aws

Best Practices for Deploying Microsoft SQL Server 2008 on AWS

1

Introduction:
Time to migrate, time to modernize

Housing essential information for key applications, SQL servers are a vital resource for many enterprises. Some of these organizations are currently using legacy applications built on Microsoft SQL Server 2008. Unfortunately, Microsoft will be ending support for this platform on July 9, 2019.

While this will undoubtedly create a host of problems, it also presents an opportunity—there's never been a better time to modernize legacy SQL applications and migrate to newer, more innovative solutions like cloud computing. Maximizing the results of these changes while minimizing business disruption requires choosing the right partner. Amazon Web Services (AWS) is optimally positioned to guide you through the transition, enabling superior value, benefit, and ROI.

aws

2 | Upgrade and migrate how you want, when you want

When you move to AWS, you make the decision on how to migrate and update your infrastructure and at what pace. You can customize your cloud migration and application modernization plans based on your business needs, not lengthy agreements or complex licensing. Ultimately, AWS helps you reduce costs, add efficiencies, and retain the most value from your existing investments.

Let's take a look at the different AWS options for upgrading your systems and capabilities. Then we'll review AWS choices for migrating your applications and data to the cloud.

Upgrade options

AWS offers two predesigned upgrade programs, giving you the flexibility to choose the one that's the best fit for your business needs.

The simplest, quickest path to upgrade is the Amazon Relational Database Service (Amazon RDS). Amazon RDS makes it easy to set up, operate, and scale SQL Server deployments in the cloud. You can deploy multiple editions of SQL Server in minutes with cost-efficient and resizable compute capacity. Amazon RDS frees you up to focus on application development by managing time-consuming database administration tasks including provisioning, backups, software patching, monitoring, high availability, and hardware scaling.

If you want more fine-tuned control of your database, consider Amazon Elastic Compute Cloud (EC2). Amazon EC2 presents a true virtual computing environment, allowing you to use web service interfaces to launch instances with a variety of operating systems, load them with your custom application environment, manage your network's access permissions, and run your image using as many or few systems as you desire.

Migration options

The Amazon Database Migration Service (DMS) is the fastest and easiest path to the AWS cloud. Amazon DMS supports homogenous migrations, such as from Microsoft SQL Server database to another SQL Server database, and heterogeneous migrations between different database platforms, such as Microsoft SQL Server to MySQL or Amazon Aurora. With Amazon DMS, you can continuously replicate your data with high availability. The service supports migrations from on-premises to cloud, cloud-to-cloud, or cloud to on-premises.

Migration options (cont'd)

Alternatively, you can migrate via SQL server native solutions. These include:

Backup/restore

You can use native Microsoft SQL Server backup/restore capabilities to migrate databases to instances of SQL Server running in Amazon RDS or EC2. Amazon RDS supports restoring database backups stored in Amazon Simple Storage Service (S3). This is the easiest method of migration, but you should consider the outage time required between creating a backup, transferring it to Amazon S3, and finally restoring it in your target instance.
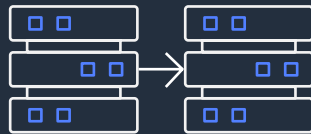
Replication

Achieve synchronous DB-level replication and zero data loss through mirroring, AlwaysOn availability groups, or basic availability groups while running in separate Availability Zones (AZs). Offload your read-only transactions from your primary SQL Server instance to one or more read replica instances.

AlwaysOn Availability Groups (AGs)

Support one set of primary databases and one to eight sets of corresponding secondary databases. Combine with Distributed AGs to achieve virtually unlimited scale.

Distributed Availability Groups

Migrate databases with zero downtime. Keep both sides of the migration synchronized without worrying about the complexities of Active Directory or WSFC. Combine AGs deployed in each region into a larger distributed AG. Good for cases involving several replicas across two or more regions.

aws

3 | Optimizing infrastructure performance

Migrating and modernizing with AWS will significantly improve your system performance, which can lead to less downtime, faster service delivery, and greater customer satisfaction. With a robust set of options to modernize your databases and an ever-expanding catalog of compelling, innovative services, AWS delivers what your business needs today and for years to come.

Get better throughput with Amazon EBS

Amazon Elastic Block Store (Amazon EBS) is a single-AZ block storage service with various flexible options catering to diverse requirements. You can provision up to 64,000 IOPS per io1 EBS volume (based on 16 KiB I/O size), along with 1000 MB/s throughput. Amazon EBS volumes are simple, convenient, and effective.

If you need more IOPS and throughput than a single EBS volume provides, you can create multiple volumes and stripe them in your Windows or Linux instance.

Amazon EBS also enables you to create point-in-time and instantaneous EBS snapshots. This feature copies the EBS snapshot to Amazon S3 infrastructure, an AWS service that comes with 99.999999999% durability.

Reduce latency with instance storage

Instance storage helps your SQL Server deliver better results at a lower cost. Storage optimized EC2 instance types use fixed-size local disks, and a variety of different storage technologies are available. Among these, Non-Volatile Memory express (NVMe) is the fastest technology with the highest IOPS and throughput.

To minimize latency, you can deploy AlwaysOn FCIs or AlwaysOn AGs on instances that run inside an EC2 cluster placement group.

Instance disks are ephemeral, living only as long as their associated EC2 instance runs. One suitable use for instance storage may be for the TempDB system database files, because they are recreated each time the SQL Server service is restarted.

Another use for EC2 instance storage is the buffer pool extension. This feature utilizes fast random-access disks (SSD) as a secondary AWS cache between RAM memory and persistent disk storage, thus striking a balance between cost and performance when running workloads on SQL Server.

aws

Optimize file server performance with Storage Spaces Direct

Storage Spaces Direct (S2D) on Amazon EC2 for Windows provides a convenient way to increase durability, availability, performance, and scale of your file servers. S2D allows all or selected disks attached to instances of a Windows Server Failover Cluster (WSFC) to be clustered into a storage pool and made available to all members of the cluster. It removes the complexities of managing different disk technologies and creating a RAID cluster spread across several servers in a network.

Using Amazon EC2 Windows instances with S2D solves problems of both durability and scale. You can deploy a group of Windows EC2 instances, join them to the same Windows AD domain, and create a WSFC. Then you can add all attached NVMe disks to your pool and create an SMB 3.0 share drive on top.

Achieve global availability and reduce latency with read replicas

If you determine many of your database transactions are read-only queries, and that the sheer number of incoming connections is flooding your database, read replicas may offer a solution. You can offload read-only transactions from primary SQL servers to one or more read replica instances. Read replicas may be used to perform backup operations, relieving the primary instance from performance hits during backup windows.

If you mark your connection strings as read-only when using AG listeners, SQL Server routes incoming connections to any available read replicas and only sends read-write transactions to the primary instance.

4 | Optimizing your costs

AWS offers many services available at a fraction of the price of on-premises solutions. Our flexible pricing options help you manage your costs while maintaining maximum performance and capacity. With AWS, you can easily right-size your services, leverage Reserved Instances, and use powerful cost management tools to monitor how much you spend.

Control licensing costs

AWS offers two options that help you better control your licensing costs. Our License Included model provides you with fully compliant Microsoft software licenses bundled with Amazon EC2 or Amazon RDS instances. You pay for them as you go with no upfront costs or long-term investments.

We also understand that you've made considerable investments in your current SQL Server infrastructure and might want to reuse existing licenses when possible on AWS. No problem—you're welcome to Bring Your Own License (BYOL) into the AWS cloud.

For many businesses, some combination of the License Included and BYOL models will likely be appropriate. And that's fine—AWS can easily manage any mixture of the two.

Save on vCPU-based licensing costs with Optimize CPUs

Optimize CPUs is a feature that gives you greater control of your EC2 instances on two fronts. First, you can specify a custom number of vCPUs when launching new instances to save on vCPU-based licensing costs. Second, you can disable Intel Hyper-Threading Technology (Intel HT Technology) for workloads that perform well with single-threaded CPUs, like certain high-performance computing (HPC) applications. This may reduce the number of overall cores your system requires, thus decreasing licensing costs even further.

Expand flexibility by running SQL inside containers

Running SQL Server inside containers provides higher flexibility with less overhead than VM deployments. Unlike VMs, containers do not need a guest OS running on top of a hypervisor and host OS. Instead, all containers share the same OS kernel of the host. That means it's possible to run far more containers on the same server, with almost no extra overhead.

aws

You can assign any number of cores (or fraction of a core) to each container, depending on compute requirements. This powers high-density deployments, which can reduce both infrastructure and licensing costs.

Increasing or decreasing resources always results in downtime. However, containers share resources available on the same host, therefore, they can use more or less resources as needed over time. If an SQL Server instance requires resources that are not available on its current host, it can be moved to a new host in a few seconds. Boot time for SQL Server containers is a matter of seconds, boosting speed and agility.

Reduce cores, reduce licensing costs

When you run SQL Server on a server with multiple cores, you need to license all cores available in the instance, regardless of how many are actually used. However, running SQL Server inside a container with AWS allows you to limit the number of cores accessible to your container, thus only requiring you to retain licenses for the cores that are in use.

Ensure you've got the SQL version that's right for you

After exploring migration and upgrade capabilities with AWS, some businesses find that they don't need all the high-performance functions that come with SQL Enterprise Edition. These organizations can realize significant cost savings by downgrading to SQL Standard Edition. While this will only be an option for businesses that require a lower level of system performance, they may be pleasantly surprised to find that SQL Standard Edition has been inflated with many Enterprise-level features through its latest updates. Businesses utilizing non-production environments can save even further by downgrading to SQL Developer Edition, which has no licensing costs.

5 | Optimizing security

We know security concerns are top-of-mind for businesses considering a cloud migration. Rest assured, moving to AWS will lead to much higher levels of security than if you were to continue relying on your legacy architecture. Security is the first priority at AWS, and there are many AWS security features available to you. These features can be combined with the built-in security features of Microsoft SQL Server to satisfy even the most stringent requirements and expectations.

Encryption at rest made easy with Amazon EBS and KMS

If you are using EBS volumes to store your SQL Server database files, you have the option to enable block-level encryption. Amazon EBS transparently handles encryption and decryption for you. This is available through a simple checkbox, with no further action necessary.

AWS Key Management Service (KMS) is a fully managed service that creates and stores encryption keys. You can use KMS-generated keys or bring your own. In either case, keys never leave KMS and are protected from any unauthorized access.

Expand to file-level encryption with TDE

Transparent Data Encryption (TDE) provides transparent encryption of your data at rest. This feature is available on both Amazon RDS for SQL Server and EC2 deployments. While EBS encrypts at the block-level, TDE encrypts at the file-level, meaning database files can only be decrypted using the corresponding certificate. This prevents your database files from being exposed, even if someone gains access to your EC2 instance.

Stay secure with Always Encrypted

Always Encrypted is a feature that allows separation between data owners and data managers. With Always Encrypted, sensitive data stays encrypted even during query processing. Encryption keys remain with the data owners and are not revealed to the database engine. This feature is available on both Amazon RDS for SQL Server and EC2 deployments.

Secure your databases down to the row-level

Control database access at the row level with Row-Level Security (RLS). This feature reduces your attack surface by filtering out all unauthorized access attempts originating from any layer of your application. RLS could potentially simplify your applications, but only if you design them in a way that differentiates users at the database level—so be sure to consider this at application design time. This feature is available on both Amazon RDS for SQL Server and EC2 deployments.

aws

Protect data in transit with Amazon VPC

Data moves safer with Amazon VPC. Use security groups to restrict access to your EC2 instances and only allow whitelisted endpoints and protocols. And use network access control lists to blacklist known sources of threats.

Keep your data in the right hands with Application Whitelisting

You can leverage Windows Server Group Policies to whitelist your SQL Server software (and possibly other known applications) on your EC2 Windows instances. This ensures that nothing but your whitelisted applications can run on these servers, and it's one of the most effective ways to prevent malware from breaching your instances.

Block unauthorized users with Dynamic Data Masking

Dynamic Data Masking (DDM) protects data from any unwanted requests, masking and obfuscating sensitive data in real-time. DDM is a policy-based security function that conceals data in the result set of a query over designated database fields, while making no physical changes to the original production data.

aws

6 | Conclusion: Why AWS?

AWS has over ten years of experience running Microsoft workloads in the cloud, longer than any other cloud provider. It's the clear choice for your Windows and SQL databases and applications.

AWS provides a modernization platform for both database and operating system. With AWS, you can choose from flexible deployment options based on your objectives and desired business outcomes—such as lower TCO, higher system performance, or better SLA/regulatory compliance.

With over 100 services across multiple categories, AWS is the leader in cloud innovation. According to IDC, AWS controls 60% of the Cloud IaaS for Microsoft Workloads market segment share.* That's because AWS is a proven, reliable solution that can help your business optimize infrastructure at levels no other provider can match.

July 9, 2019 might mark the end of support for Microsoft SQL Server 2008, but it can also signify the dawning of a new era for your business—an era of high-performing, cost-efficient, reliably secure architecture. By entering this bold new era, you'll empower your business and its leaders to worry less about infrastructure, focus more on your core mission, and redirect resources to new business initiatives and innovation.

Only AWS can deliver:

> Optimum security at multiple levels

> Trusted solutions build on long-term experience and leading-edge innovation

> Absolute agility, exceptional elasticity, and superior scalability

> Cost savings, quick ROI, and low TCO

> Maximum uptime across a massive global footprint

> Access to the latest advances through our powerful partner network

Make the transition to AWS
Contact us today →