not detected during the discovery period.
- Physical/Bare metal volumes are those which are allocated to physical servers or as RDMs to Virtual Machines (VMs).
- Detailed volume level mapping is shared in a separate excel sheet.

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These are fictitious numbers for the purpose of example/illustration.

Sample Disks: Mapping to Amazon Elastic Block Storage (EBS)

Amazon EBS – Boot Disks

Target EBS Volumes	VM Count	Volumes Used Capacity (GB)	AWS Directional Cost Estimation (Monthly)	AWS Directional Cost Estimation (Annually)
AWS EBS GP3	537	16,110	$1,288.80	$15,465.60

Amazon EBS - Data Disks

Target EBS Volumes	Volumes Count	Volumes Used Capacity (GB) Post Buffer & Min Quota	AWS Directional Cost Estimation (Monthly)	AWS Directional Cost Estimation (Annually)
AWS EBS GP3	160	70,054.14	$6,313.02	$75,756.18
AWS EBS IO2 Block Express	2	8,599.17	$4,178.15	$50,137.85
AWS EBS SC1	238	58,713.42	$1,451.90	$17,422.77
AWS EBS ST1	137	31,830.97	$1,761.19	$21,134.30

Modeling

- Mapping to Amazon EBS is based on adjusted used capacity, peak IOPS, and peak throughput
- Adjusted capacity has 10% buffer on actual used capacity
- 30GB of boot disks have been considered for all in-scope servers as directional costing
    - All boot disks are mapped to Amazon EBS GP3
- Disks with high capacity and performance requirements are mapped to EBS IO2 and EBS IO2 Block Express

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These are fictitious numbers for the purpose of example/illustration.

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Supplementary AWS Services

Cloud-Based Disaster Recovery with AWS Elastic Disaster Recovery

Achieve reliability and availability based on top-tier recovery objectives by using AWS Elastic Disaster Recovery (DRS) as a simple and flexible Disaster Recovery Service. This service continuously replicates your machines (including operating system, system state configuration, databases, applications, and files) into a low-cost staging area in your target AWS account and preferred region. This reduces the need for duplicate infrastructure and licensing. In the case of a disaster, you can instruct AWS Elastic Disaster Recovery to automatically launch thousands of your machines in their fully provisioned state in minutes.

AWS DRS pricing	Monthly
DRS Replication Cost (monthly)	$11,324

AWS EC2/EBS estimated costs	Monthly	Amount of Data (GB)
EBS General Purpose storage (gp3)	$31,186	389,824
EBS Magnetic (standard)	$0	0
Total Snapshots New Data (base + new)	$26,313	526,262

Monthly TCO	$68,823
Annual Consumption	$825,874

Modeling Details

AWS Region	US East (N. Virginia)
Number of replicated servers	554
Storage capacity in GB	389824
Total number of disks	554
Estimated Replication Servers	37
Incremental Snapshot Retention Period	7

- Candidates: All active workloads
- Daily change rate assumed: 5%
- Costs in USD

If you would like to explore this option further, please let us know and we will engage you with one of our experts from our AWS Elastic Disaster Recovery team.

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Next Steps

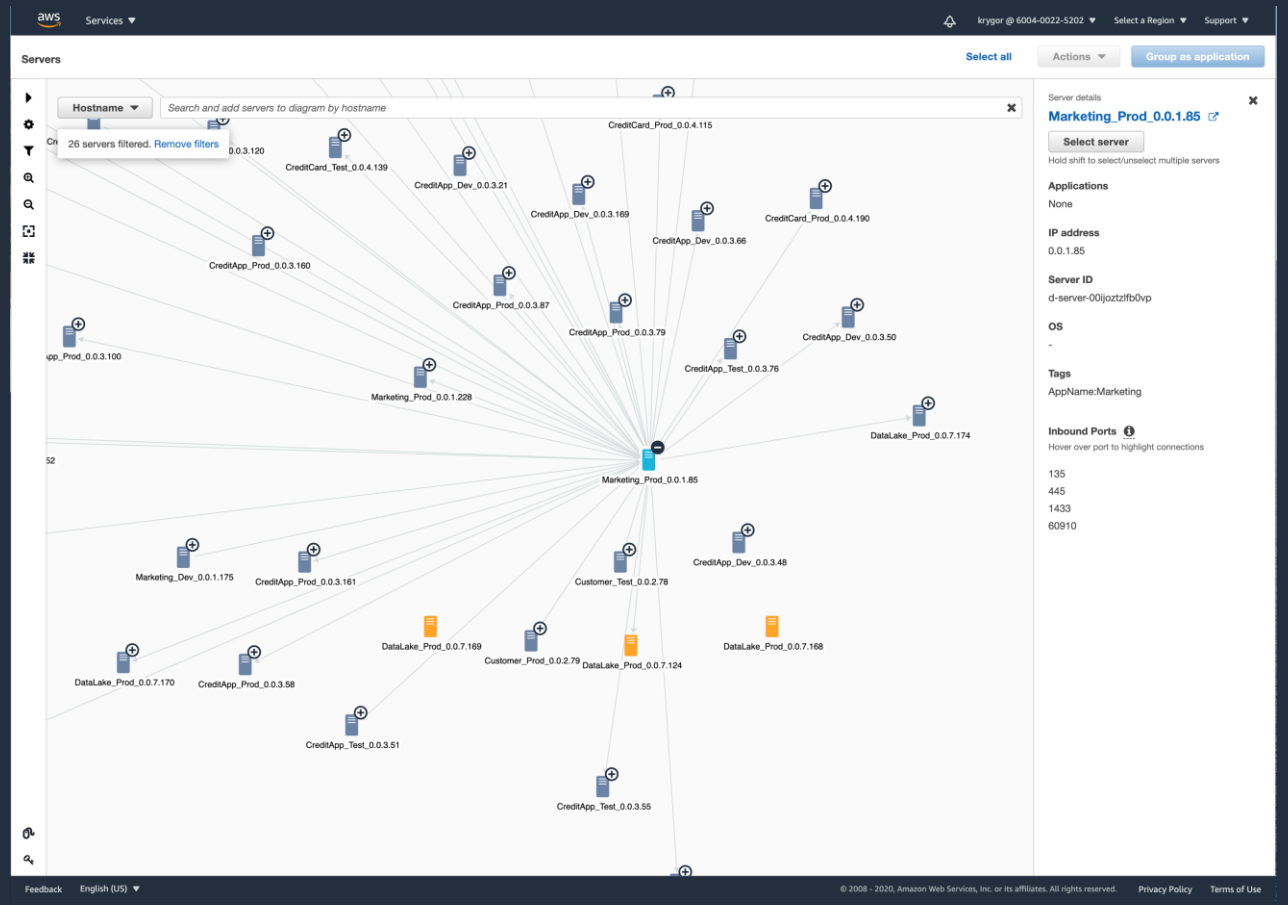
Next Steps – Server Dependency Mapping

Migration Evaluator integrates the discovery of on-premises resources used for a business case with Migration Hub's Server Dependency Mapping. By collecting network Transmission Control Protocol (TCP) connections you can identify server-to-server dependencies which provides the needed foundation to make sound digital transformation decisions.

1. [Setup your AWS Migration Hub account]

2. Install and deploy the Migration Evaluator Collector (or add configuration to your existing installation)

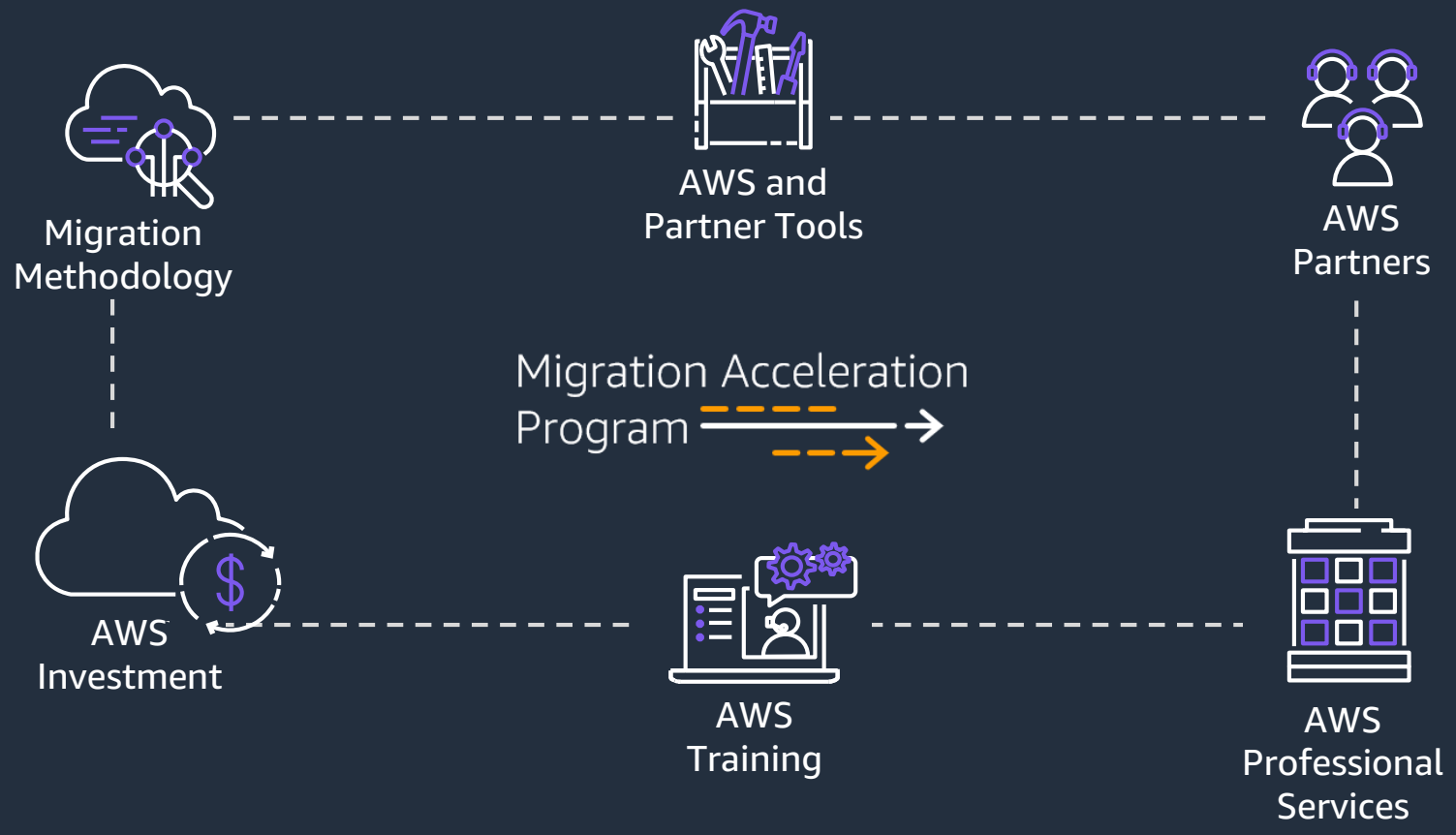
3. Use AWS Migration Hub to visualize, group and tag servers



Next Steps - Migration Acceleration Program

For customers with incremental AWS adoption exceeding $500K annually, the Migration Acceleration Program provides a comprehensive and proven methodology, based on experience migrating hundreds of enterprise customers, making cloud adoption easier and allowing customers to gain cloud benefits sooner. MAP consists of an agile-based migration approach, a global network of vetted partners, automation tools, a training path to up-skill staff, professional services, and financial investment to help manage transition costs.

1. Identify and engage your executive champion and sponsor.
2. Work with your account team to engage the Migration Acceleration Program to accelerate your cloud journey.
3. Schedule a discovery and migration readiness assessment



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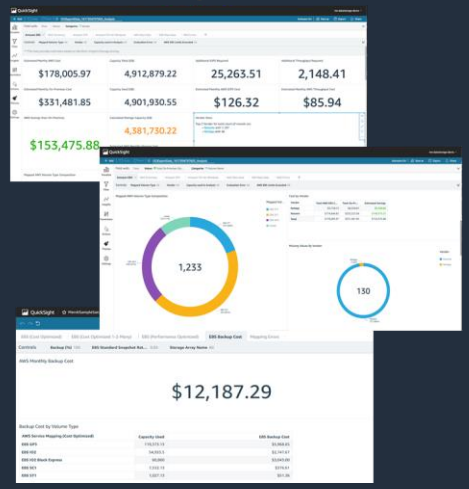
Next Steps – Storage Assessment

Build a data driven business case quickly providing holistic view of structured and unstructured data. Realize potential savings up to 67% of on-premises storage costs by running a Storage Assessment.

1. Engage your AWS Account team
2. Review technical and business requirements
3. Schedule a Storage Assessment
4. Review business case analysis
5. Plan migration strategy – POC for sample workload

Project Engagement → **Data Discovery & Analysis** → **Directional Cost Estimation**

- Tenant Creation
- Data Collection Setup
- Queries Creation



Next Steps – Licensing Health Check

- Need help determining your BYOL use rights for Windows & SQL Server?
- Understand the Pros/Cons & costs of bringing existing Microsoft volume licenses versus using AWS License Included
- Optimize your Windows & SQL footprint in AWS
- Consider running an independent AWS funded “Licensing Health Check” assessment with one of our expert licensing consulting partners

Other Recommendations

- AWS Training & Certification

- Migration Readiness Assessment (MRA)

- Immersion Days

- Datacenter Divest

- Cloud Adoption Framework (CAF)

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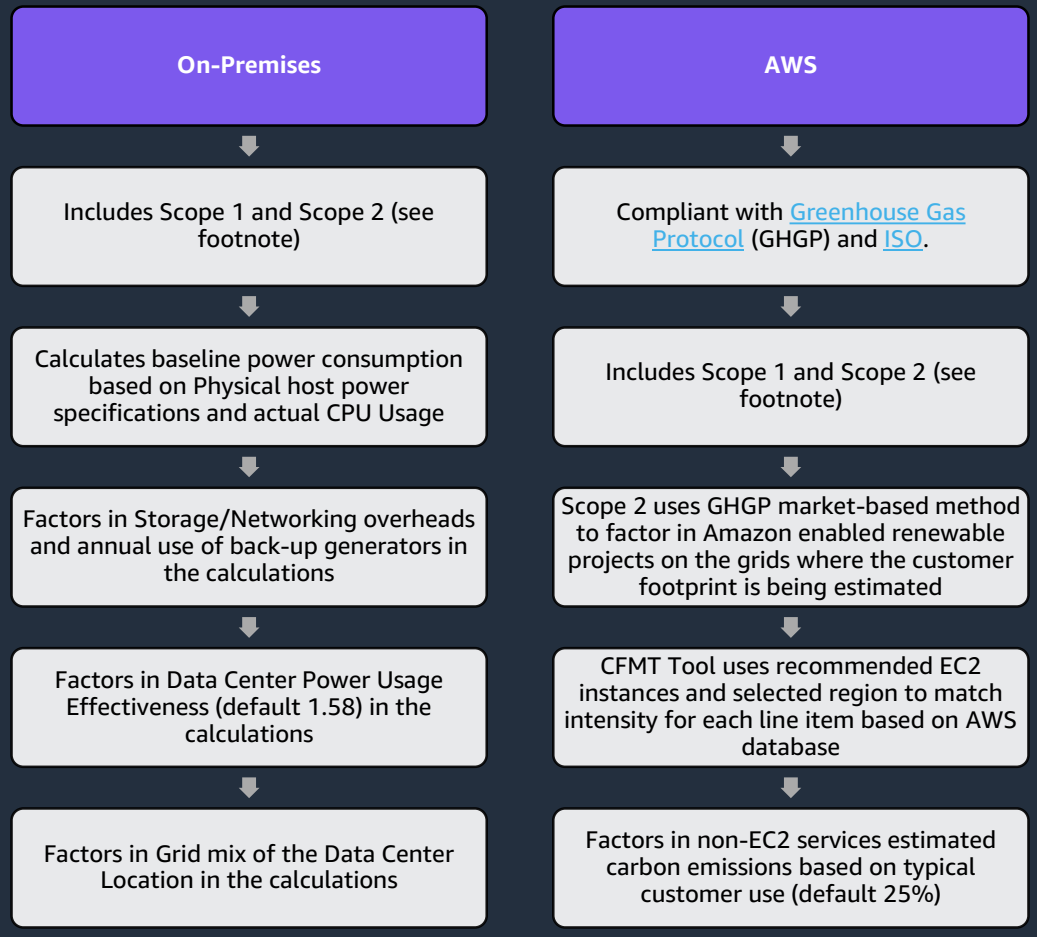
Thank you!

Appendix

Sustainability: Carbon Estimation Methodology



The GHG Protocol Corporate Standard classifies a company's GHG emissions into three 'scopes'. Scope 1 emissions are direct emissions from owned or controlled sources. Scope 2 emissions are indirect emissions from the generation of purchased energy.

On-Premises Annual Cost Estimation

Included in On-Premises Cost Estimation

- Server based on AWS benchmarks
- Attached storage
- Power
- Software licensing: OS (if applicable)
- MS SQL Server licensing (if applicable)

Excluded in On-Premises Cost Estimation

- Employee costs
- Migration tools
- Professional services
- Software outside OS and SQL
- Networking

Parameter	On-Premises Cost
Compute	$1,831,506
Storage	$828,648
Annual Total	**$2,660,154**

Currency is in USD, annually. Migration Evaluator benchmark costs were used for calculating on-premises estimations. OS and SQL licensing can be configured to customer actuals. On-premises licensed SQL cores are counted at the operating system level verses host @ $2,717 per core; operating system @ $300 per OS.

Windows & SQL Server Licensing Rules on AWS

*Licensing options on AWS for Microsoft Migrations

Licenses purchased **BEFORE Oct 1, 2019**, or as part of a true up on an Enterprise enrollment with an effective date prior to 10/1/2019

	Windows Server	SQL Server
If the licenses **have** Software Assurance		
1. Move licenses to default (shared) tenant EC2?	✗	✓
2. Move licenses to EC2 Dedicated Hosts?	✓	✓
If the licenses **Do Not have** software Assurance		
1. Move licenses to default (shared) tenant EC2?	✗	✗
2. Move licenses to EC2 Dedicated Hosts?	✓	✓

Licenses purchased **AFTER Oct 1, 2019**, that are not part of a true up on an Enterprise enrollment with an effective date prior to 10/1/2019*

	Windows Server	SQL Server
If the licenses **have** Software Assurance		
1. Move licenses to default (shared) tenant EC2?	✗	✓
2. Move licenses to EC2 Dedicated Host?	✗	✓
If the licenses **Do Not have** Software Assurance		
1. Move licenses to default (shared) tenant EC2?	✗	✗
2. Move licenses to EC2 Dedicated Host?	✗	✗

*Based on Microsoft's publicly available Product Terms

- Renewing software assurance on a perpetual Microsoft license as part of a renewal will not change the “purchase date” for any server license purchased prior to 10/1/19
- SQL Server, Exchange, SharePoint & Remote Desktop Services retain their License Mobility Rights and can run in any AWS environment with active software assurance

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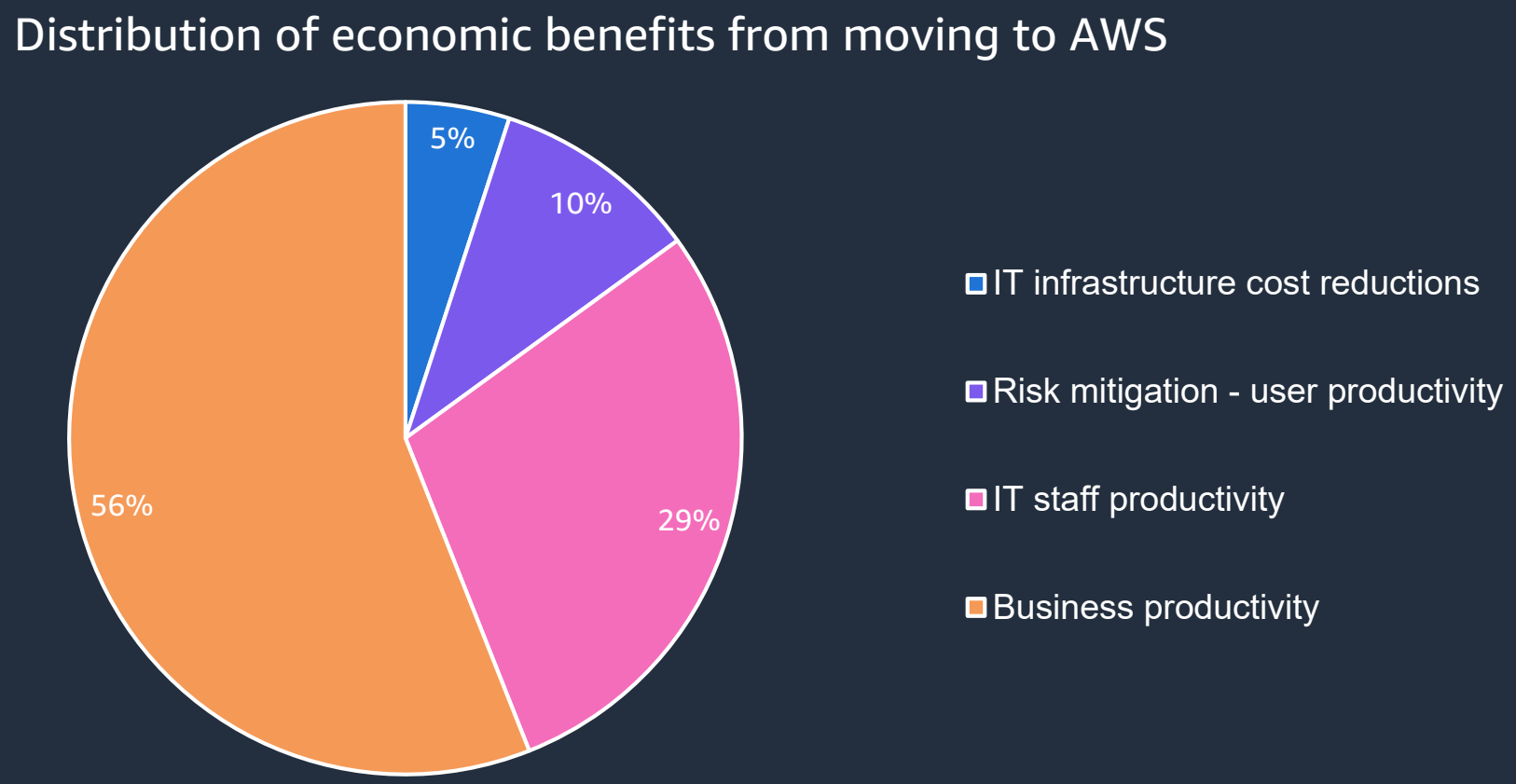
Where does Cloud Business Value come from?

IDC: NON-TCO DRIVERS CONSTITUTE OVER 90% OF ECONOMIC BUSINESS VALUE



The Business Value of Amazon Web Services, IDC Research, Inc., June 2022

Glossary

Right-Sizing	A key mechanism and process of matching instance types and sizes to your workload performance and capacity requirements at the lowest possible cost. It's also the process of looking at deployed instances and identifying opportunities to eliminate or downsize without compromising capacity or other requirements, which results in lower costs.
Direct Match	A direct match or "lift and shift" is an Amazon EC2 deployment strategy where you migrate to an EC2 instance that closely matches the on-prem servers current provisioning specifications.
NURI	No Upfront Reserved Instances – a purchase option for AWS Reserved Instances (https://aws.amazon.com/aws-cost-management/aws-cost-optimization/reserved-instances/)
AURI	All Upfront Reserved Instances – a purchase option for AWS Reserved Instances (https://aws.amazon.com/aws-cost-management/aws-cost-optimization/reserved-instances/)
Shared Tenancy	Shared tenancy is the default tenancy for Amazon EC2 instances that launch in a virtual private cloud (VPC). It means that multiple EC2 instances from different customers may reside on the same piece of physical hardware. You can change the default tenancy of a virtual private cloud (VPC) from default (shared) to a Dedicated Host.
Dedicated Host	Allow you to use your eligible software licenses from vendors such as Microsoft and Oracle on Amazon EC2, so that you get the flexibility and cost effectiveness of using your own licenses, but with the resiliency, simplicity and elasticity of AWS. An Amazon EC2 Dedicated Host is a physical server fully dedicated for your use, so you can help address corporate compliance requirements. You can use your existing per-socket, per-core or per-VM software licenses.
Mixed Tenancy	An EC2 deployment strategy to combine both Shared (Default) tenancy along with Dedicated Hosts.
BYOL	If you've already purchased Microsoft software, you have the option to bring your own licenses (BYOL) to the AWS Cloud (subject to Microsoft license terms). With the BYOL experience, customers can easily bring and manage their existing licenses for Microsoft Windows Server and SQL Server to AWS.
LI	License Included - allows you access to fully compliant Microsoft software licenses bundled with Amazon EC2 or Amazon RDS instances and pay for them as you go with no upfront costs or long-term investments. You can choose from Amazon Machine Images (AMIs) with just Microsoft Windows Server, or with Windows Server and Microsoft SQL Server pre-installed.
Zombie	Zombies are servers that did not exceed the minimum CPU utilization threshold (5% for bare metals or 300 MHz for VMs) for any 15 minute period duration data collection. Often these are machines that can be excluded from migration scope as they may not need to move to AWS.
Licensing Health Check	Refer to Slide 33 - Comparison of owned licenses versus required licenses - to be included in upcoming vendor license agreement discussion. Microsoft License Statement required
EC2	Amazon Elastic Compute Cloud - over 600 instance types and choice of the latest processor, storage, networking, operating system, and purchase model to help you best match the needs of your workload (https://aws.amazon.com/ec2/)
EBS	Amazon Elastic Block Store - an easy-to-use, scalable, high-performance block-storage service designed for Amazon EC2 (https://aws.amazon.com/ebs/)
SSD	solid-state storage device
HDD	hard disk drive