INNOVATE

MODERN APPLICATIONS EDITION

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Save costs by migrating and modernizing SQL Server workloads

Sepehr Samiei

Principal Solutions Architect
Amazon Web Services

Agenda

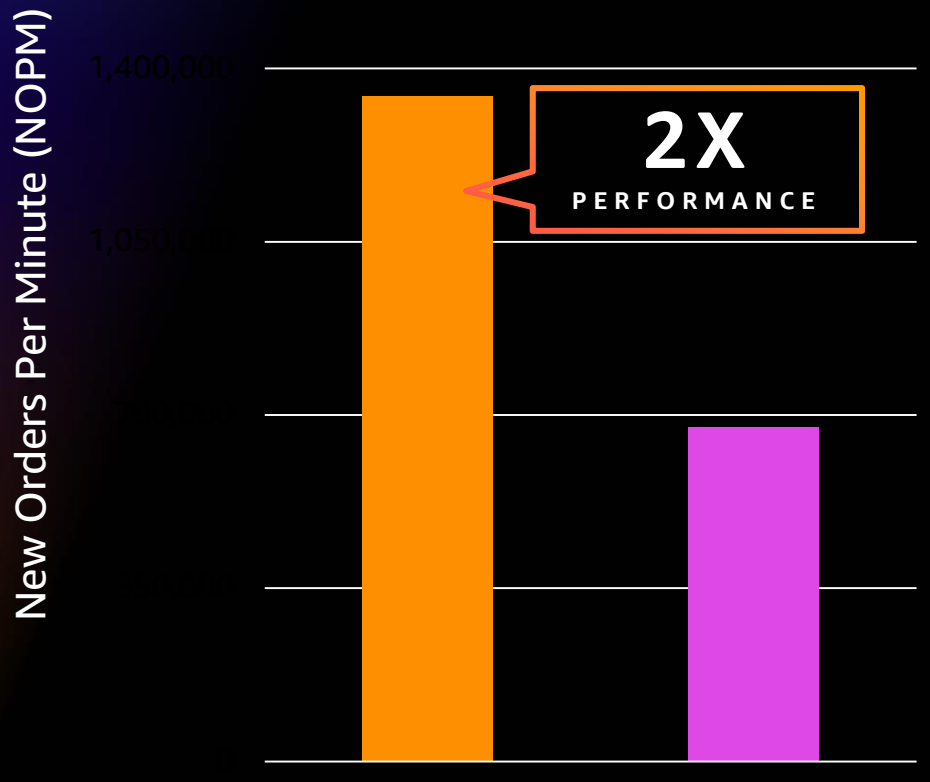
- Cost savings with Microsoft workloads on AWS
- Windows End of Life (EOL) and End of Migration Program (EMP)
- SQL Server migration and modernization

Cost savings with Microsoft workloads on AWS

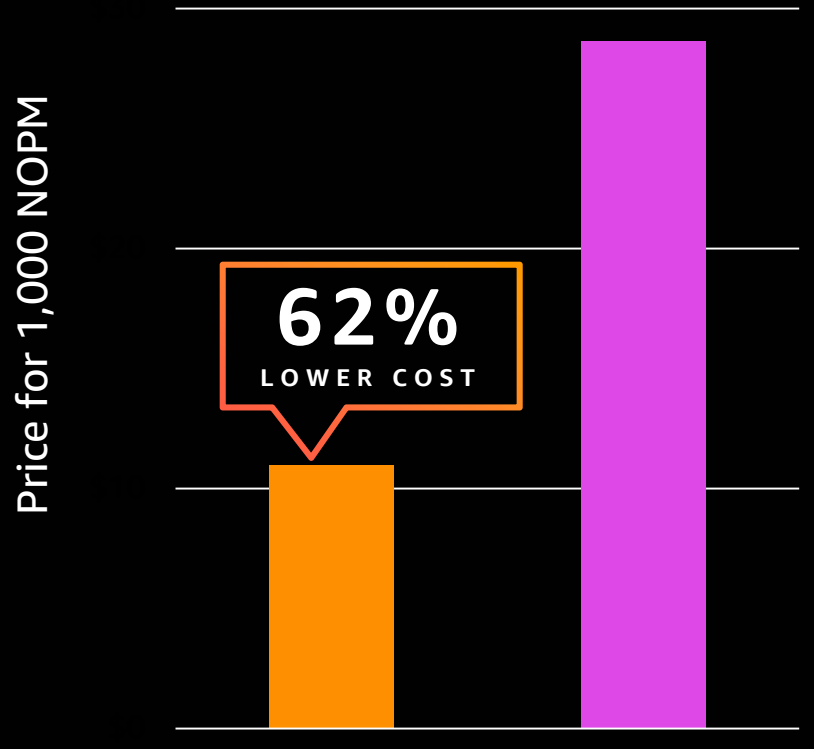
Better Performance

2X PERFORMANCE AT 62% LOWER COST VS. NEXT LARGEST CLOUD PROVIDER

Performance (NOPM)



Price / Performance



https://aws.amazon.com/blogs/compute/sql-server-runs-better-on-aws/

Lower TCO

SAVE ON INFRASTRUCTURE

According to IDC report, customers on average realized 442% ROI over 5 years, when they bring their Windows workloads to AWS

OPTIMIZE LICENSING FOOTPRINT

Use Optimization and Licensing Assessment (OLA) to optimize licensing footprint and accelerate migration of Windows workloads to AWS

COST MANAGEMENT TOOLS

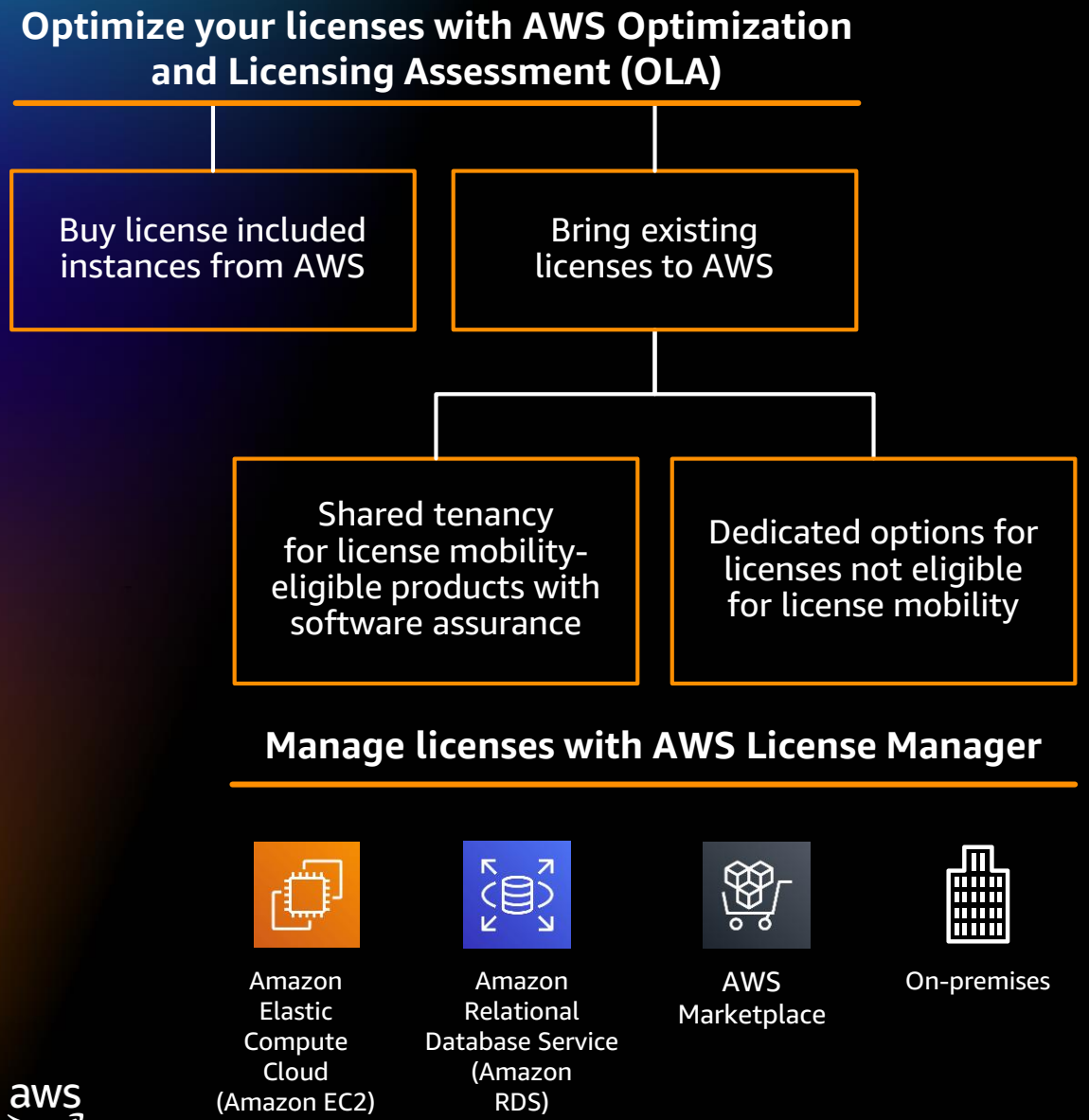
1. **AWS Trusted Advisor** serves real-time recommendations to help you increase performance and reduce overall costs
2. **AWS Compute Optimizer** can help you save up to 25% on Amazon EC2 by serving Amazon EC2 instance recommendation for existing workloads
3. **AWS Cost Explorer** provides rightsizing recommendations and cost saving estimates, incorporating customers' billing, credits, Reserved Instances and Savings Plans

442%

5-year return on investment*

* IDC report: The Business Value of Efficiently Running High-Performing Windows Workloads in the AWS Cloud

Flexible licensing options for Windows on AWS



1. **Bring your licenses to AWS (BYOL)**
   Save costs with dedicated hosts

2. **Buy licenses included (LI) from AWS**
   Pay as you go with no upfront costs

3. **AWS License Manager**
   Manage, discover, and report software license usage

License optimization with Amazon EC2 CPU optimization

- Control active vCPUs and hyper-threading status when launching new Amazon EC2 instances
- Reduce the number of SQL Server licenses
- Requires SQL BYOL

Instance Type	Total vCPUs	Active vCPUs with Optimize CPUs	SQL Server license savings
r5.4xlarge	16	8	50%
r5.8xlarge	32	8	75%

*Sample licensing example only

Mixed licensing model is a win-win situation

Use BYOL for core (slowly varying) infrastructure

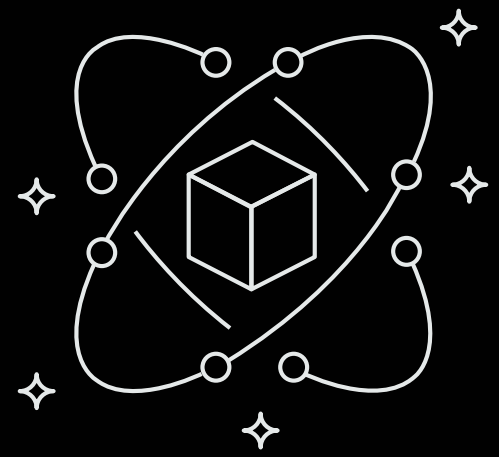
Large potential savings by reusing licenses

and

Use License included for varying infrastructure

Take advantage of AWS Auto Scaling

Less management overhead, pay-as-you-go



AWS License Manager

- One stop-solution for BYOL tracking across a wide variety of software products
- Centrally track licenses counted by vCPU, cores, sockets, or instances across all AWS accounts and hybrid environments
- Native integrations with Amazon EC2, Amazon RDS, AWS Systems Manager, and AWS Organizations

New capabilities

- Automated discovery of BYOL usage of products such as Windows Server, SQL Server, and Oracle
- Automated tracking of RDS Oracle BYOL usage (database, options, and packs)

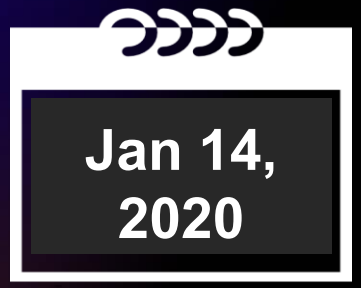
Available at no additional costs to customers

https://aws.amazon.com/license-manager/

Windows EOL and EMP

End-of-Support (EOS) is approaching

Windows Server 2003 and 2003 R2 reached End-of-Support



Windows Server 2008 and 2008 R2 reached End-of-Support

Windows Server 20012 and 2012 R2 reaches End-of-Support

What does EOS mean?

Security	No security updates mean exposure to increasingly insecure cyberspace
Compliance	Risk of non-compliance with industry regulations
Costs	High operational cost to isolate applications and high extended support cost
Cloud adoption	Blockers to adopting cloud and cloud-native technologies

Migrating to new Windows Server OS resolves security and compliance risk while accelerating cloud adoption

Legacy applications present several migration challenges

- Lost expertise, code and/or installation media
- High cost and time commitment for refactoring or recoding the application
- High risk of upgrade failure
- Incompatible highly customized commercial-off-the-shelf (COTS) applications
- Dependencies on older runtime versions like Java, .NET etc.

End-of-Support Migration Program (EMP) for Windows Server

EMP for Windows Server helps customers package legacy applications allowing them to run on newer windows server OS without any code changes.

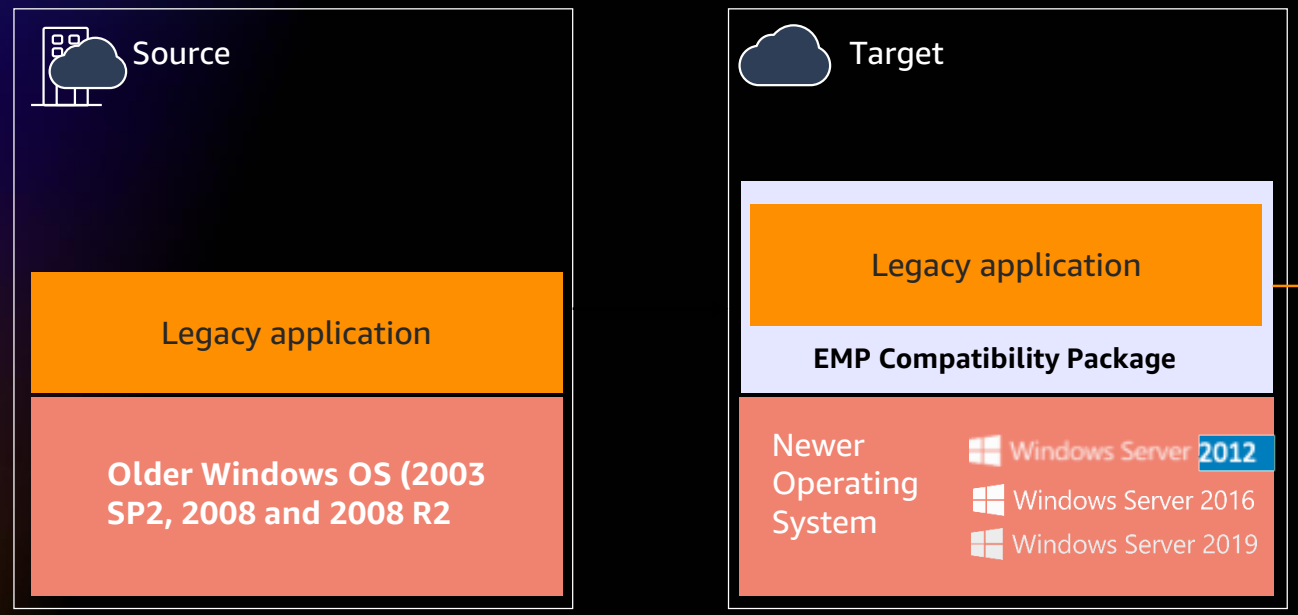
EMP for Windows Server provides

Technology

Experts

https://aws.amazon.com/emp-windows-server/

How does EMP Compatibility Package work?



Compatibility package features

Redirection

Intercepts Windows API calls as the application interacts with local operating system returning the resources expected by the application regardless of OS

Isolation

Runs older versions of runtimes that can only be accessed by packaged application

Compatibility

Resolves OS incompatibilities while maintaining integration with other applications and services

Why EMP?

Future-proof

Decouple from underlying OS

Low risk of failure on subsequent OS updates

Reduced risk

Improved security and performance on new OS

Compliance with industry regulations

Cost-effective

No application refactoring or recoding cost

No extended support costs

EMP for Windows server process

1

Application assessment

- Application discovery documented
- Testing criteria defined

2

Compatibility packaging

- EMP compatibility package created using EMP tooling
- Reverse packaging process for apps with no installation media

3

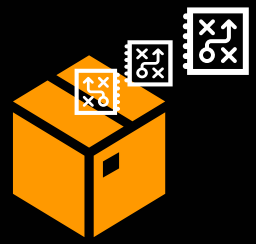
Migration

- EMP compatibility package deployed on target new Windows Server OS on AWS

EMP packaging options

Snapshot Package

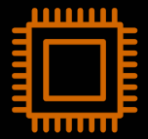
- Suitable for COTS/Media based applications – requires source installer and associated license keys
- Package process using EMP package builder:
  - Run pre-snapshot of the vanilla legacy OS environment
  - Install software using media
  - Configure software to replicate production setup
  - Run post-snapshot
- Copy the package manifest to Amazon Simple Storage Service (Amazon S3) to use in target OS



Reverse Package

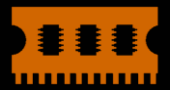
- Suitable for non-media based application - no installer, custom developed and no source code
- Package process using EMP package builder:
  - Run promon on source environment to extract application dependencies
  - Filter the output from promon to remove unwanted dependencies
  - Use EMP Package Builder to create package manifest
- Copy the package manifest to Amazon Simple Storage Service (Amazon S3) to use in target OS

EMP offers lightweight packaging



< 1% CPU hit

+10MB additional disk space



+20MB RAM overhead per package

No agent or client

No backend infrastructure

Example of supported applications

- Applications that are incompatible with newer Windows versions
- Legacy Windows workloads that have not yet been migrated into AWS
- Legacy workloads that have been lifted and shifted into AWS but still run on older Windows versions

Examples of technologies supported:

- **Applications and databases:** Apache Tomcat 6.2, SQL Management Studio x86 2008, SQL Management Tools x86 2005, MS-SQL 2000, MS-SQL 2005, MS-SQL 2008, dBase, Oracle 9i, Oracle 10g, Oracle 11g, IBM DB2, Microsoft JET Engine, Access 2003, WebSphere
- **Runtimes:** ActiveX, VB 4, VB 5, VB 6, .NET 1.1, .NET 2.0, .NET 3.5, Java 4, Java 5, Java 6, C++ runtimes CRT
- Applications with **no installation media, or source code**

Migrate and modernize Microsoft SQL Server

Microsoft SQL Server on AWS

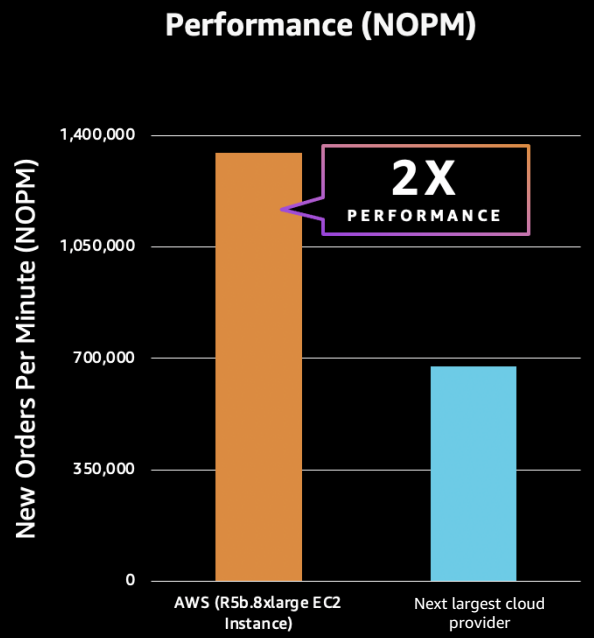
2x
higher performance for a SQL Server workload than the next largest cloud provider*

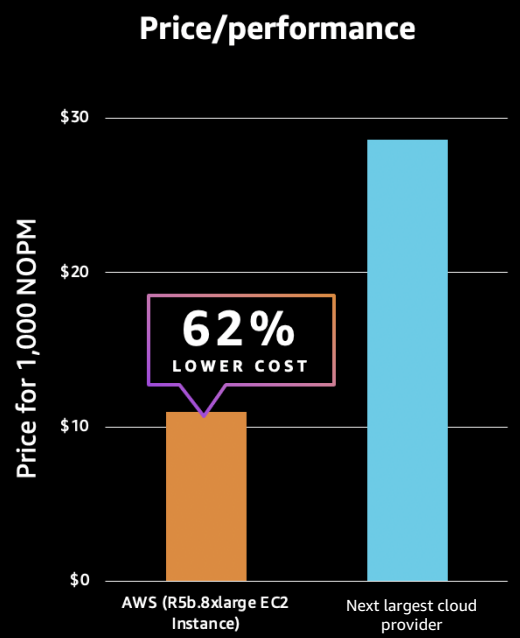
2x
more regions with multiple availability zones than the next largest cloud provider

36%
savings using AWS over three years, by right-sizing instances with Migration Evaluator

5x
more services offering encryption than the next largest cloud provider

442%
projected 5-year ROI running Windows on AWS**

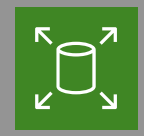




https://aws.amazon.com/windows/
https://aws.amazon.com/blogs/compute/sql-server-runs-better-on-aws/

SQL Server

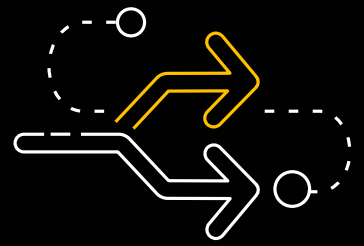
We cover all deployment types

Fully managed		Self-managed		
Standalone	Always On Availability Group	Standalone	Always On Failover Cluster	Always On Availability Group
 Amazon RDS		 Amazon EC2 +  Amazon Elastic Block Store (Amazon EBS)	 Amazon EC2 +  Amazon FSx for Windows File Server	 Amazon EC2 +  Amazon Elastic Block Store (Amazon EBS)
• Zero hardware setup • Zero software patching • Auto-scaled storage • Automated backups		• Direct lift & shift • Scale up as needed	• Fully managed shared file system reduces complexity • Only needs SQL Standard licenses for 2 nodes	• Based on database replication • Higher management overhead • Typically uses SQL Enterprise licenses

SQL Server upgrade tool - 2008 to 2016

SQL Server upgrade tool

Automated

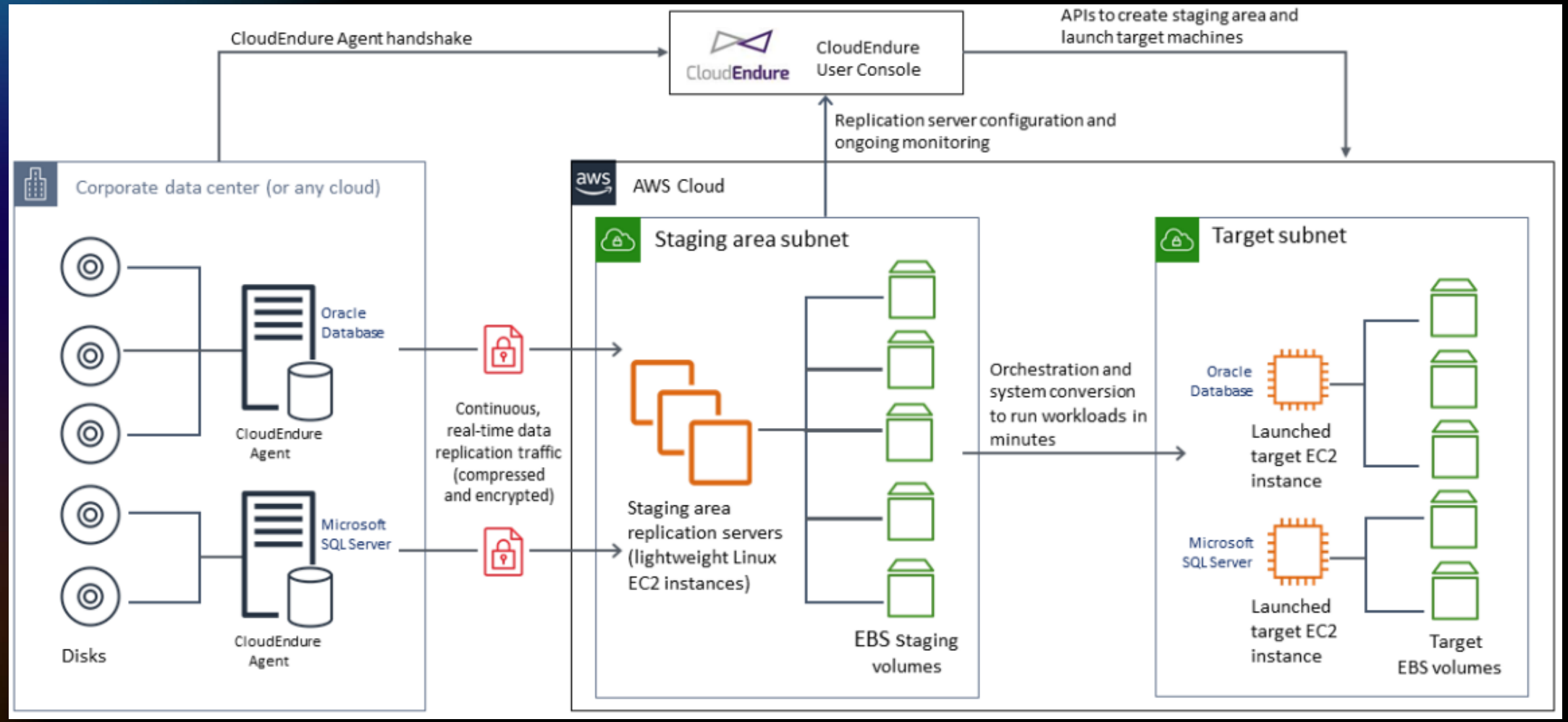


Side-by-side

Streamlined

https://tinyurl.com/sqlserverupgrade

CloudEndure migration

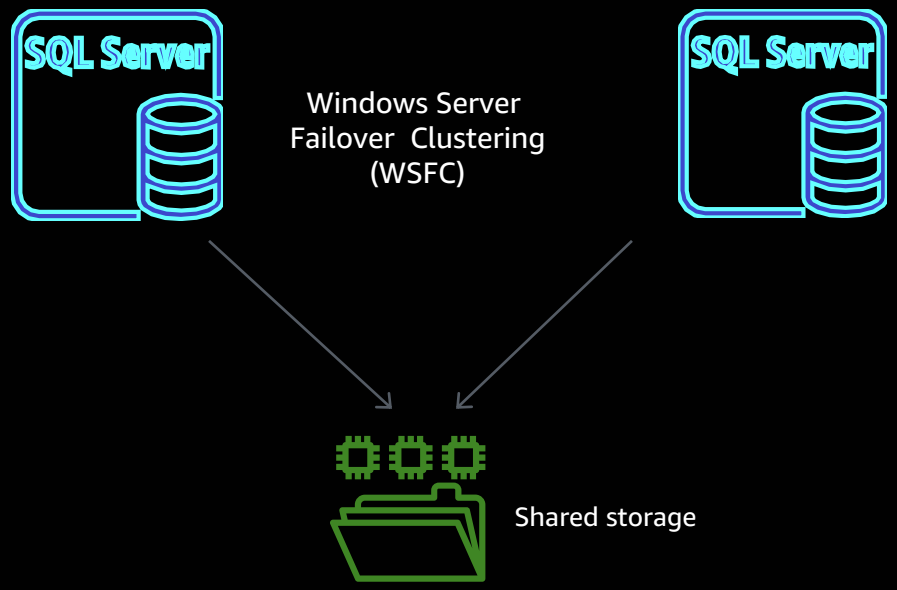


https://aws.amazon.com/application-migration-service/

Running SQL with high availability (HA) and disaster recovery (DR)

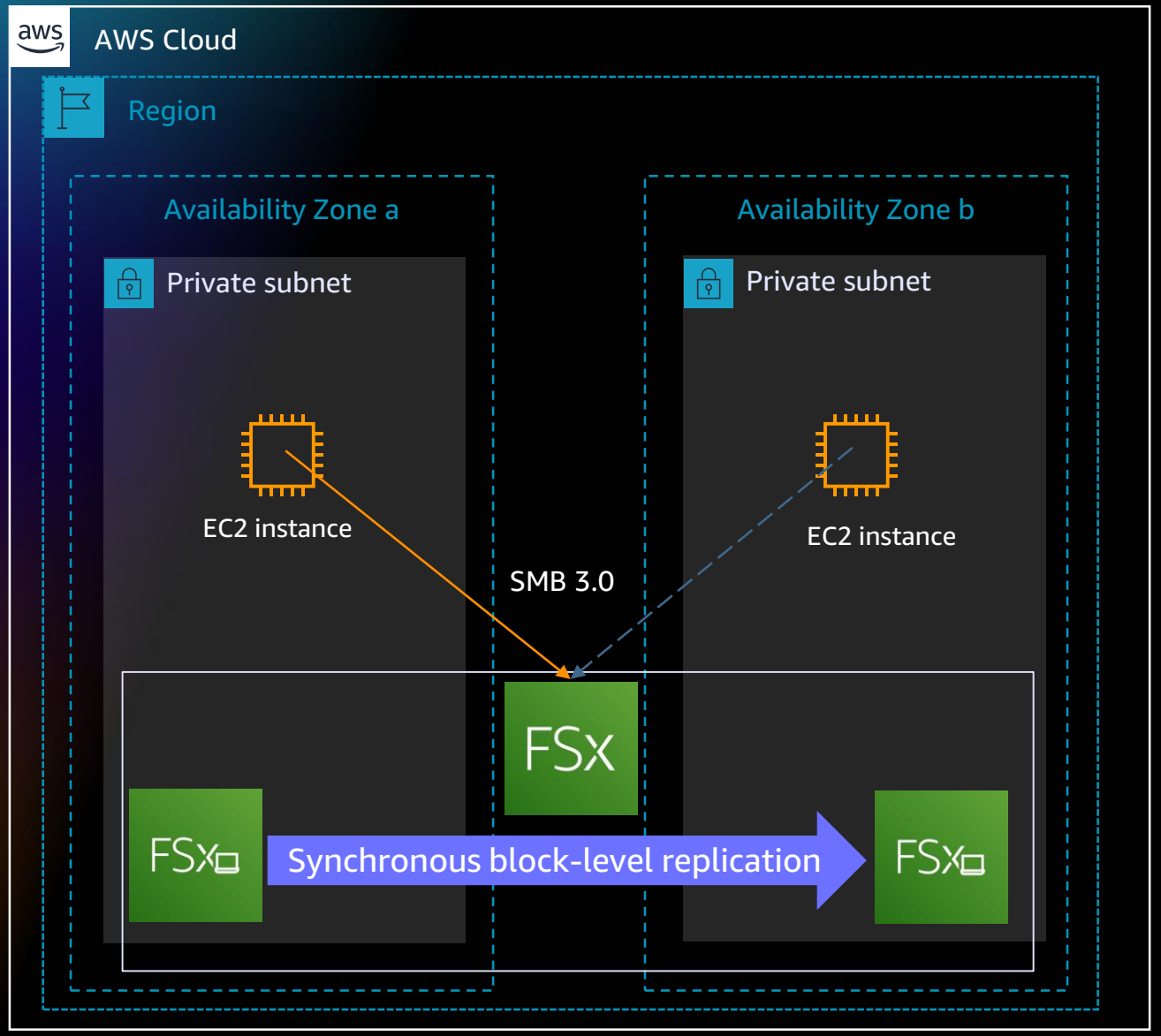
Microsoft SQL Server provides two deployment options of its Always On solution for business continuity use cases like high availability and disaster recovery:

Always On Availability Groups (AG)
SQL Enterprise Licensing



Always On Failover Cluster (FCI)
SQL Standard licensing

MSSQL FCI using Amazon FSx for Windows File Server



- Fully AWS-managed service, based on native Windows
- Continuously available Multi-AZ using block-level synchronous replication
- Configurable throughput capacity
- Access using SMB over ENI bandwidth
- Supports all versions of Windows

https://aws.amazon.com/fsx/windows/

Why Failover Clustering (FCI) over Availability Groups (AG)

TCO: SQL Standard licensing (vs. Enterprise)

Familiar: Common scenario for running SQL on-premises

Faster: storage handles replication (vs. compute), frees up CPU/memory on database server and no need for storage optimization such as strip of disks

Simpler: Easier for database admins to ensure HA

Example TCO: Availability Groups (AG) vs. Failover Cluster Instances (FCI) on AWS

Compute Requirements
- **2 x M5d.4xlarge**
- **SQL on AWS licensing**

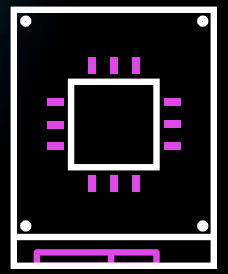
Storage requirements
- 400GB of storage
- 18,000 IOPS

Monthly Estimate	AG	FCI w/ FSx
Compute nodes	$2,119.92	$2,119.92
SQL License (AWS)	$8,760*	$2,803**
Storage	$2,702.52/month	$2,758.90/month ***
Total cost	$13,584.44/month	$7,681.82/month

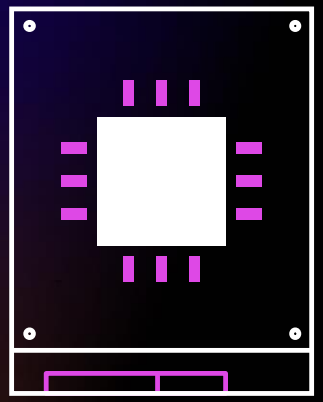
* Monthly cost for MSSQL licensing component of two M5d.4xlarge instances with MSSQL Enterprise
** Monthly cost for MSSQL licensing component of two M5d.4xlarge instances with MSSQL Standard
*** Monthly cost for Amazon FSx Multi-AZ filesystem with 400GB storage and 512 MB/S throughput

aws

Amazon EBS: 4 different volume types for optimal use

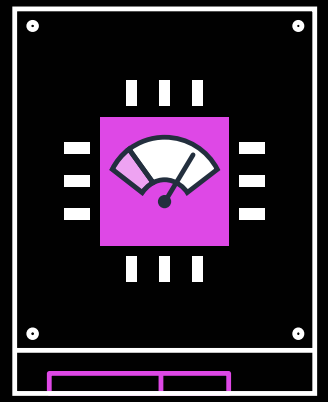


SSD



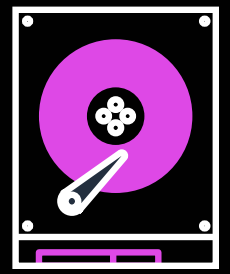
gp2

General purpose
SSD

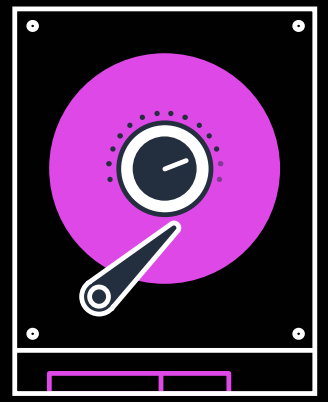


io1 / io2

Provisioned IOPS
SSD

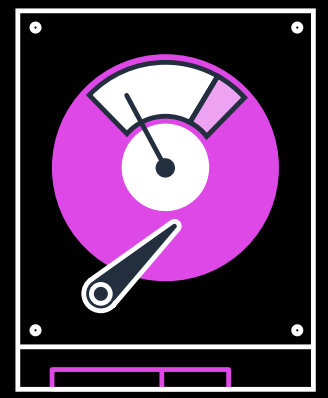


HDD



st1

Throughput optimized
HDD



sc1

Cold
HDD

Other resources

- https://aws.amazon.com/microsoft
- https://aws.amazon.com/windows
- https://aws.amazon.com/sql
- https://aws.amazon.com/migration

Visit the Modern Applications Resource Hub for more resources

Dive deeper with these resources to help you develop an effective plan for your modernization journey.

- Build modern applications on AWS e-book
- Build mobile and web apps faster e-book
- Modernize today with containers on AWS e-book
- Adopting a modern Dev+Ops model e-book
- Modern apps need modern ops e-book
- Determining the total cost of ownership: Comparing Serverless and Server-based technologies paper
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- … and more!

https://bit.ly/3yfOvbK

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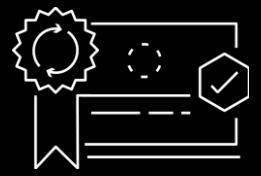

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