SQL Server on AWS

Lessons Learned From The Field

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Where can I run my SQL Server workloads on AWS?

Amazon Relational Database Service (Amazon RDS)

Managed service with up to 96 vCPU, 488 -GB RAM, and 16-TB storage

Amazon Elastic Compute Cloud (Amazon EC2)

Self-managed virtual machine with up to 128 vCPU, 4-TB RAM, and 400-TB storage

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Options for Deploying SQL Server on AWS

Amazon RDS for SQL Server

- **Consider RDS first**
- Focus on business value tasks
- High-level tuning
- Schema optimization
- No in-house DB expertise
- Auto Host Replacement
- Multi-AZ Always On Support
- Read Replicas NEW!!
- SQL Component Services:
  - *Integration Services (in preview)*
  - *Analysis Services (in preview)*

Scaling
High Availability
Database Backups
DBMS Patching
DBMS Install/Maintenance
OS Patching
OS Install/Maintenance
Power, HVAC, net

SQL Server on Amazon EC2

- Need full DB control
- BYOL For Licensing
- Replication
- Clustering
- Multi-Region AGs
- Distributed AGs
- RDS Options not available
- SQL Component Services:
  - *Reporting Services*
  - *Data Quality Services*
  - *Master Data Services*

Scaling
High Availability
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OS Install/Maintenance
Power, HVAC, net

AWS managed

Customer managed

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SQL Server Features at a Glance

	Amazon RDS	Amazon EC2
Versions Supported:	2012, 2014, 2016, 2017, 2019	All
Editions Supported:	Express, Web, Standard, Enterprise	All
High Availability:	AWS-managed with Always On Support	Self-managed; Always On, Mirroring…
Encryption:	Encrypted Storage using AWS KMS (all editions); TDE Support	
Authentication:	Windows & SQL Authentication	
Backups:	Managed Automated Backups	Maintenance Plans & 3rd Party Tools
Maintenance:	Automated Software Patching	Self-managed
Licensing Options:	License Included (no free passive use rights)	License Included -or- Bring Your Own License
SQL Component Services:	SSIS *(in preview)*, SSAS *(in preview)*	SSRS, MDS, DQS

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License Optimization with Optimize CPUs

- Control active vCPUs and Hyper-Threading status when launching new EC2 instances
- Reduce the number of SQL Server licenses

Instance Type	Total vCPUs	Active vCPUs with Optimize CPUs	SQL Server license savings
r4.4xlarge	16	8	50%
r4.8xlarge	32	8	75%

*Sample licensing example only

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Microsoft Licensing Strategy

1 License-included for Windows Server and SQL Server

-Use for highly elastic workloads

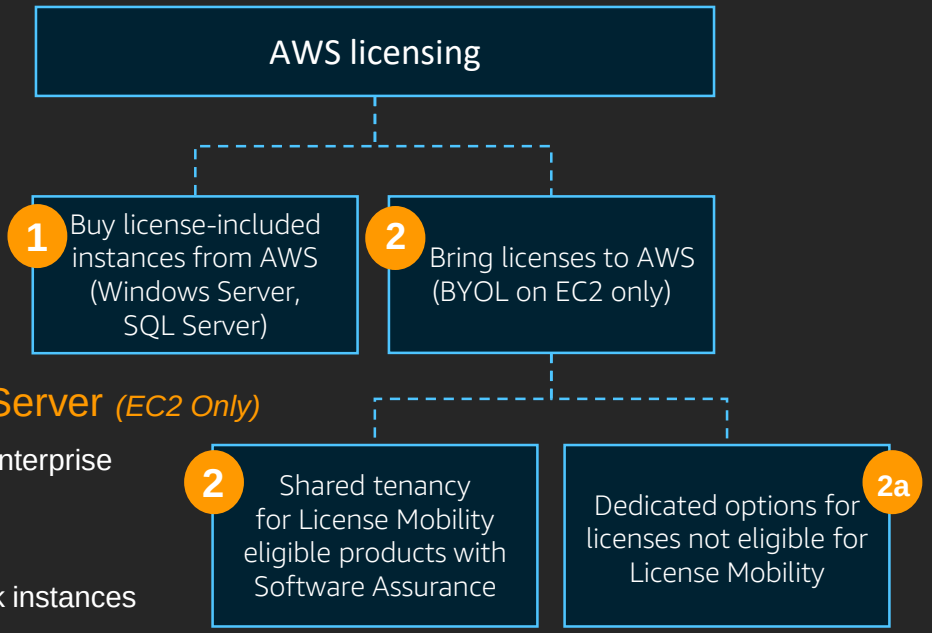
-Great option for auto scaling up and down

-Can be used for SQL on RDS and EC2

2 Shared tenancy with License Mobility *(EC2 Only)*

-Leverage your existing SQL investment in AWS

-BYOL Passive instances do NOT require a SQL license



2a Dedicated Hosts for Windows Server and SQL Server *(EC2 Only)*

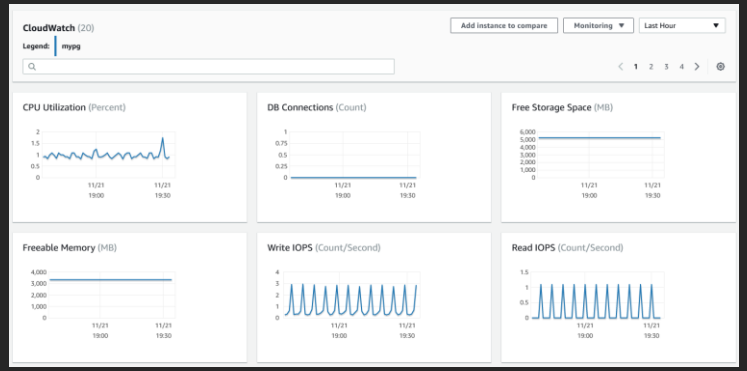
-BYOL for Windows Server Datacenter and SQL Server Enterprise maximize virtualization benefits (*up to WinSrv 2019*)

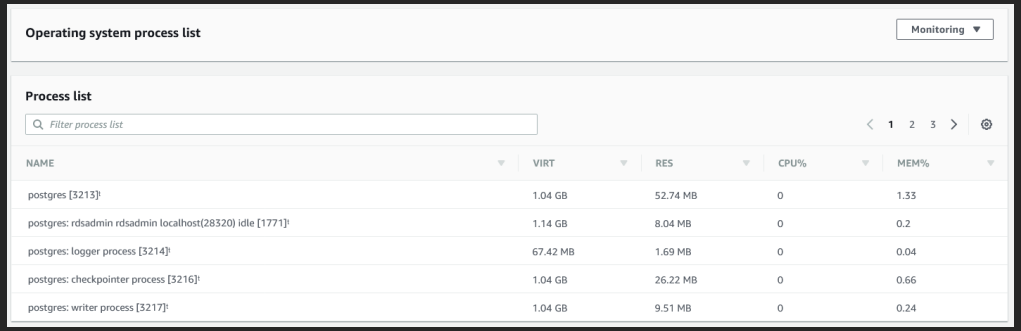
-SQL can still be any version *at this time*

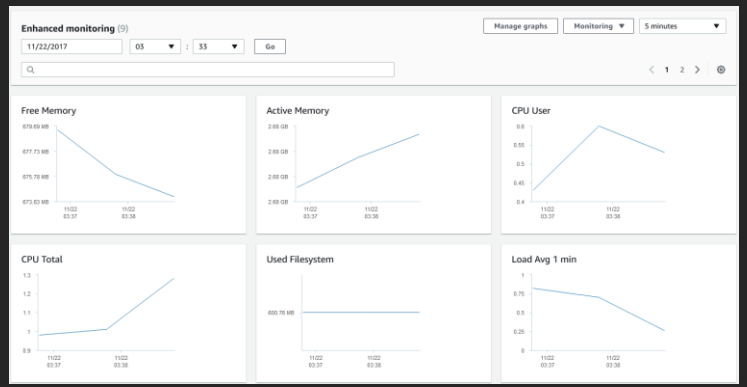
-License just the dedicated host physical cores, then stack instances

Common Questions For RDS SQL Server

How do I *monitor my Amazon RDS database?*







Monitoring Options

Amazon CloudWatch metrics & alarms

Upload DB logs directly to CloudWatch Logs

Enhanced Monitoring for Amazon RDS

- *Access to over 50 CPU, memory, file system, and disk I/O metrics*
- *As low as 1-second intervals*

Integration with third-party monitoring tools

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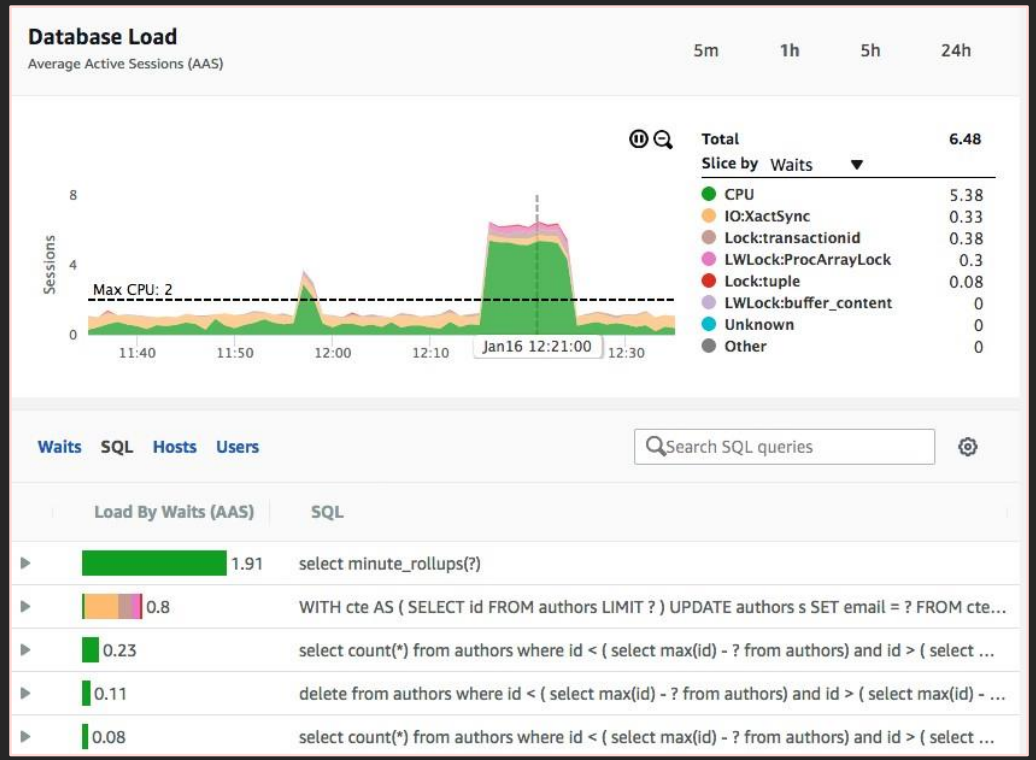
How do I *improve database performance?*

Introducing Amazon RDS Performance Insights



DB load

- *Average active sessions*

Identifies database bottlenecks

- *Easy*
- *Powerful*
- *Top SQL/most intensive queries*

Identifies source of bottlenecks

Enables problem discovery

Adjustable timeframe

- *Hour, day, week, and longer*

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How do I *know when service events happen?*

RDS uses SNS to receive notification when an event occurs

Notifications can be:

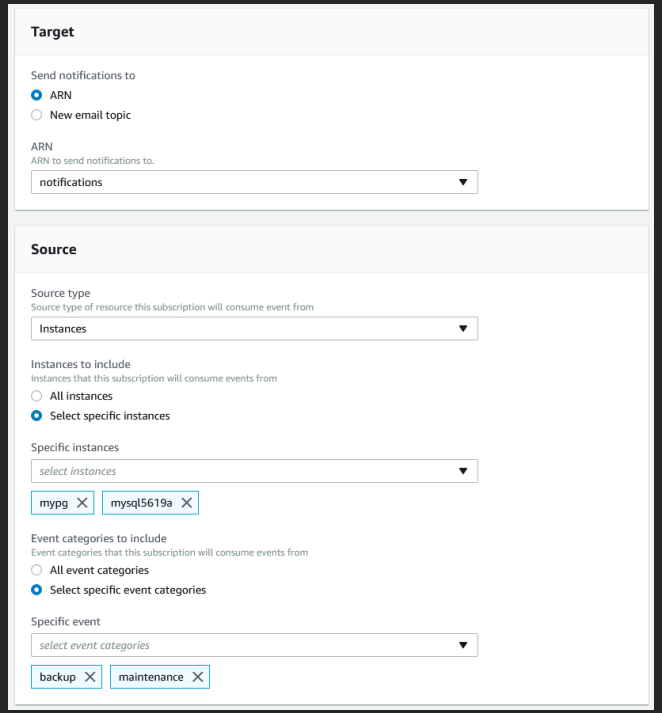
- *Email, text message, or call to an HTTP endpoint*

Six different source types:

- *DB instance, DB parameter group, DB security group, DB snapshot, DB cluster, DB cluster snapshot*

17 different event categories:

- *Availability, backup, deletion, configuration change, etc.*



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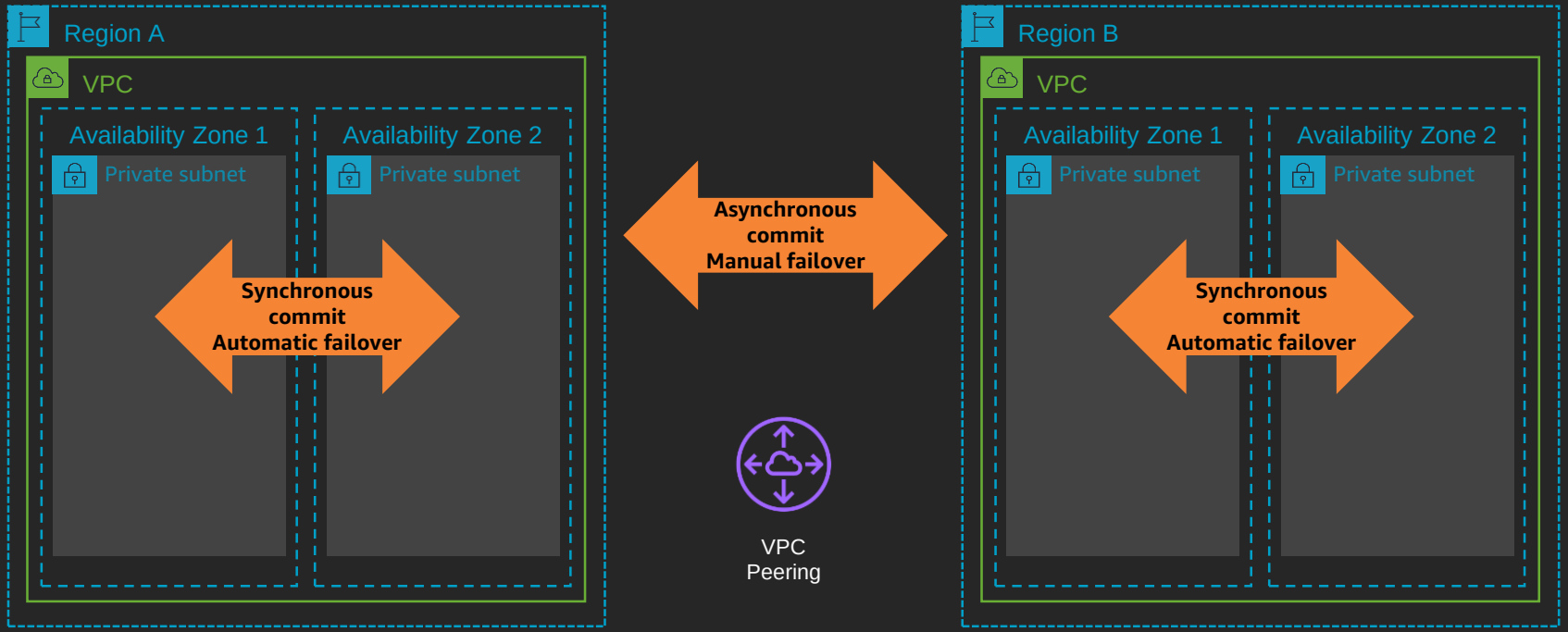
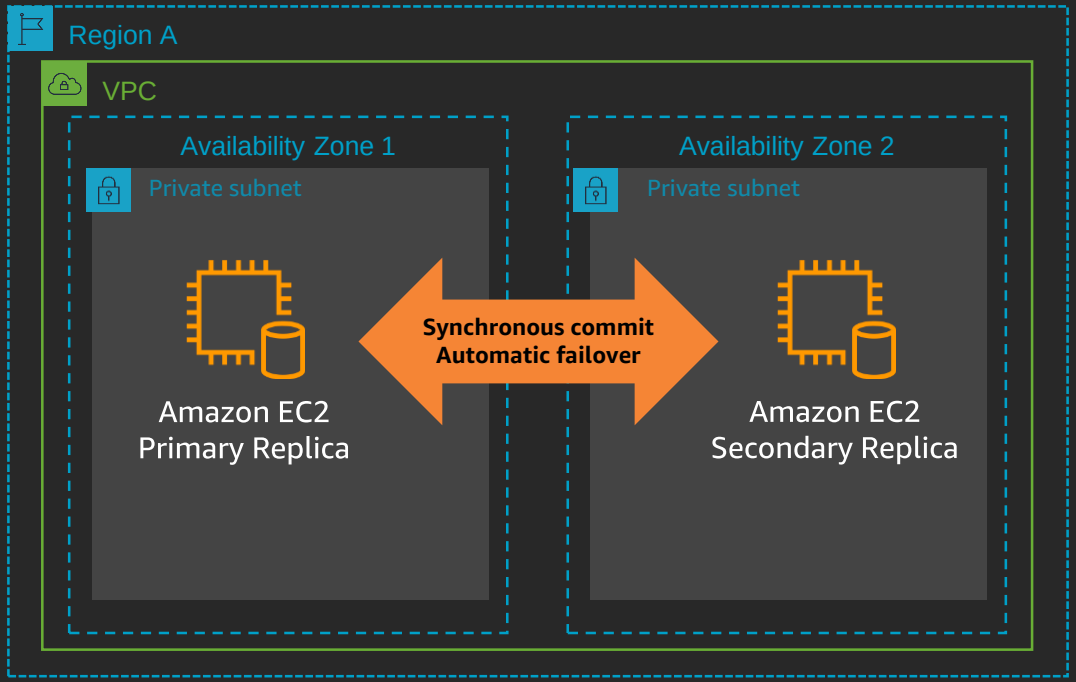
SQL Server HA / DR Designs

High Availability and Disaster Recovery

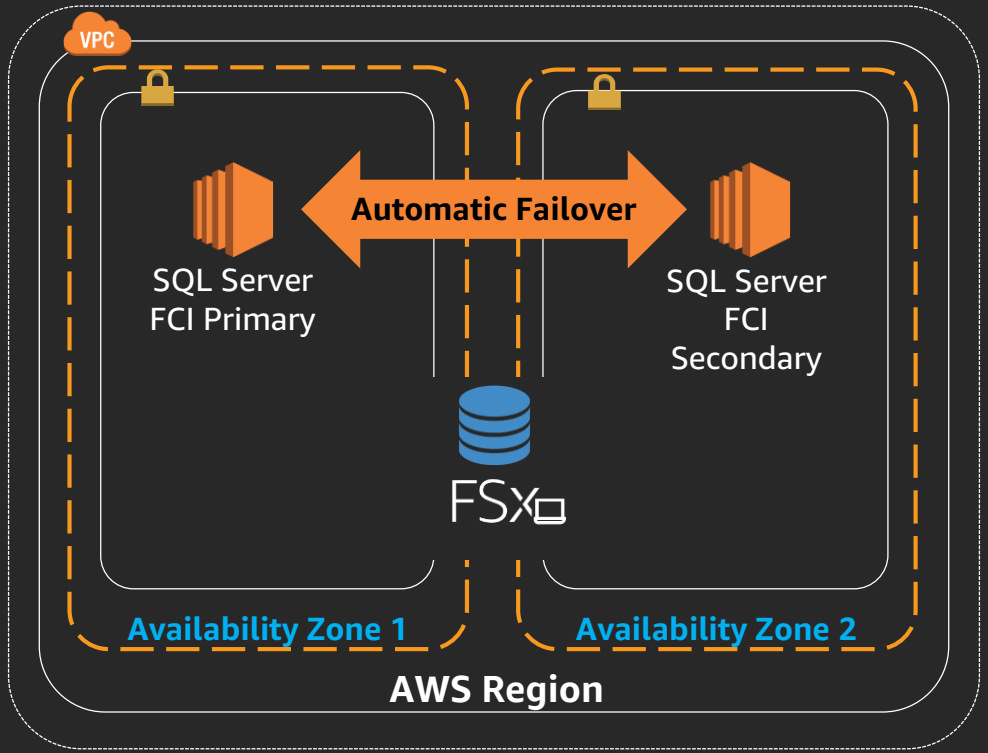


Amazon EC2
Multi-AZ Always On Availability Group



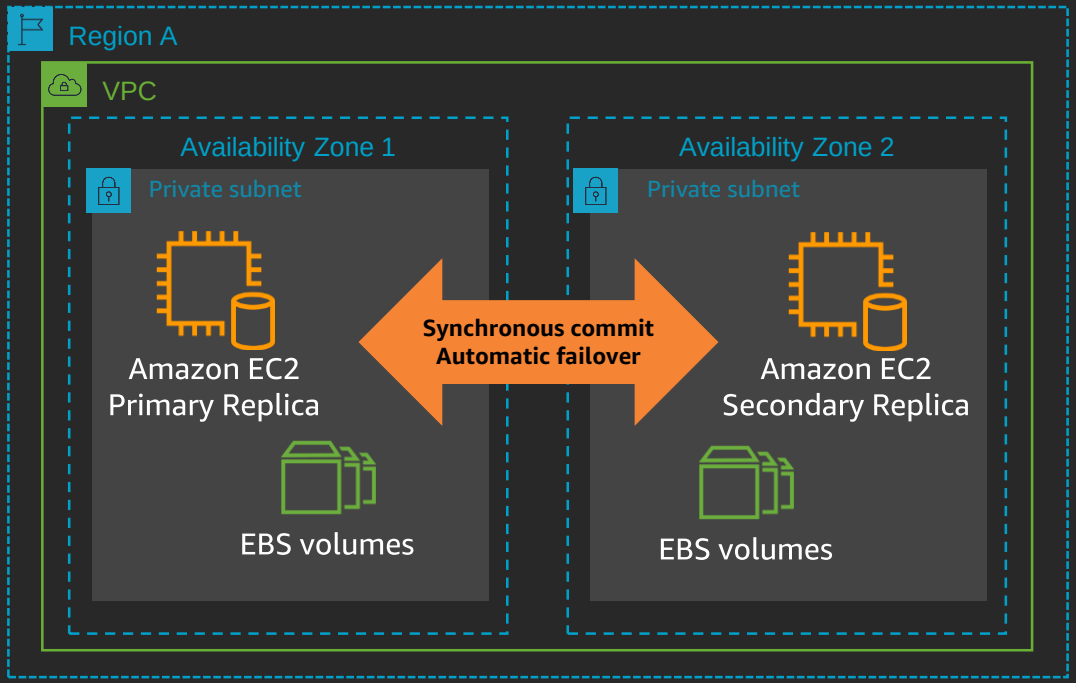
Amazon FSx simplifies SQL Server HA deployments

With Amazon FSx there is no need to deploy, manage, and pay license fees for storage replication software solutions



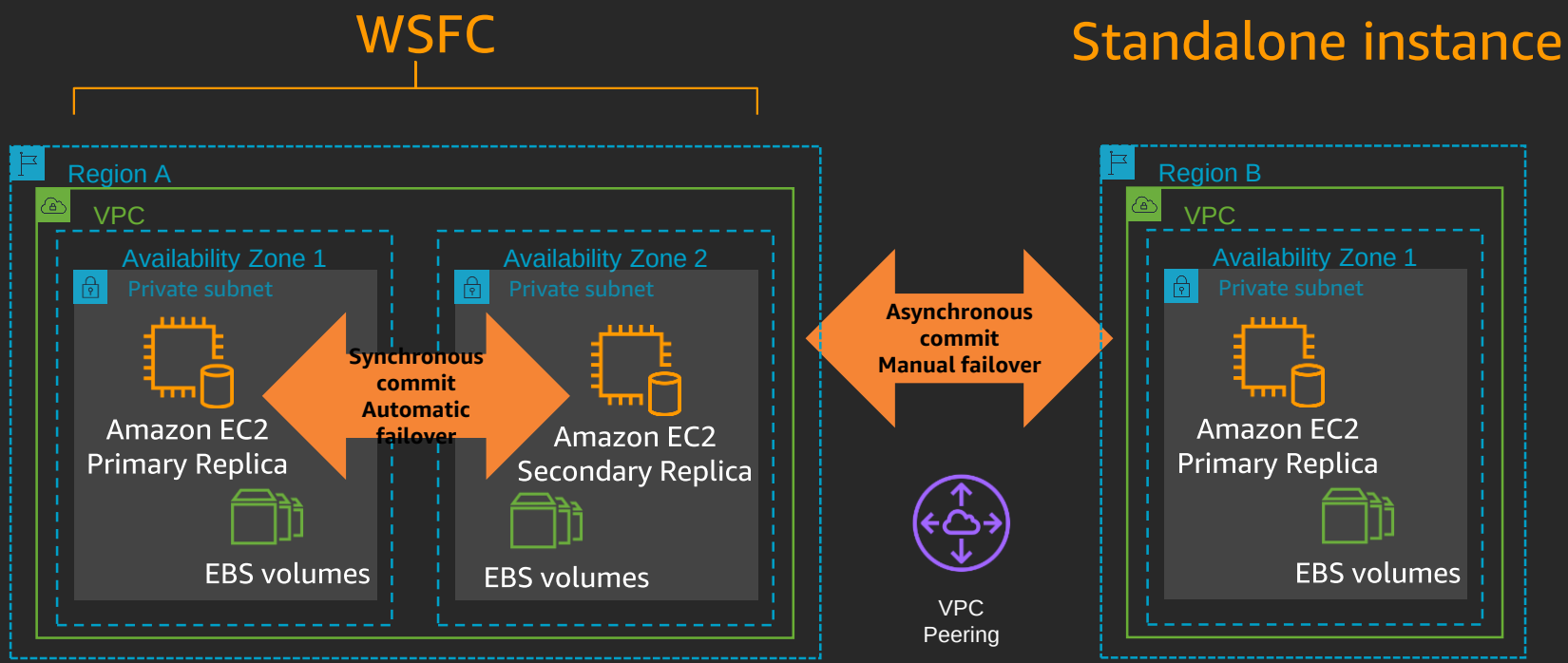
Amazon EC2

Multi-AZ failover cluster instances with SIOS DataKeeper

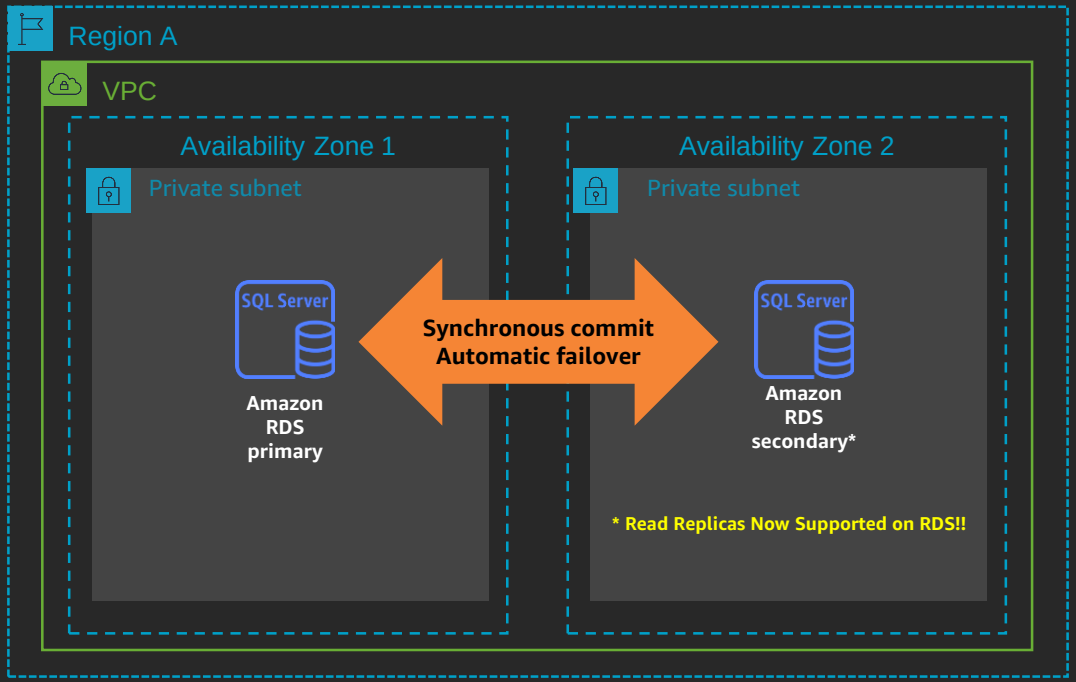


Amazon EC2

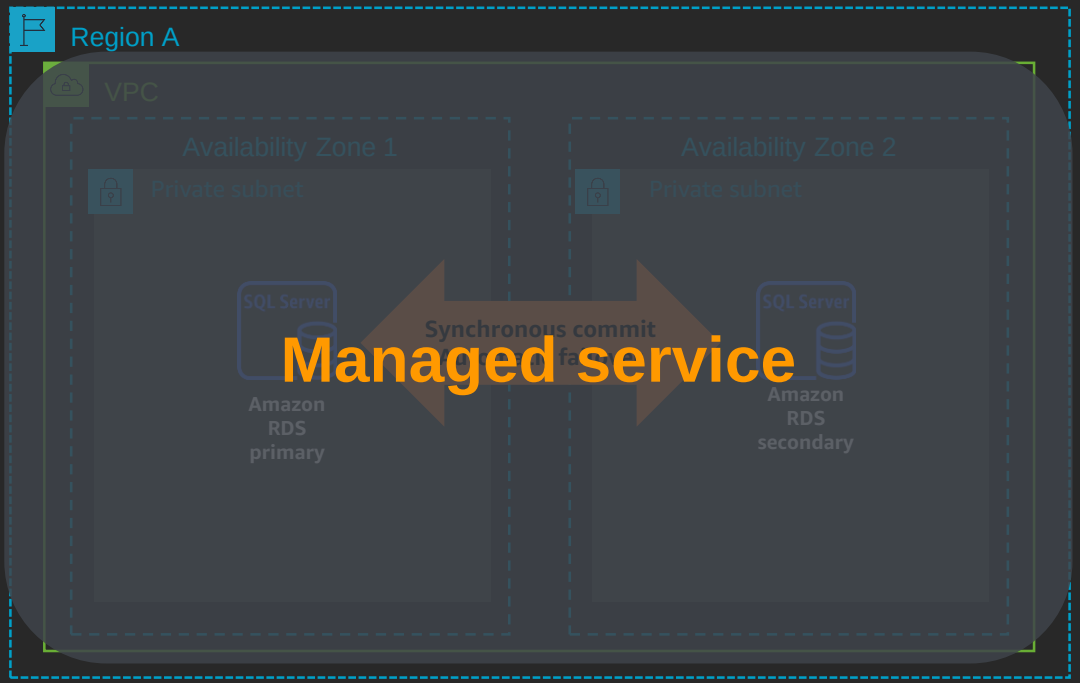
Multi-Region disaster recovery with SIOS DataKeeper



Amazon RDS
Multi-AZ SQL Server



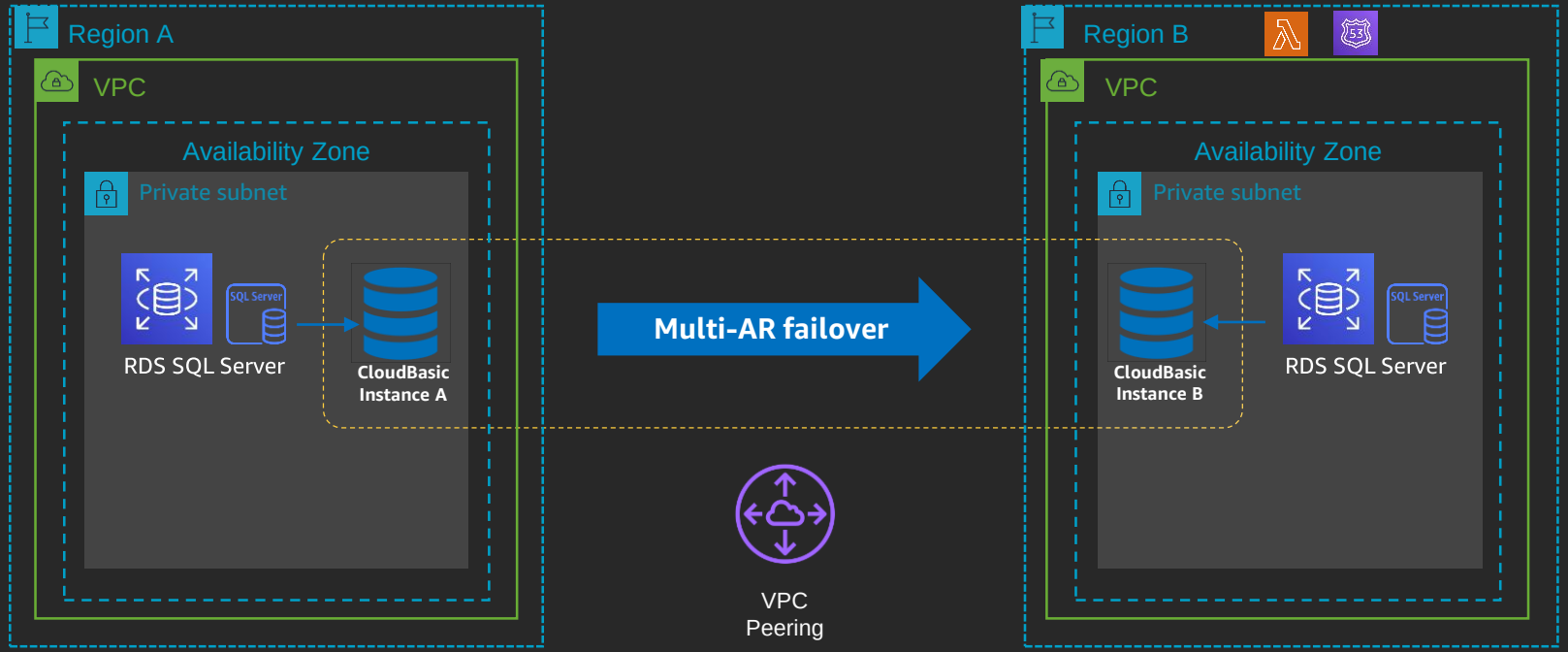
Amazon RDS
Multi-AZ SQL Server



CLOUDBASIC

Amazon RDS

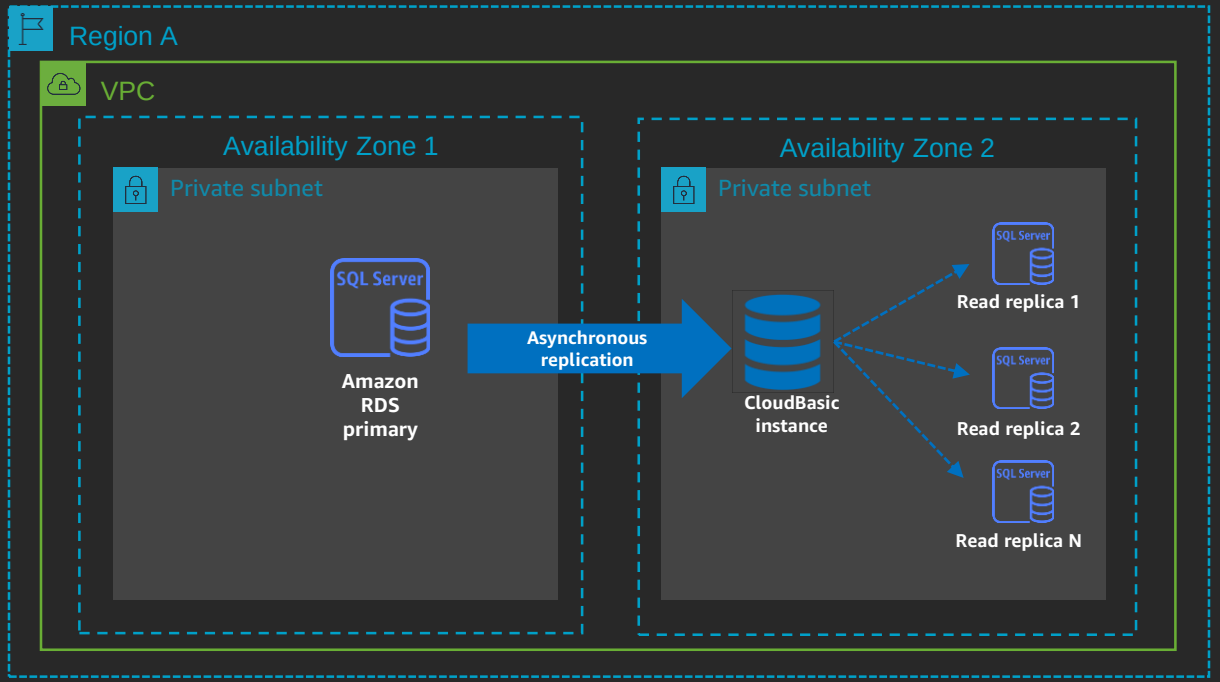
Multi-Region SQL Server Availability with CloudBasic



CLOUDBASIC

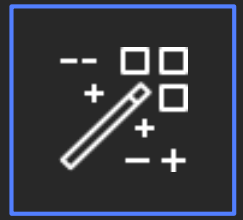
Amazon RDS

Multi-AZ SQL Server Read Replicas with CloudBasic



AWS Launch Wizard for SQL Server

Guided experience to size, configure, and deploy SQL Server Always on solutions on Amazon EC2.



AWS Launch Wizard

Simple

Easy GUI based interface for deployment

End-to-end

Size, deploy and configure your workload

Tailored

Workload is customized to your needs

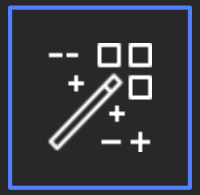
Automated

Deployment is automated through a few easy steps

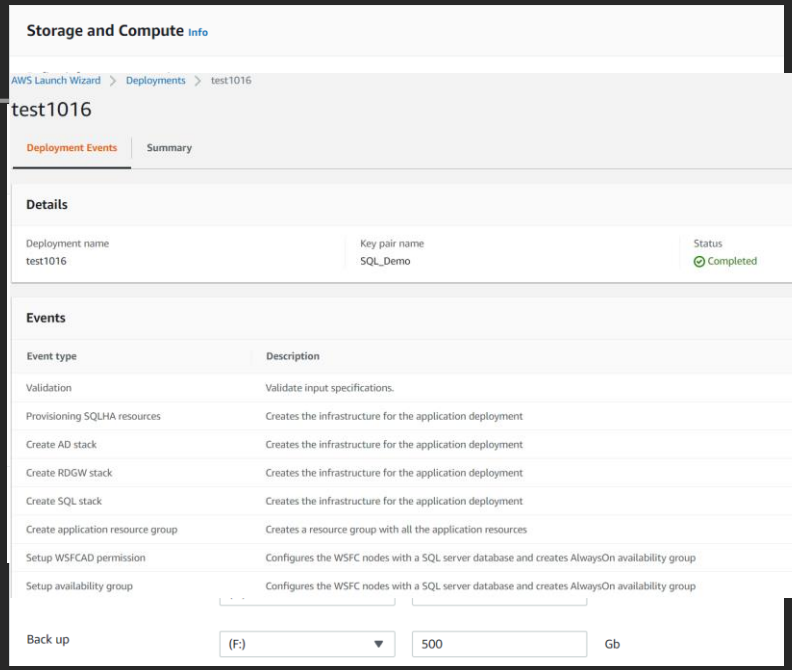
Based on Best Practices

Follows Well-Architected framework

AWS Launch Wizard for SQL Server



AWS Launch Wizard



Manage SQL Server License Usage with AWS License Manager

License Manager enables hybrid IT licensing

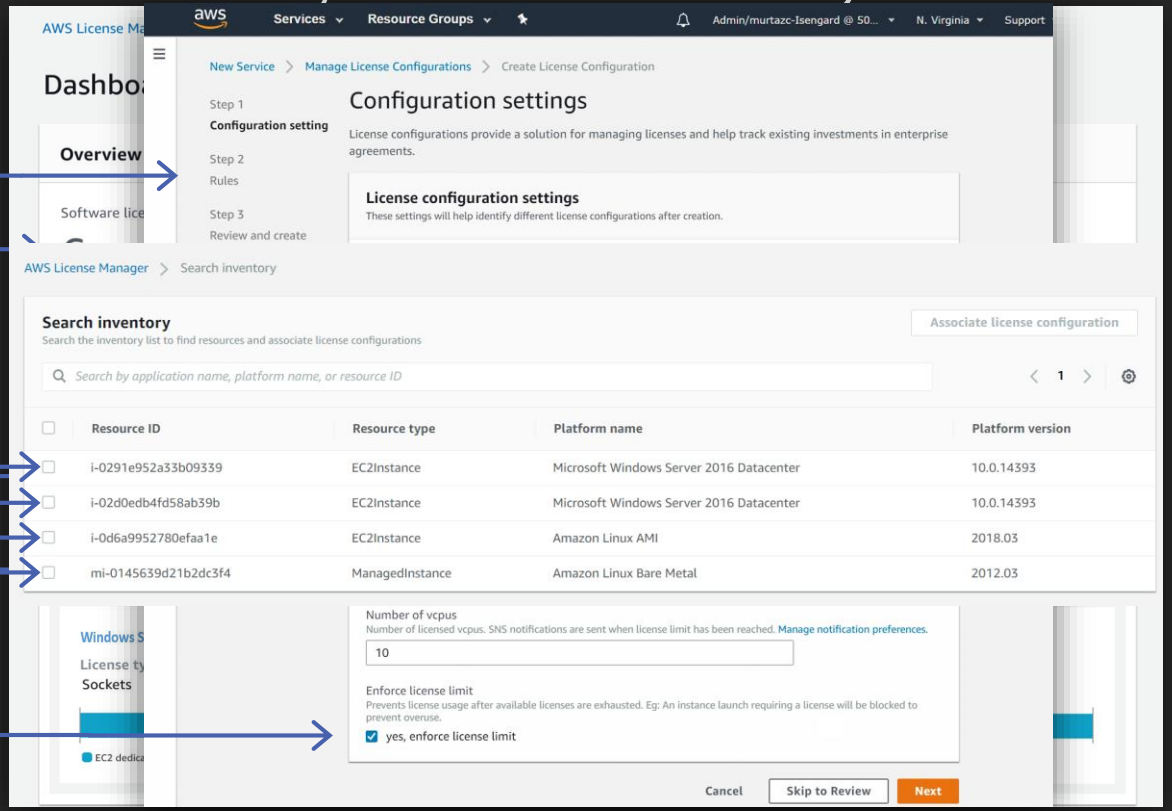
Define rules for your licensed software from Microsoft, Oracle, IBM, SAP, and others

At-a-glance, summary of licenses and usage limits

Windows Server on AWS

Choose a license not limiting IBM DB2 on AWS

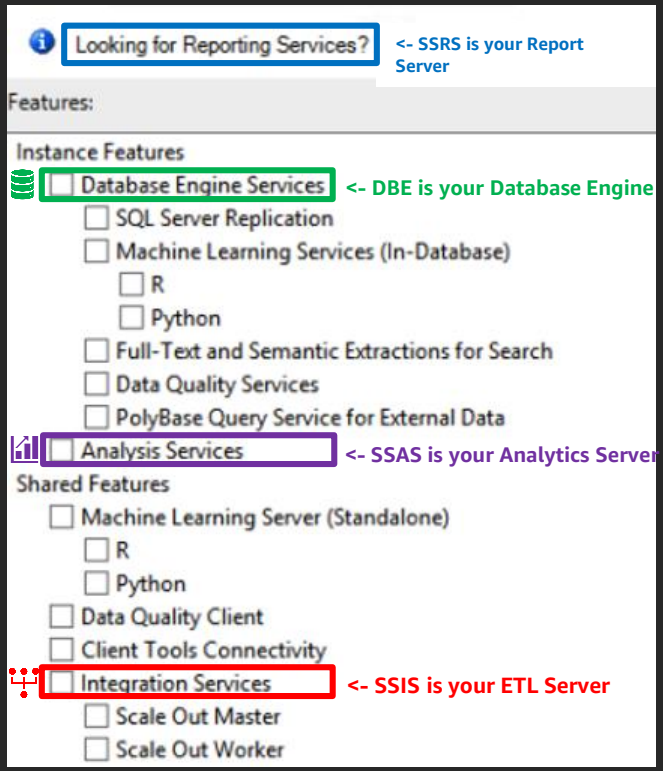
Choose whether to enforce a license limit



The Birth of the SQL Monolith

It's All Free If The DB Is Licensed Already, Right?

Just Check Mark Everything By Default When Installing SQL? NO!!



- **Yes, installing ALL of these "SQL Components" on the same server doesn't require additional licenses if it's already big enough and licensed by the DB server, however:**
  - **Individually**, you can usually use **Standard Edition** for each SQL component if they were on separate servers. Collectively, you'll almost always require **Enterprise Edition** when you Total up the Cores, RAM, or capabilities of all the Components
  - **Each** of these components have unique **CPU**, **RAM**, **IO** and **Growth** patterns, but the entire box requires scaling when just one component needs more resources which happens very often and becomes extremely expensive
  - **ETL (SSIS)** , **Report Servers (SSRS),** and **Analysis Servers (SSAS)** could be moved to *separate servers / virtual machines* or even cloud based *managed services* that offer metered based pricing. **SSIS** is typically only run a few hours a day to prep the reporting, so it's unnecessary to pay for SQL licensing as if it's needed 24/7

The reality is, there are no free lunches. You can install and run the **add'l component** software for free on a big enough box that's licensed for the DB engine, but what if you had another option to run managed services for everything except what's in green, which is just what's storing data, and only had to license that many cores. How small of a server would you need to accomplish that?

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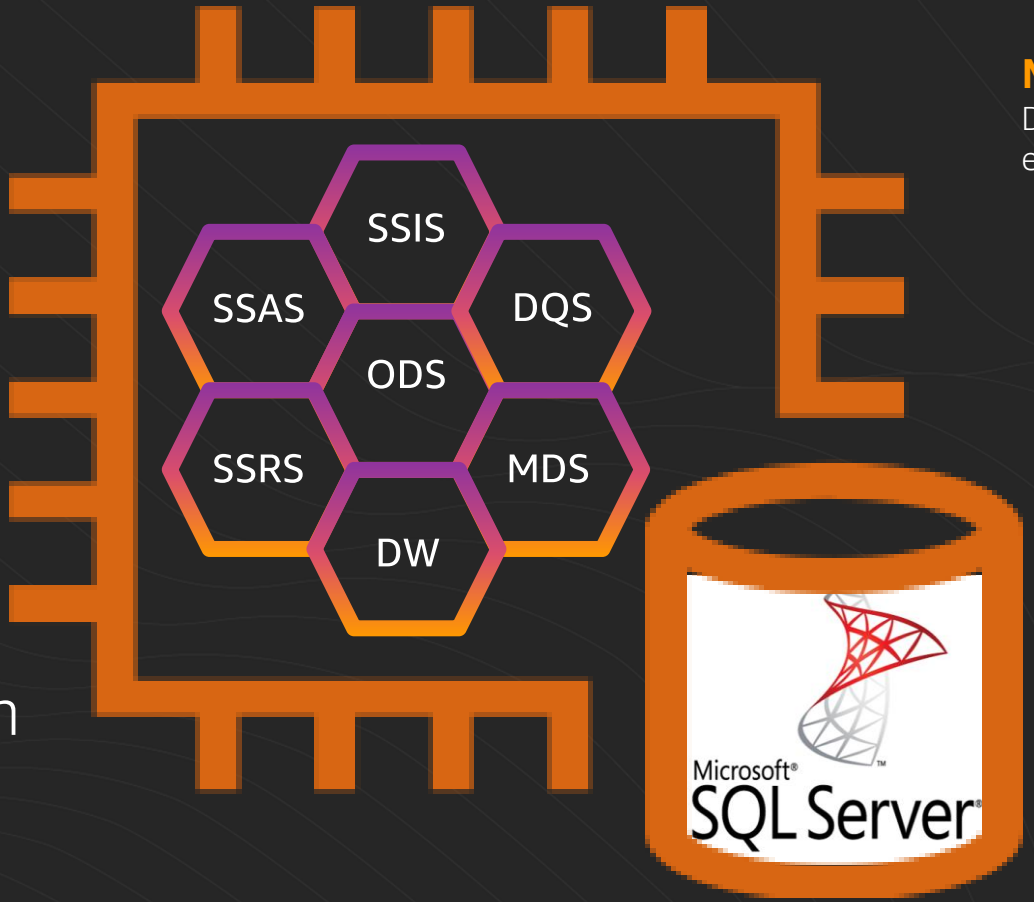
What Is A SQL Server Monolith



MONOLITH
Does
everything

From a Monolith
Instance…

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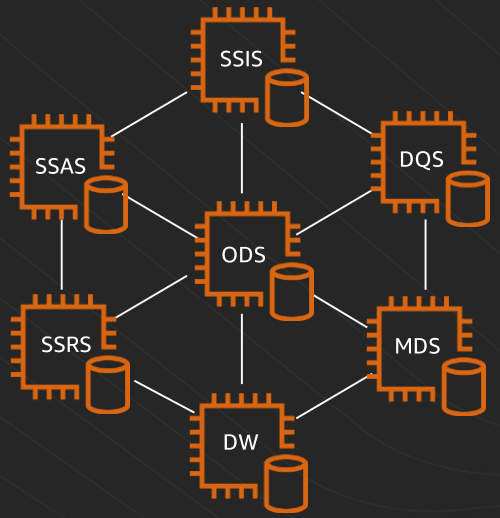
SQL Server Workload Type Separation Has Significant Benefits

To Workload-based Instances



Workload-based Instances

Each instance sized to its workload's needs

- Mix between SQL Standard and Enterprise editions based on the components features being used
- Individual workloads will likely have different HA/DR SLAs, eliminating oversizing
- Each workload can scale independently, eliminating a lot of unnecessary compute and licensing cost
- Scale Compute, Memory, Networking, and Storage independently from other workloads
- Create the opportunity to use Spot Instances, where applicable, to save up to 90% on the instance cost

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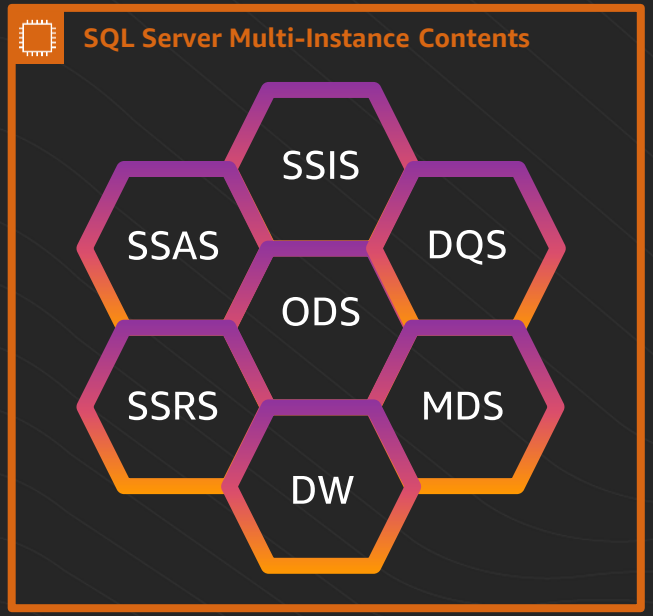
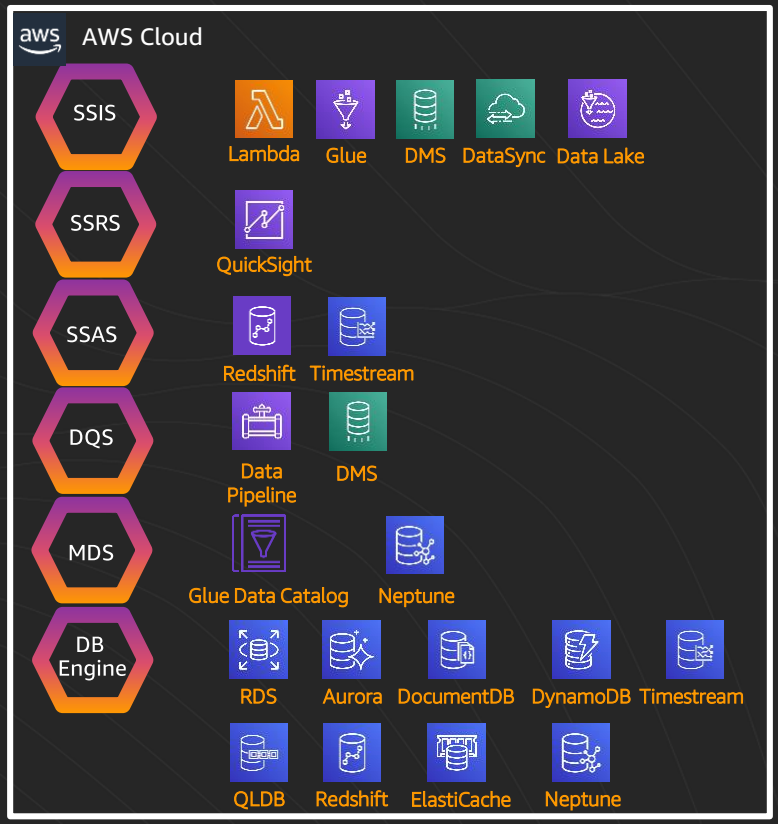
Leverage AWS Managed Services Wherever Possible

AWS Managed Services are already Highly Available, simplifying architecture/design and can significantly reduce overall cloud spend

SQL Monolith



Options For Breaking Apart a Monolith



AWS Has The Broadest Selection of Purpose-Built Databases

Relational

Referential integrity, ACID transactions, schema-on-write

Common use cases: Lift and shift, ERP, CRM, Finance

AWS service(s): **Amazon EC2 SQL Server, Amazon RDS SQL Server, Amazon RDS, Amazon Aurora**

Key-value

High throughput, low-latency reads and writes, endless scale

Common use cases: Real-time bidding, shopping cart, social, catalog

AWS service(s): **Amazon DynamoDB**

Document

Store documents and quickly access querying on any attribute

Common use cases: Content management, personalization, mobile

AWS service(s): **Amazon DocumentDB**

In-memory

Query by key with microsecond latency

Common use cases: Leaderboards, real-time analytics, caching

AWS service(s): **Amazon ElastiCache**

Graph

Quickly and easily create and navigate relationships between data

Common use cases: Fraud detection, social networking, recommendation engine

AWS service(s): **Amazon Neptune**

Time-series

Collect, store, and process data sequenced by time

Common use cases: IoT applications, event tracking

AWS service(s): **Amazon Timestream**

Ledger

Complete, immutable, and verifiable history of all changes to application data

Common use cases: Systems of record, supply chain, healthcare, financial

AWS service(s): **Amazon QLDB**

Here to help you build

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