



GPS Data/AI Strategy FY23

Delivered by CSA Team



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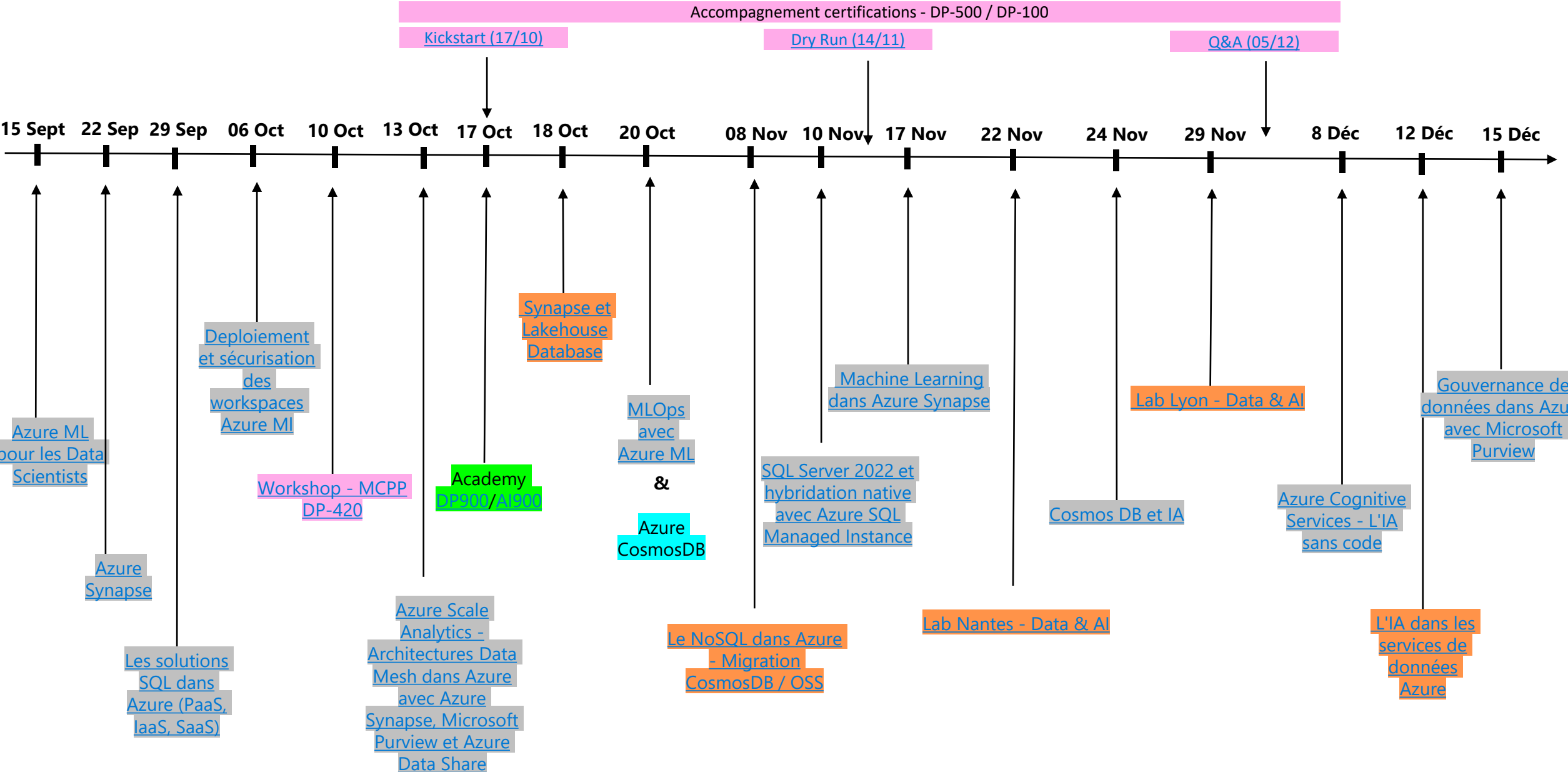


Azure Data & AI technical intensity plan

- From June 2022 to June 2023
- Focus on "Azure Data & AI" tech intensity
- Many content, from **L100** Beginner to **L400** Expert level:
 - Academy L100
 - Webinar L200/L300
 - Workshop L300/L400
 - Certification kickstart L300/L400
 - Openhack / Microhack L400
- aka.ms/gpsdataevents & aka.ms/gpsdatamaterials

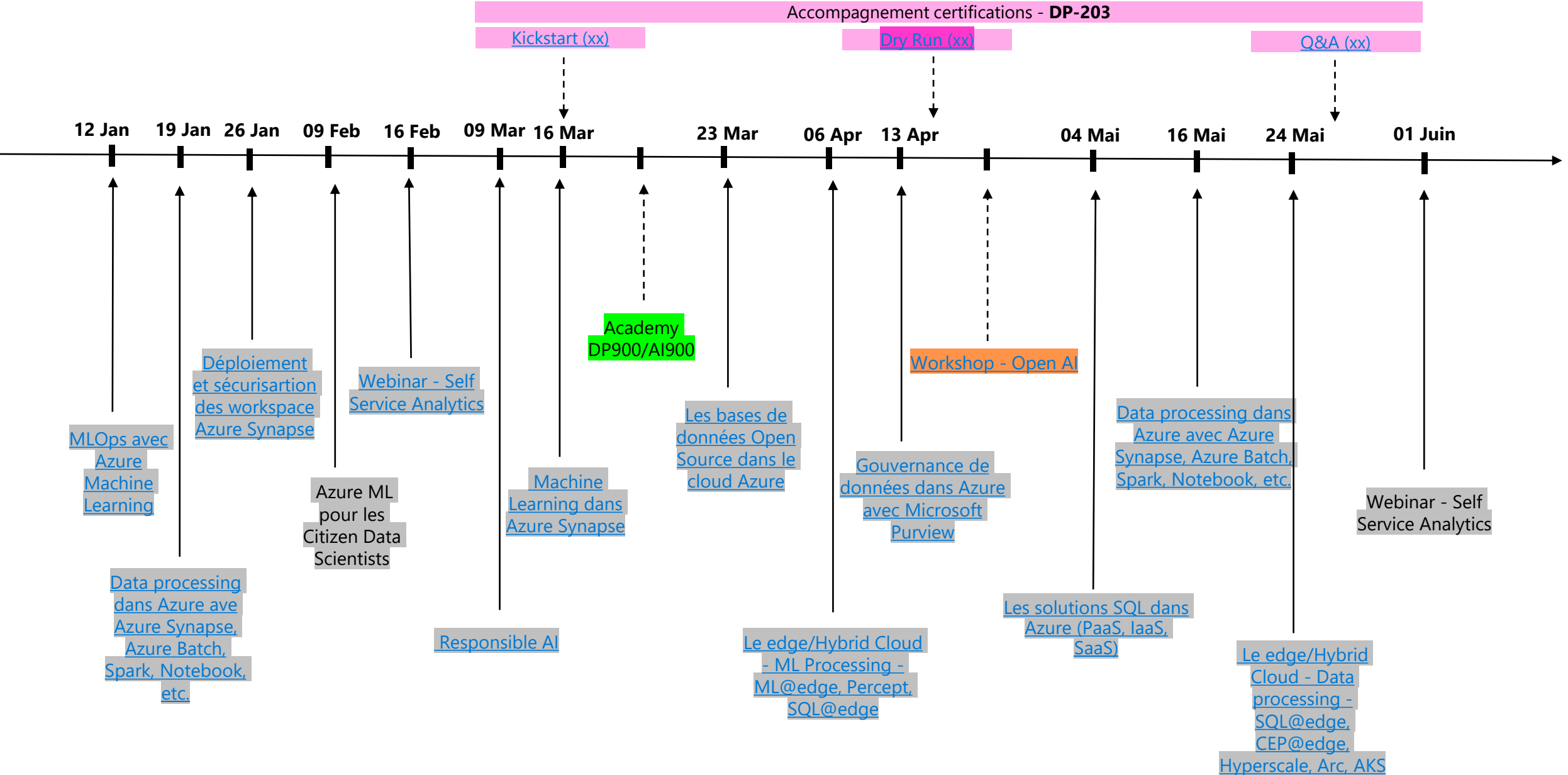
Data & AI events timeline – H1

Webinar/Academy- L 200/300
Workshop/Openhack/ Certifications – L 300/400



Data & AI events timeline – H2

Webinar/Academy - L 200/300
Workshop/Openhack/Certifications – L 300/400



Liste des évènements de type Webinar 2H

Event Webinar (Les jeudis de la Data & AI) - L200/300	Date	Duration (min)	Link
Azure Machine Learning pour les Data Scientists	15/09/2022	120	https://msevents.microsoft.com/event?id=2454281594
Azure Synapse	22/09/2022	120	https://msevents.microsoft.com/event?id=857781749
Les solutions SQL dans Azure (PaaS, IaaS, SaaS)	29/09/2022	120	https://msevents.microsoft.com/event?id=502366997
Déploiement et sécurisation des workspaces Azure Machine Learning	06/10/2022	120	https://msevents.microsoft.com/event?id=1505714138
Azure Scale Analytics - Architectures Data Mesh dans Azure avec Azure Synapse, Microsoft Purview et Azure Data Share	13/10/2022	120	https://msevents.microsoft.com/event?id=139685175
MLOps avec Azure Machine Learning	20/10/2022	120	https://msevents.microsoft.com/event?id=1245885767
SQL Server 2022 et hybridation native avec Azure SQL Managed Instance	10/11/2022	120	https://msevents.microsoft.com/event?id=145826476
Machine Learning dans Azure Synapse Analytics	17/11/2022	120	https://msevents.microsoft.com/event?id=3637723312
Azure Cosmos DB et IA	24/11/2022	120	https://msevents.microsoft.com/event?id=2646013445
Azure et les Services Cognitifs	08/12/2022	120	https://msevents.microsoft.com/event?id=3772037220
La gouvernance de données dans Azure avec Microsoft Purview	15/12/2022	120	https://msevents.microsoft.com/event?id=1499560981
MLOps avec Azure Machine Learning	12/01/2023	120	https://msevents.microsoft.com/event?id=4115194515
Data processing dans Azure avec Azure Synapse, Azure Batch, Spark, Notebook, etc.	19/01/2023	120	https://msevents.microsoft.com/event?id=1537241181
Déploiement et sécurisation des workspaces Azure Synapse	26/01/2023	120	https://msevents.microsoft.com/event?id=1806467748
Azure Machine Learning pour les Citizen Data Scientists	09/02/2023	120	En cours
PowerBI - Self Service Analytics	16/02/2023	120	https://msevents.microsoft.com/event?id=1401519679
L'IA responsable avec Azure Machine Learning	09/03/2023	120	https://msevents.microsoft.com/event?id=2072953112
Machine Learning dans Azure Synapse Analytics	16/03/2023	120	https://msevents.microsoft.com/event?id=3413014857
Les bases de données Open Source dans le cloud Azure	23/03/2023	120	https://msevents.microsoft.com/event?id=2727487131
Hybridation des services de Machine Learning Azure	06/04/2023	120	https://msevents.microsoft.com/event?id=1624914222
La gouvernance de données dans Azure avec Microsoft Purview	13/04/2023	120	https://msevents.microsoft.com/event?id=3909342839
Les solutions SQL dans Azure (PaaS, IaaS, SaaS)	04/05/2023	120	https://msevents.microsoft.com/event?id=1162207895
Data processing dans Azure avec Azure Synapse, Azure Batch, Spark, Notebook, etc.	16/05/2023	120	https://msevents.microsoft.com/event?id=3517068442
Hybridation des services de données Azure	24/05/2023	120	https://msevents.microsoft.com/event?id=2996507398
Self Service Analytics	01/06/2023	120	En cours

Liste des évènements de type Workshop/Prepa Cert/Academy

Event Workshop L300/400	Date	Duration (min)	Link
Synapse et Lakehouse Database	18/10/2022	120	https://forms.office.com/Pages/ResponsePage.aspx?id=v4j5cvGGr0GRqy180BHbR3zwJTO3s11AuaqpNnBbrwdURE1RMVgwTDNISTE1TDFYSDVLR0cyS1kwWS4u
Le NoSQL dans Azure - Migration CosmosDB / OSS	08/11/2022	120	https://forms.office.com/Pages/ResponsePage.aspx?id=v4j5cvGGr0GRqy180BHbR3zwJTO3s11AuaqpNnBbrwdURE1RMVgwTDNISTE1TDFYSDVLR0cyS1kwWS4u
Lab Lyon - Data & AI	22/11/2022	240	https://forms.office.com/Pages/ResponsePage.aspx?id=v4j5cvGGr0GRqy180BHbR3zwJTO3s11AuaqpNnBbrwdUMIZZOURET0RSWjcyTERYRkJGTIFFUjJaUi4u
Lab Nantes - Data & AI	29/11/2022	240	https://forms.office.com/Pages/ResponsePage.aspx?id=v4j5cvGGr0GRqy180BHbR3zwJTO3s11AuaqpNnBbrwdUMIZZOURET0RSWjcyTERYRkJGTIFFUjJaUi4u
L'IA dans les services de données Azure	12/12/2022	120	https://forms.office.com/Pages/ResponsePage.aspx?id=v4j5cvGGr0GRqy180BHbR3zwJTO3s11AuaqpNnBbrwdURE1RMVgwTDNISTE1TDFYSDVLR0cyS1kwWS4u
Open AI	H2	120	https://forms.office.com/Pages/ResponsePage.aspx?id=v4j5cvGGr0GRqy180BHbR3zwJTO3s11AuaqpNnBbrwdURE1RMVgwTDNISTE1TDFYSDVLR0cyS1kwWS4u

Event Academy, kickstart certifications, workshop certifications	Date	Duration (min)	Link
MCP - DP-420	10/10/2022	420	https://forms.office.com/Pages/ResponsePage.aspx?id=v4j5cvGGr0GRqy180BHbR3zwJTO3s11AuaqpNnBbrwdUMkIJSIRKSU1RRFA0OVgzSfDSTY0RE9WQy4u
Micro Hack CosmosDB	20/10/2022	420	H1 - Inscriptions PTA
Academy DP900	17-21/10/2022	300	https://msevents.microsoft.com/event?id=3250818161
Academy AI900	17-21/10/2022	300	https://msevents.microsoft.com/event?id=2717528090
Kickstart DP-500	17/10/2022	60	https://forms.office.com/Pages/ResponsePage.aspx?id=v4j5cvGGr0GRqy180BHbR3zwJTO3s11AuaqpNnBbrwdUNEK3WFQ1TEdNNTQ2Uk85V0cxQzM3TE9ZRS4u
Dry Run DP-500	14/11/2022	120	https://forms.office.com/Pages/ResponsePage.aspx?id=v4j5cvGGr0GRqy180BHbR3zwJTO3s11AuaqpNnBbrwdUNEK3WFQ1TEdNNTQ2Uk85V0cxQzM3TE9ZRS4u
Q&A DP-500	05/12/2022	90	https://forms.office.com/Pages/ResponsePage.aspx?id=v4j5cvGGr0GRqy180BHbR3zwJTO3s11AuaqpNnBbrwdUNEK3WFQ1TEdNNTQ2Uk85V0cxQzM3TE9ZRS4u
Kickstart DP-100	17/10/2022	60	https://forms.office.com/Pages/ResponsePage.aspx?id=v4j5cvGGr0GRqy180BHbR3zwJTO3s11AuaqpNnBbrwdUNDAXV0hSN0FHM1YzUzI3OUNMUfYxSkRIMi4u
Dry Run DP-100	14/11/2022	120	https://forms.office.com/Pages/ResponsePage.aspx?id=v4j5cvGGr0GRqy180BHbR3zwJTO3s11AuaqpNnBbrwdUNDAXV0hSN0FHM1YzUzI3OUNMUfYxSkRIMi4u
Q&A DP-100	05/12/2022	90	https://forms.office.com/Pages/ResponsePage.aspx?id=v4j5cvGGr0GRqy180BHbR3zwJTO3s11AuaqpNnBbrwdUNDAXV0hSN0FHM1YzUzI3OUNMUfYxSkRIMi4u
Kickstart DP-203	17/10/2022	60	https://forms.office.com/Pages/ResponsePage.aspx?id=v4j5cvGGr0GRqy180BHbR3zwJTO3s11AuaqpNnBbrwdUOVFWOUVCNFcyQk5SVjFBUfCzNktCUFpLMI4u
Dry Run DP-203	14/11/2022	120	https://forms.office.com/Pages/ResponsePage.aspx?id=v4j5cvGGr0GRqy180BHbR3zwJTO3s11AuaqpNnBbrwdUOVFWOUVCNFcyQk5SVjFBUfCzNktCUFpLMI4u
Q&A DP-203	05/12/2022	90	https://forms.office.com/Pages/ResponsePage.aspx?id=v4j5cvGGr0GRqy180BHbR3zwJTO3s11AuaqpNnBbrwdUOVFWOUVCNFcyQk5SVjFBUfCzNktCUFpLMI4u



The SQL Server 2022 Workshop

Microsoft Azure Data

#azuresql

#sqlserver2022



Goals for this workshop

- ✓ Learn in an interactive style **what** is new in SQL Server 2022
- ✓ Evaluate **why** you should upgrade to SQL Server 2022
- ✓ Learn **how** specific key features work in SQL Server 2022
- ✓ Gain **hands-on** experience trying out new features
- ✓ Walk away with **resources** you can use to learn more

The SQL Server 2022 workshop



[Module 1](#)

Introduction to SQL Server 2022



[Module 2](#)

Connect SQL Server 2022 to Azure



[Module 3](#)

Accelerate performance with built-in query intelligence



[Module 4](#)

Power your database with security, scalability, and availability



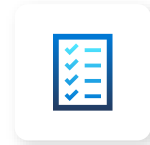
[Module 5](#)

Access new sources with data virtualization and object storage



[Module 6](#)

Enhance your application with new T-SQL capabilities



[Module 7](#)

Summary and closing

aka.ms/sql2022workshop

aka.ms/sqlworkshops

aka.ms/sqlserver2022demos



Module 1

Introduction to SQL Server 2022

Overview of SQL Server 2022

Getting started with SQL Server 2022

Knowledge checks and summary

Introducing SQL Server 2022



The next step for SQL Server



SQL Server 2016

Query Store

Polybase

Always encrypted

Row level security

It just runs faster

Std Edition surface area



SQL Server 2017

SQL Server on Linux

Containers

Adaptive query processing

Automatic Tuning

Graph database

Machine learning services



SQL Server 2019

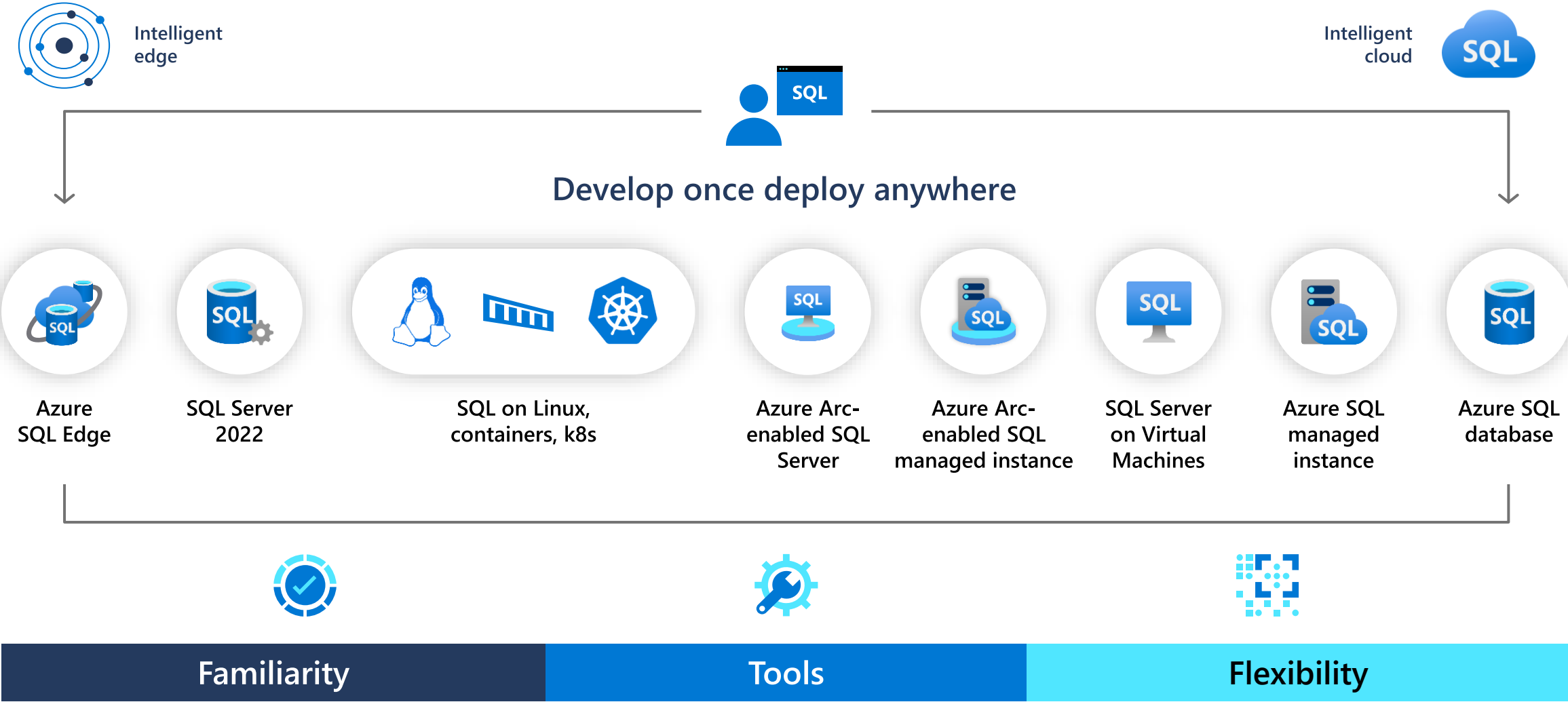
Data virtualization

Intelligent query processing

Accelerated database
recovery

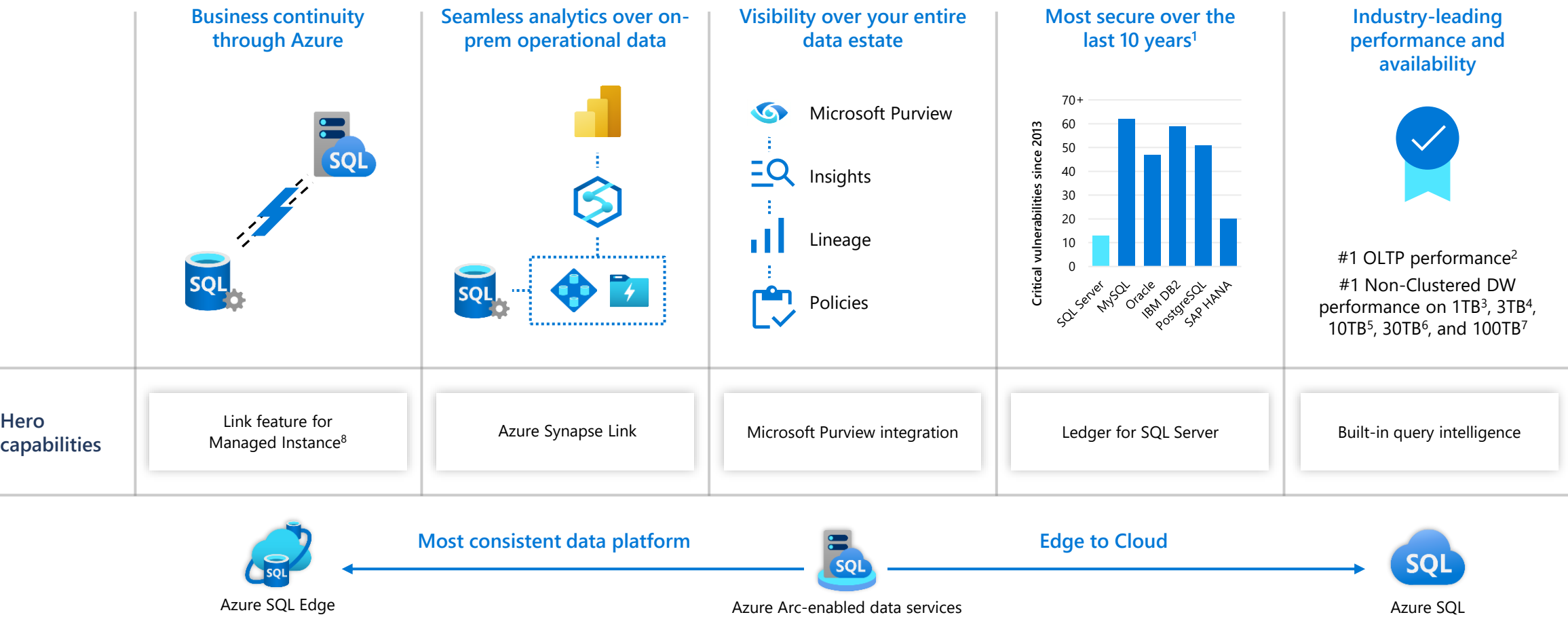
Data classification

SQL from edge to cloud



SQL Server 2022

Azure-enabled with continued performance and security innovation

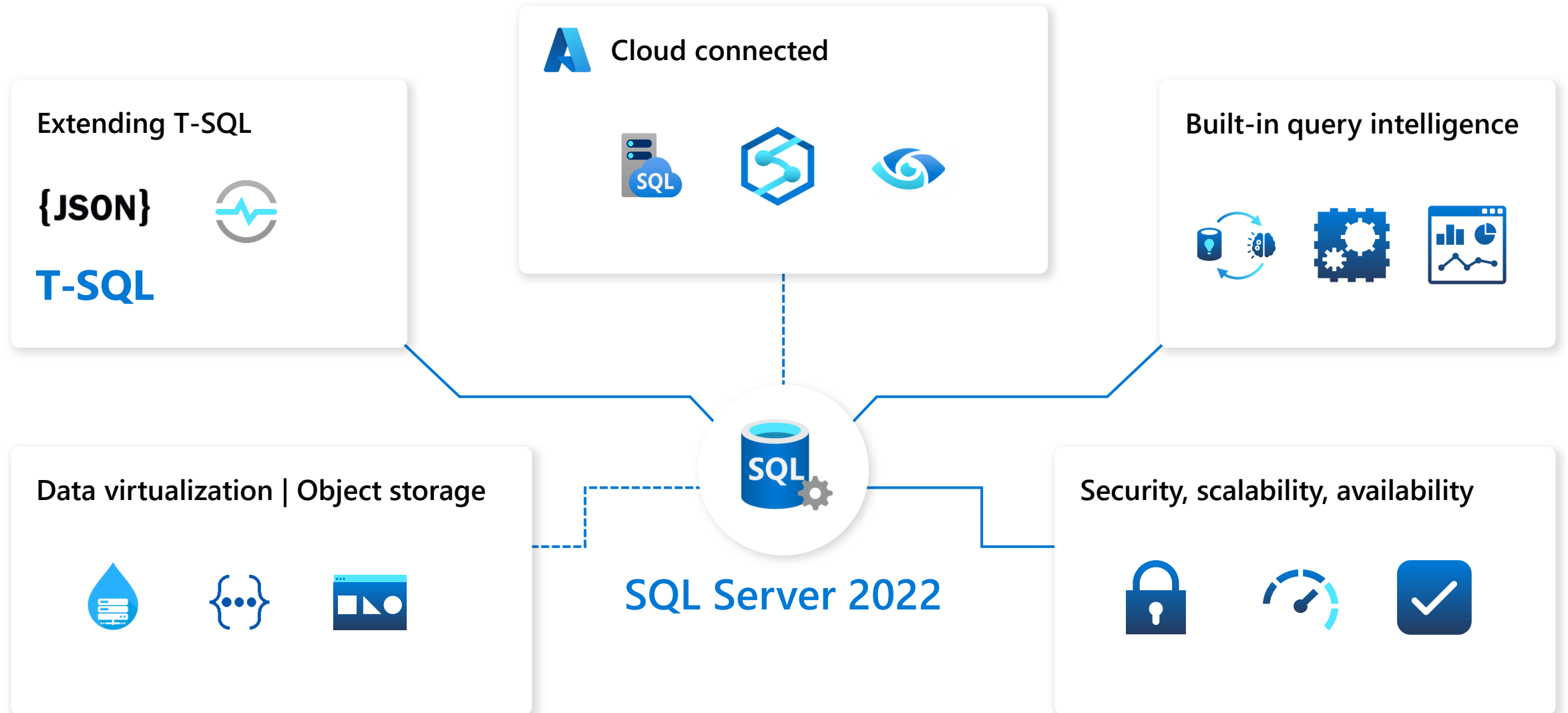


All TPC Claims as of 04/06/2022.

¹National Institute of Standards and Technology Comprehensive Vulnerability Database ²<http://www.tpc.org/4087>; ³<http://www.tpc.org/3374>; ⁴<http://www.tpc.org/3380>; ⁵<https://tpc.org/3383>; ⁶<http://www.tpc.org/3364>; ⁷<https://tpc.org/3382>;

⁸Public preview for the bidirectional disaster recovery capability of Link feature for Azure SQL Managed Instance will occur at a future date. The general availability of the bidirectional disaster recovery capability of Link feature for Azure SQL Managed Instance will occur after the general availability of SQL Server 2022.

SQL Server 2022 capabilities



Deploying SQL Server 2022



SQL Server
Instance

Supported OS

Same upgrade options
as in previous releases

dbcompat 160

older dbcompat
supported

Side by side



Windows GUI or
command line



RHEL, Ubuntu,
SLES package managers



Pre-installed container images



Azure marketplace images
for Virtual Machines

What's different about SQL Server 2022 setup?

Removed

R, Python, and Java packages

Polybase Hadoop connectivity with Java

Polybase scale out groups

Machine learning server

Distributed replay

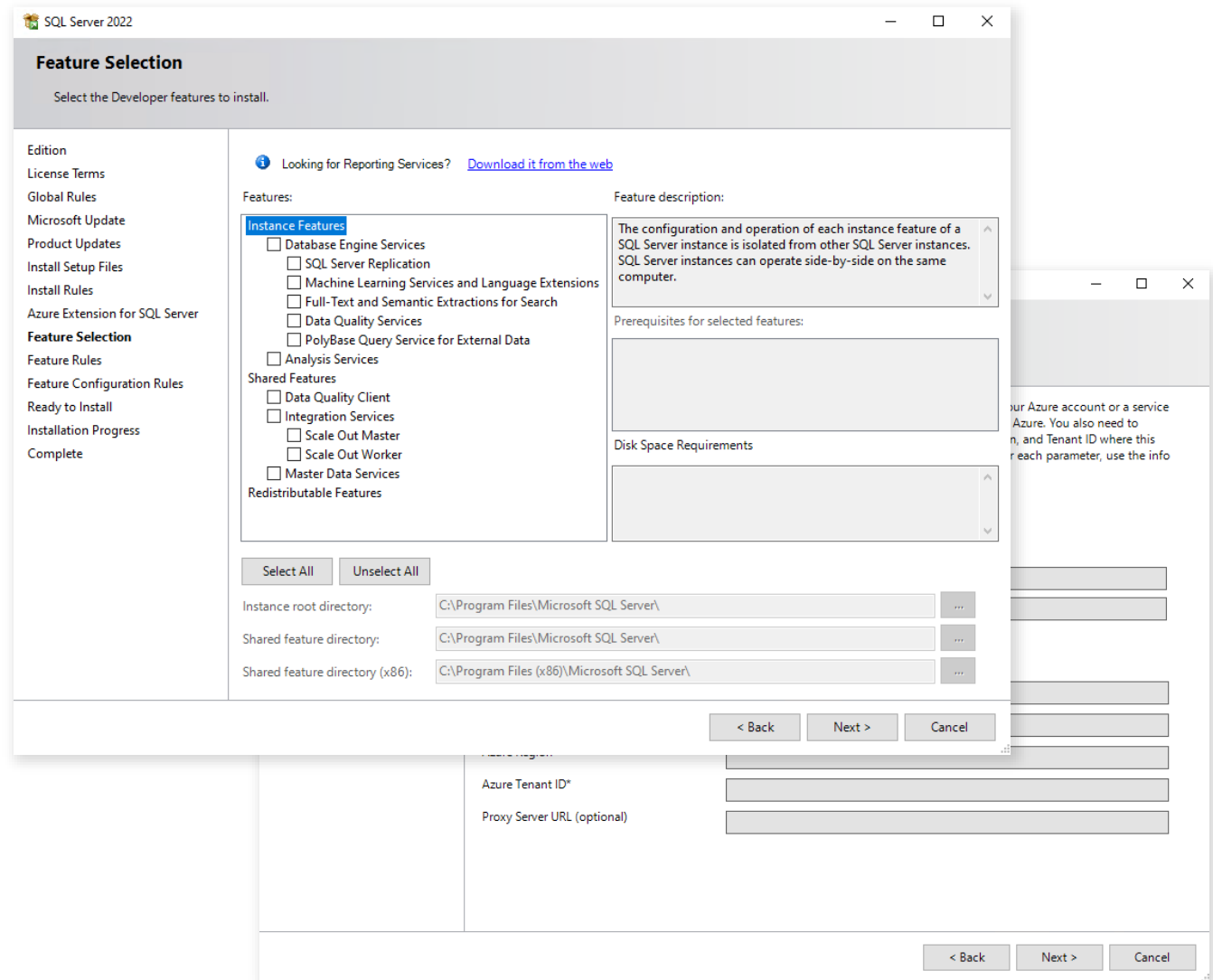
Deprecated features

Stretch database

Added

Azure extension for SQL Server

* Bring your own runtime packages



Azure extension for SQL Server

Registers Azure Arc-enabled SQL Server

Capabilities for SQL Server 2022

AAD authentication

Microsoft Purview access policies

Microsoft Defender (supported by Monitoring Agent extension)

Azure Portal

Extension under the Azure Arc Agent framework

“Mimics” IaaS extension for Azure VM

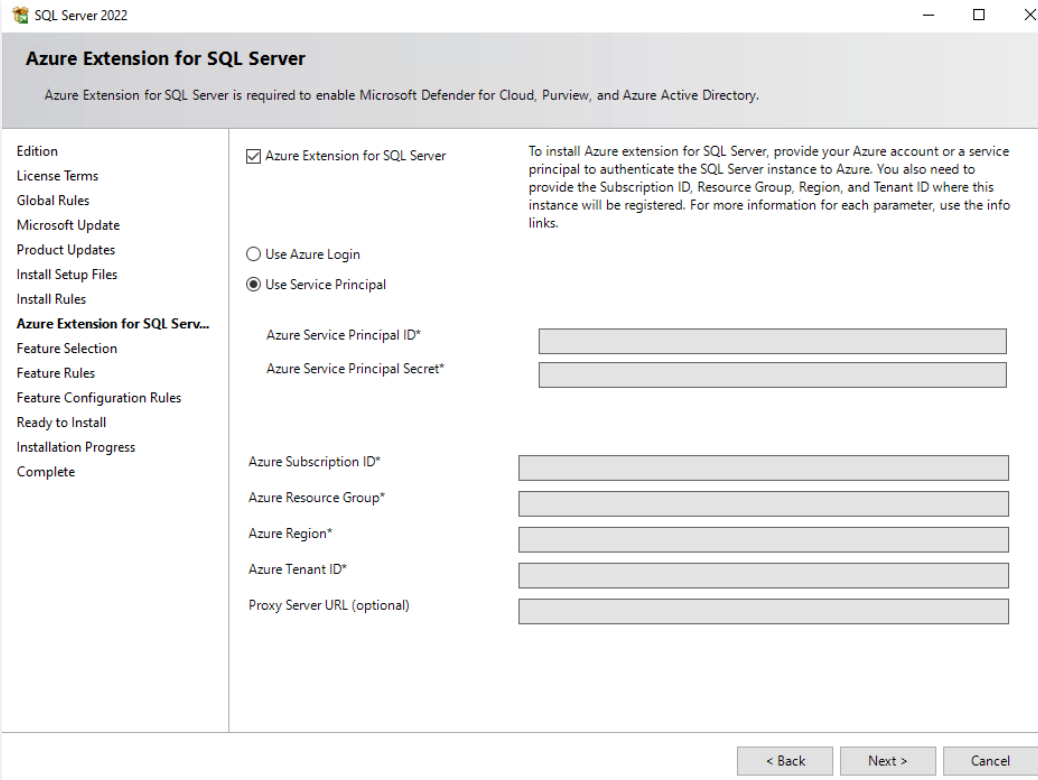
Uses REST API to communicate with Azure

Supports proxy

Service on Windows and daemon process on Linux

Configure during SQL Server 2022 setup or after with scripts

SQL Server Config Manager to stop or start extension service



The screenshot shows the 'SQL Server 2022' setup window, specifically the 'Azure Extension for SQL Server' configuration screen. The window title is 'SQL Server 2022'. The main heading is 'Azure Extension for SQL Server'. Below the heading, a note states: 'Azure Extension for SQL Server is required to enable Microsoft Defender for Cloud, Purview, and Azure Active Directory.' On the left, a list of installation steps is shown, with 'Azure Extension for SQL Serv...' highlighted. The main area contains a checkbox 'Azure Extension for SQL Server' which is checked. Below it are two radio buttons: 'Use Azure Login' and 'Use Service Principal', with 'Use Service Principal' selected. To the right of these options, a text box explains: 'To install Azure extension for SQL Server, provide your Azure account or a service principal to authenticate the SQL Server instance to Azure. You also need to provide the Subscription ID, Resource Group, Region, and Tenant ID where this instance will be registered. For more information for each parameter, use the info links.' Below this text are several input fields: 'Azure Service Principal ID*', 'Azure Service Principal Secret*', 'Azure Subscription ID*', 'Azure Resource Group*', 'Azure Region*', 'Azure Tenant ID*', and 'Proxy Server URL (optional)'. At the bottom right, there are three buttons: '< Back', 'Next >', and 'Cancel'.

SQL Server 2022 on Linux, Containers, Kubernetes

Linux distributions supported

RHEL 8.0 – 8.5

Ubuntu 20.04

SLES 15*

New DTC transaction management support under WMI

Features not supported that are new to SQL Server 2022

TLS 1.3

Intel QAT backup compression

Microsoft Purview policies

New MCR container images for SQL Server 2022 (2022-latest)

<https://aka.ms/sqllinux>

<https://aka.ms/sqlcontainers>

<https://aka.ms/sqlk8s>

SQL Server 2022 on Azure Virtual Machine

Marketplace images

Windows and Linux

Dev, Web, Std, and EE Editions

Uses the IaaS Agent Extension

T-SQL snapshot backups supported with Azure disk snapshots

Several VM sizes support AVX vector including AVX512

Portal experience always being updated

SQL Server 2022 features

AAD authentication (public preview)

Microsoft Purview policies*

<https://aka.ms/sqlazurevm>

* Planned



Knowledge check

Which of these is one of the major categories for SQL Server 2022 features?

- A.** Cloud connected
- B.** Azure Arc
- C.** Polybase
- D.** Built-in query intelligence
- E.** A and D

The Azure extension for SQL Server provides which of these capabilities?

- A.** Synapse Link
- B.** Managed disaster recovery
- C.** AAD authentication
- D.** Data virtualization
- E.** Azure virtual machine

Summary

SQL Server 2022 is **Azure-enabled** for disaster recovery, analytics, and security

Built-in query intelligence reduces query tuning and gains you performance with **no code changes**

SQL Server 2022 has new innovations in **security, scalability, and availability**

Data virtualization and object storage through standard SQL interfaces

Extending the T-SQL language for new developer scenarios



Module 2

Connect SQL Server 2022 to Azure

SQL Server 2022 Hybrid

Managed disaster recovery with Azure SQL Managed Instance*

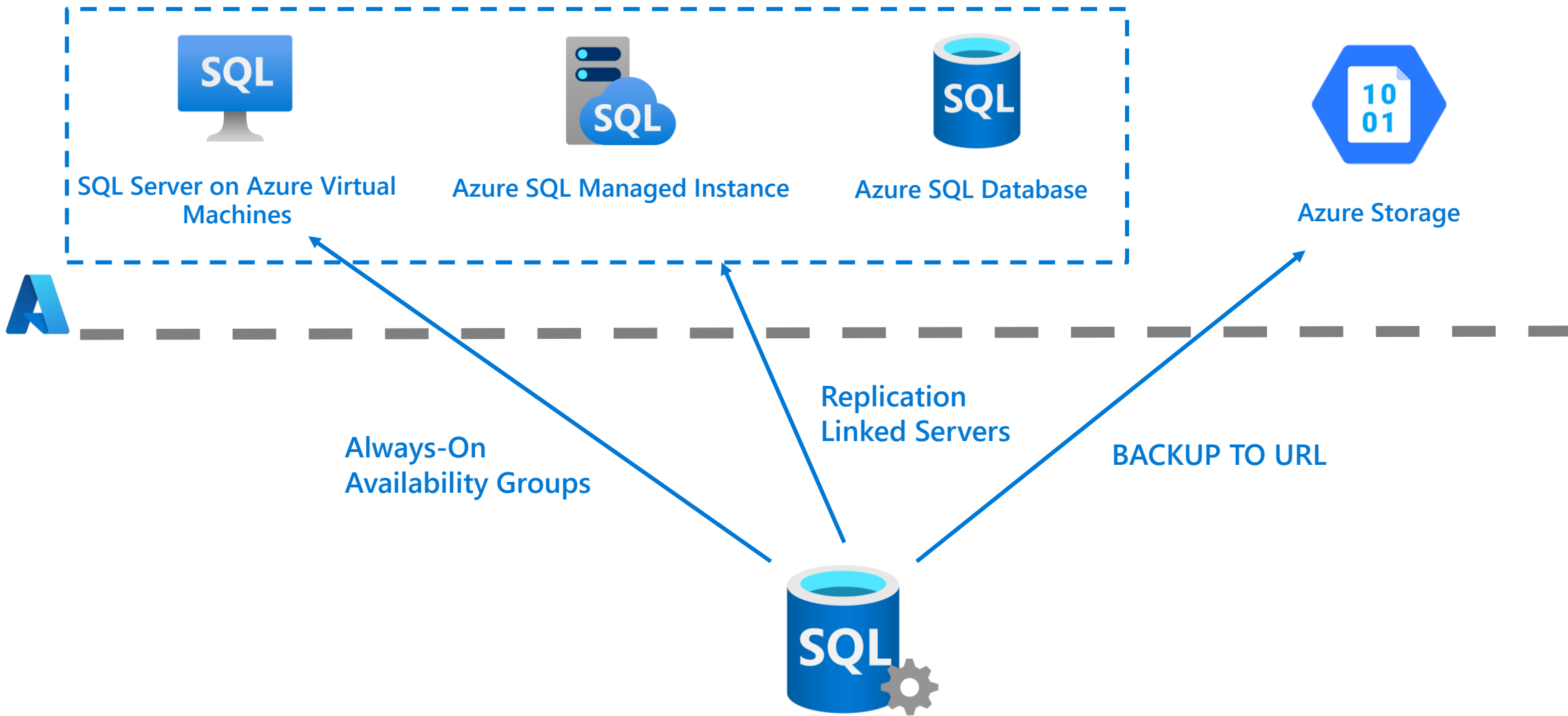
Near-real time analytics with Synapse link*

Azure Security hybrid capabilities*

Knowledge checks and summary

Demos*

Has SQL Server been hybrid?



Azure Arc-enabled SQL Server



Azure Arc-enabled SQL Server

Organize, inventory, and monitor
Governance and Security
Use with your existing SQL servers
SQL on Windows or Linux servers



View and organize along with other Azure SQL services



SQL Assessment with Log Analytics for best practices



Microsoft Defender for SQL for security assessments



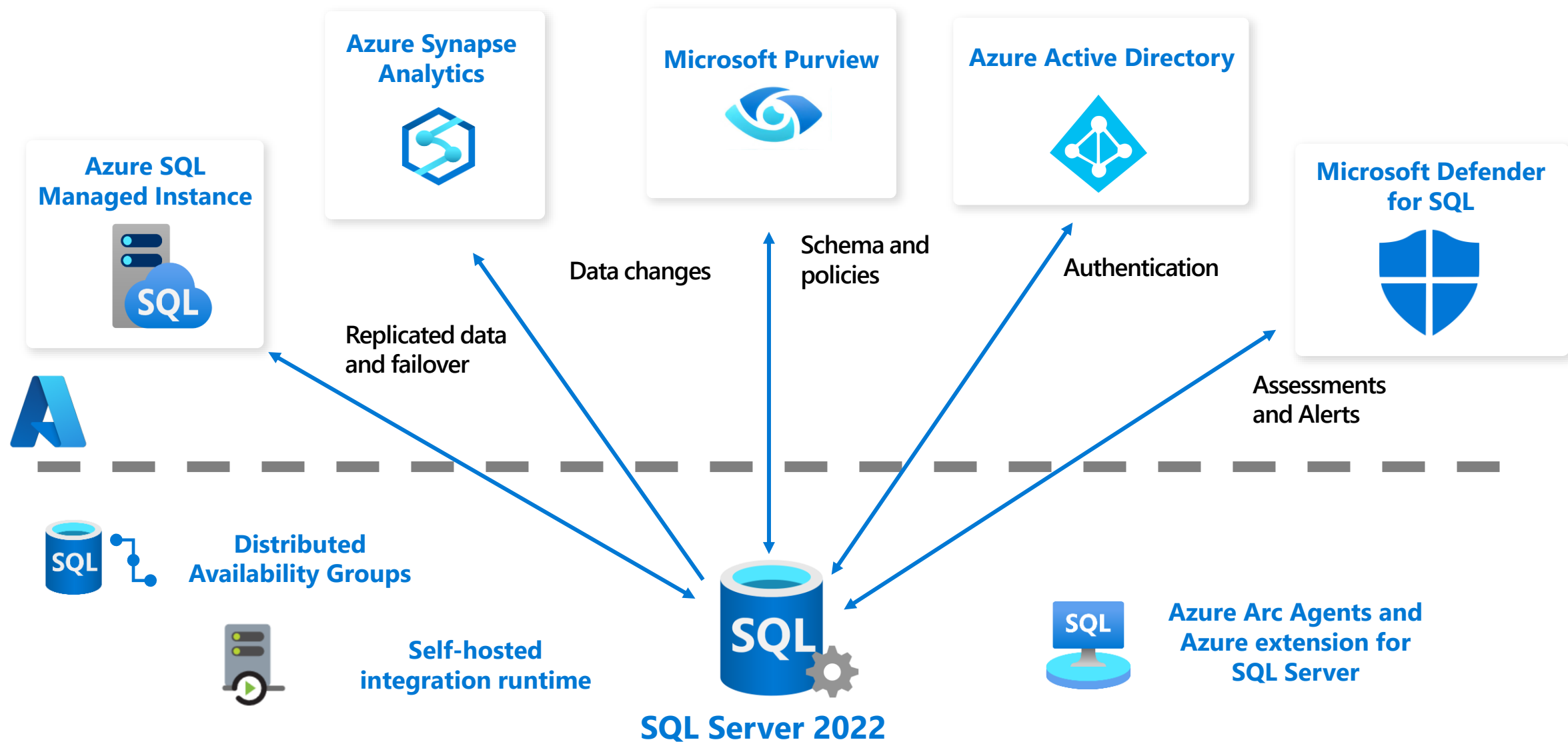
Azure Active Directory*



Microsoft Purview access policies*

* SQL Server 2022 only

SQL Server 2022 Cloud connected

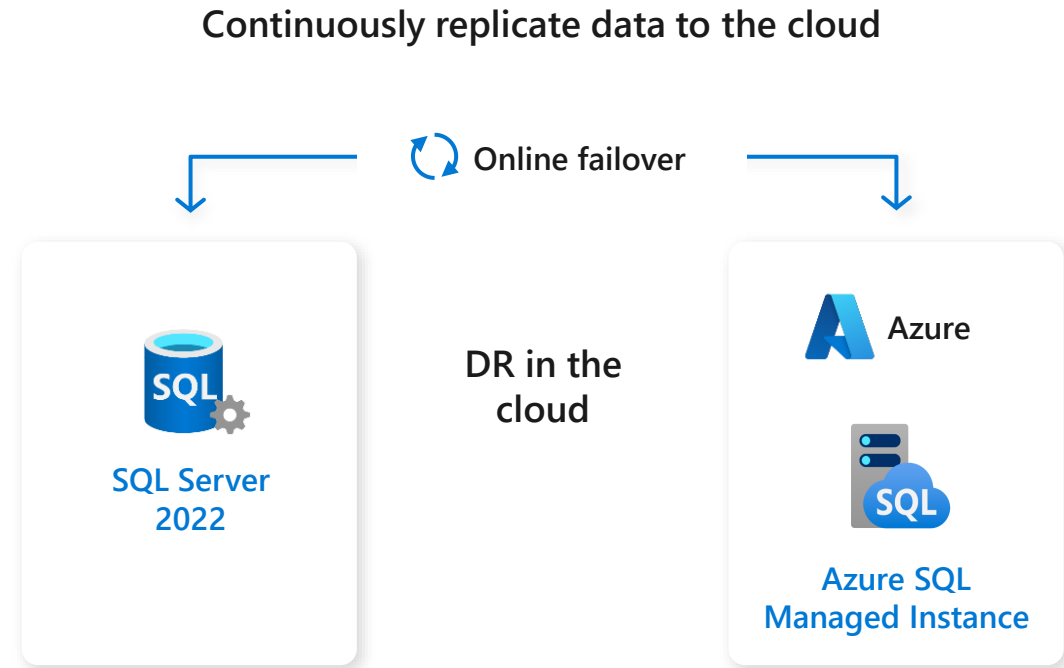


Business continuity through Azure SQL Managed Instance

Disaster recovery in the cloud with link feature for Azure SQL Managed Instance

Challenge: **Difficult to setup and maintain a DR site**

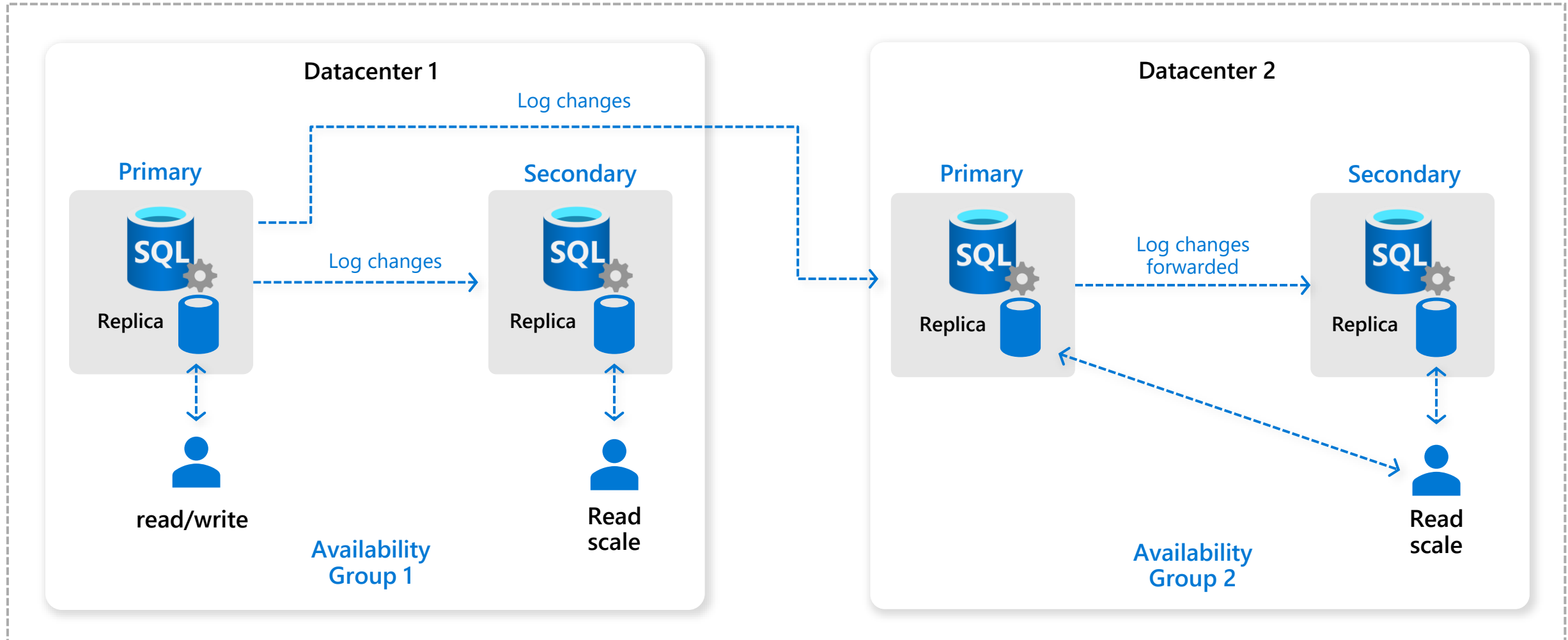
- ✓ Use PaaS for managed disaster recovery
- ✓ Don't have an AG? We will build one for you with no replica or clustering required
- ✓ Built-in distributed availability group (DAG)
- ✓ Offline Disaster Recovery using backup/restore
- ✓ Online Disaster Recovery coming soon



<https://aka.ms/milink>

SQL Server Distributed Availability Groups (DAG)

Distributed Availability Group (DAG)



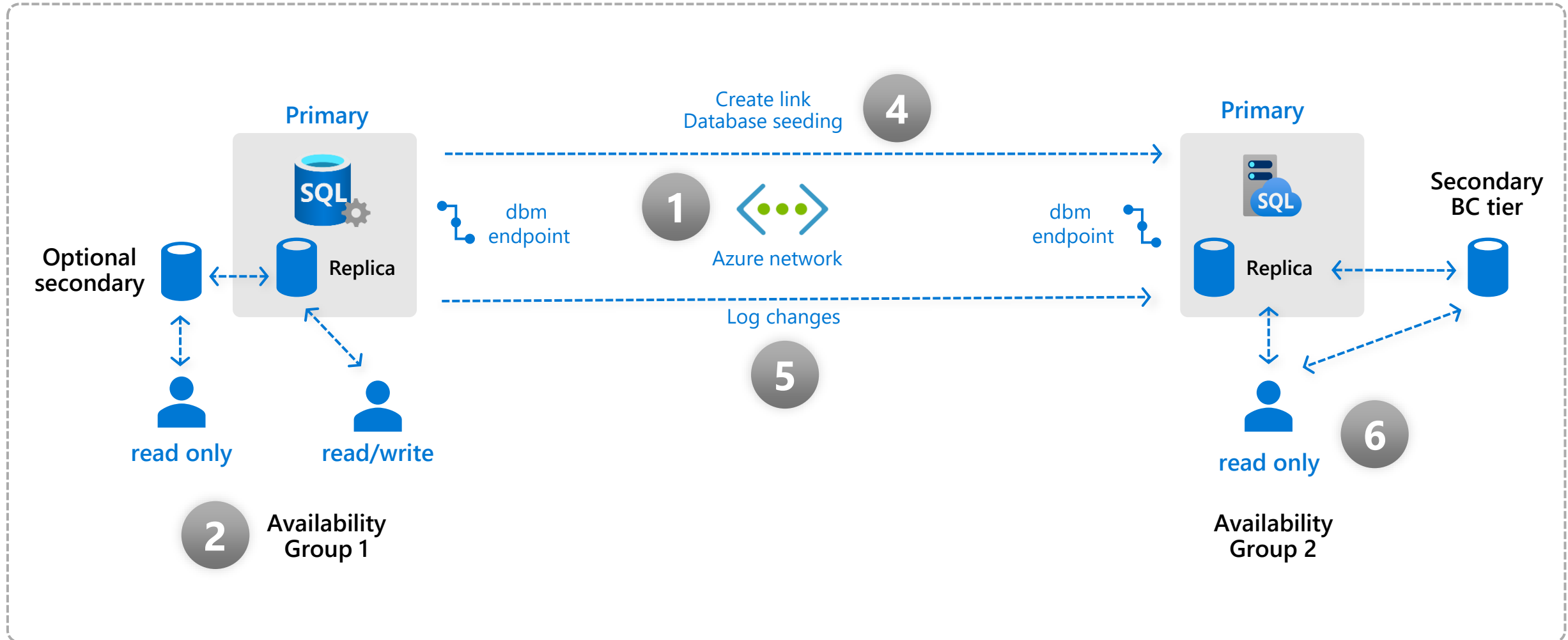
Link feature for Managed Instance

< SQL Server 2022 → Migration
SQL Server 2022 → DR

Distributed Availability Group (DAG) async

3

Single step with SSMS
using the replicate wizard



Online failover to Azure SQL Managed Instance

Single step with SSMS
using the failover wizard

1

Planned failover

- Stop all writes to database
- Switch mode for MI from async to sync
- Switch DAG to sync
- Verify LSNs match
- Remove link to MI
- Optionally clean up DAG and AG

Forced failover

- Remove link to MI
- Clean up DAG and AG when SQL Server is available

2

Database on Azure SQL Managed Instance becomes read/write

3

Redirect application to connect to Azure SQL Managed Instance

4

Migrate instance level objects to Azure SQL Managed Instance

SQL Server database version compatibility

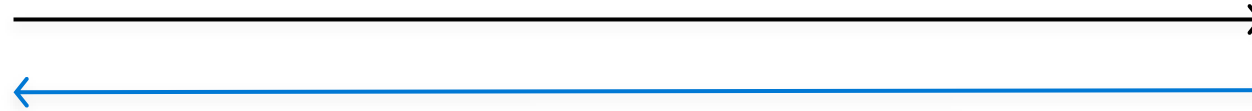
SQL Server 2019
Version 15.X



Locked in with
SQL Server 2019 RTM
Doesn't change for CUs

database version != dbcompat

Database 'WideWorldImporters' running the
upgrade step from version 904 to version 9XX



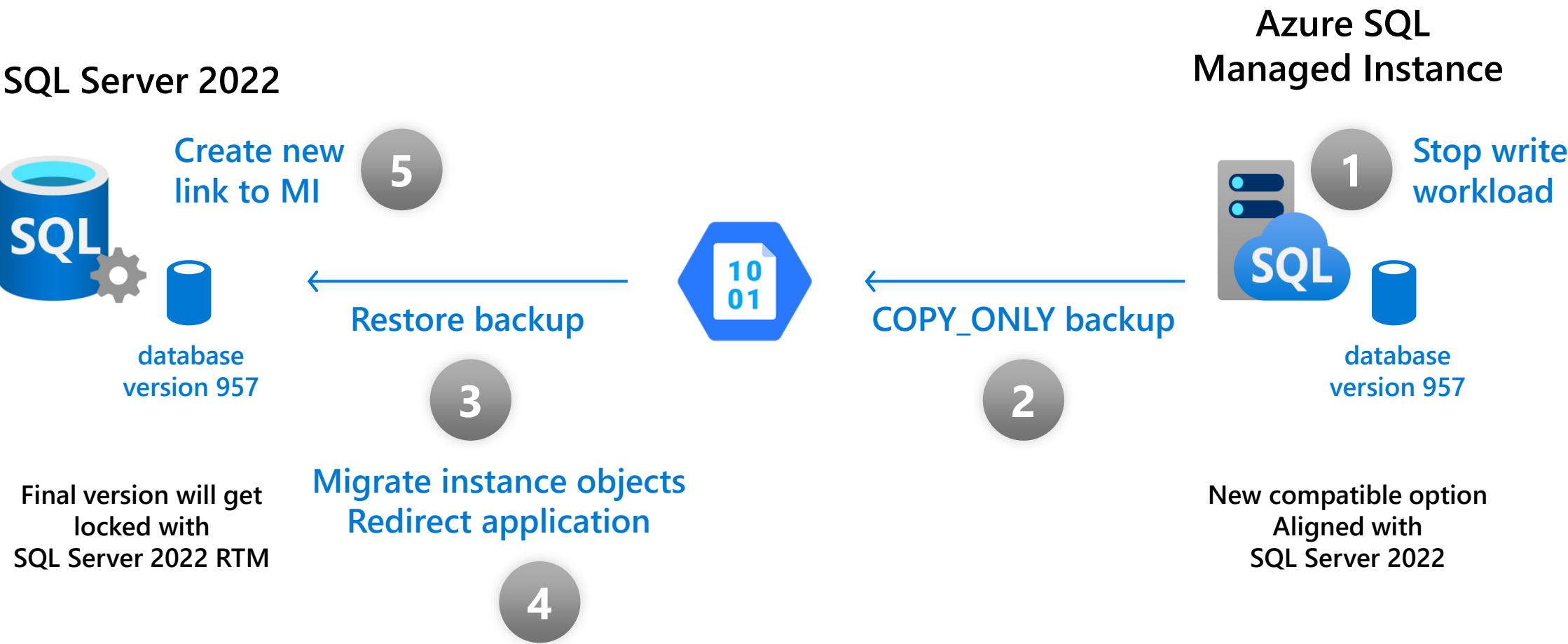
The database was backed up on a server running version 16.00.0312. That version is incompatible with this server, which is running version 15.00.2095. Either restore the database on a server that supports the backup, or use a backup that is compatible with this server.

Azure SQL
Managed Instance
Version 16.X



Updated as needed

Offline Disaster Recovery with SQL Server 2022

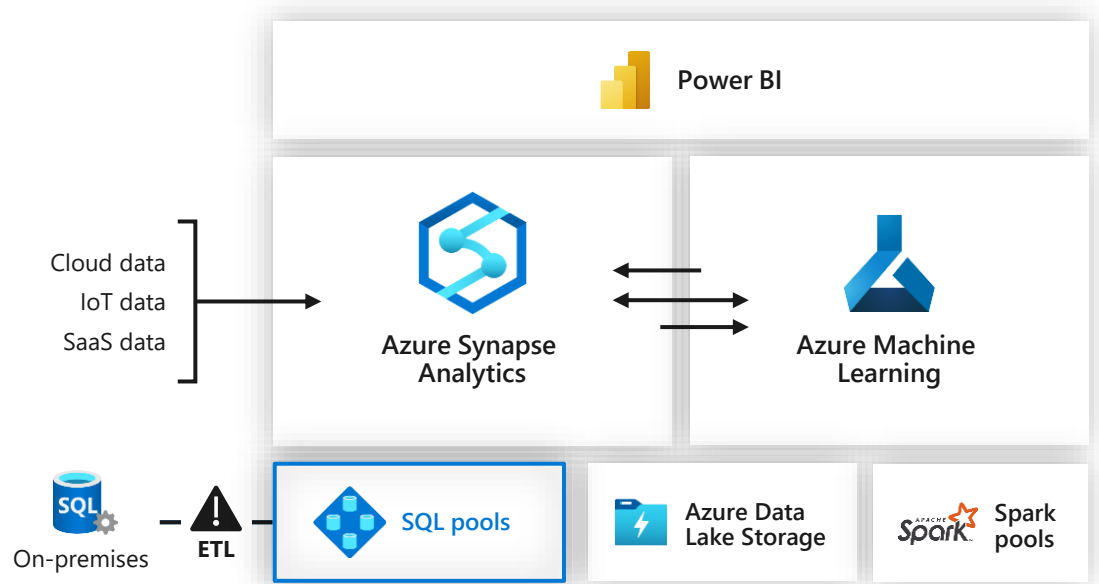


Azure Synapse Link for SQL Server

Seamless analytics over on-prem operational data

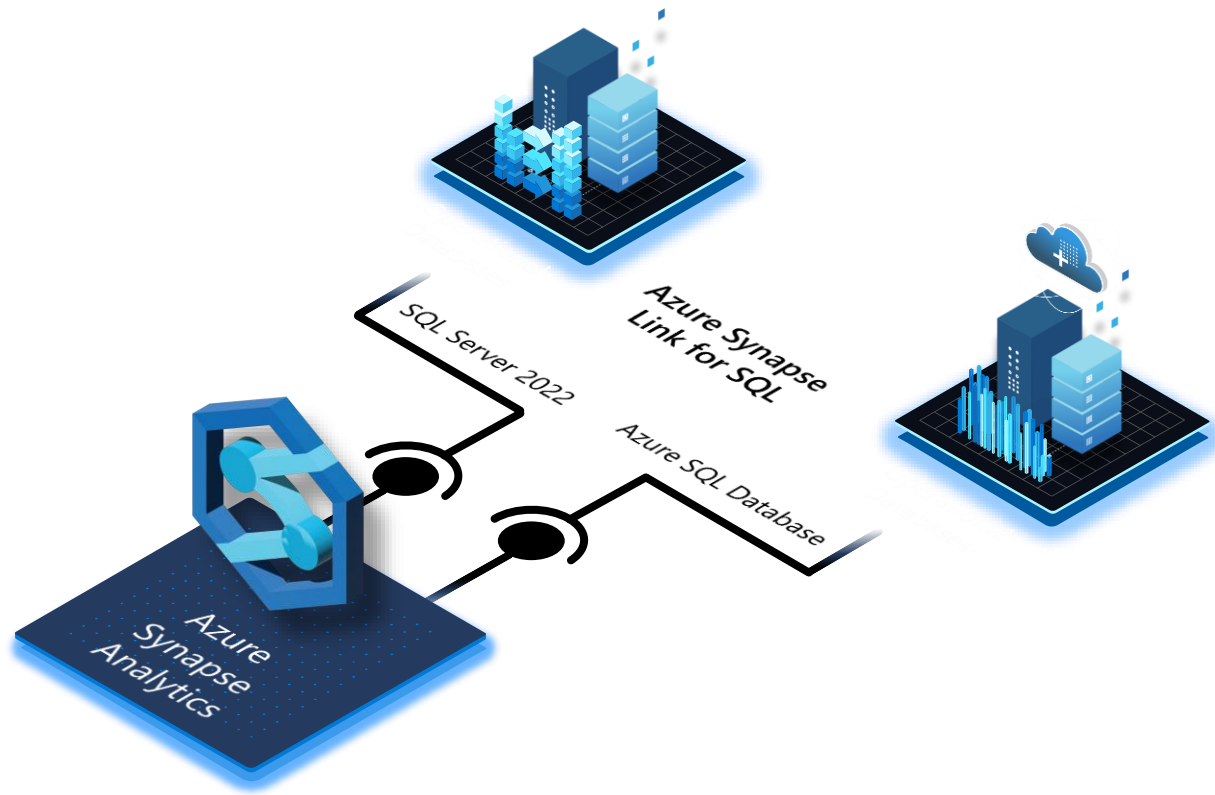
Challenge: ETL expensive, out of date, and affects operational workloads

- ✓ Break the wall between operational and analytical stores
- ✓ New change feed capability reduces impact on OLTP workloads
- ✓ Near real-time latency between SQL Server and Synapse Analytics
- ✓ Use SQL pools so harness the full power of a scalable warehouse solution
- ✓ Analyze all your data using both Spark and SQL runtimes in Synapse



<https://aka.ms/synapselinksql>

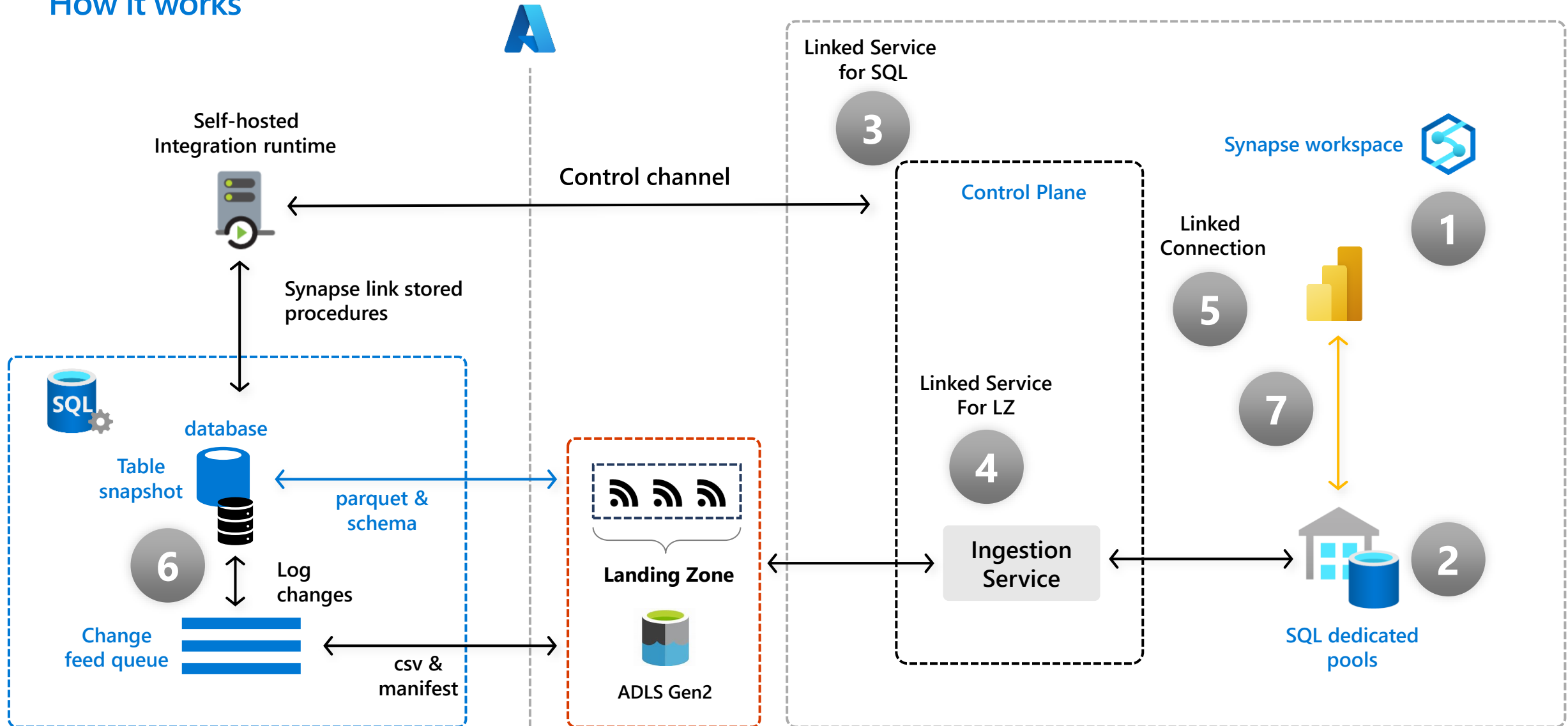
Using Synapse Link for SQL Server



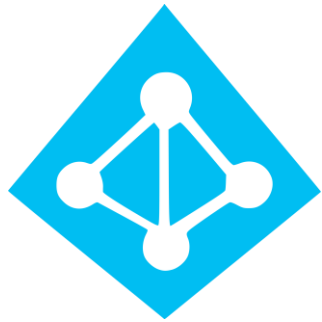
- ✓ Synapse Workspace
- ✓ Dedicated SQL Pool
- ✓ Landing Zone
- ✓ Self-hosted Integration Runtime
- ✓ SQL Server 2022 database
- ✓ Engine enhancements for change feed
- ✓ Similar for Azure SQL Database

Azure Synapse Link for SQL Server

How it works



Secure your SQL Server 2022 with Azure



**Azure Active Directory
Authentication**



**Azure
Purview**

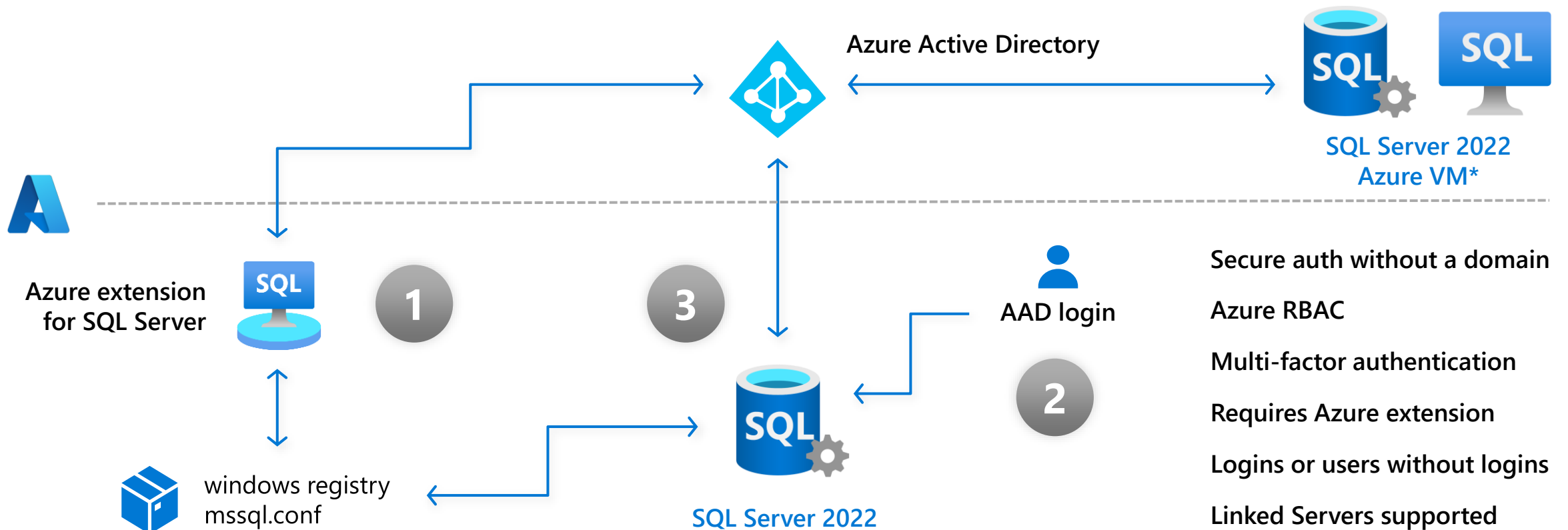


**Microsoft Defender
for SQL**

Azure Active Directory for SQL Server

<https://aka.ms/aadsqlserver>

Challenge: I need an alternative for authentication than SQL and Windows domains



*Coming soon

Microsoft Purview integration

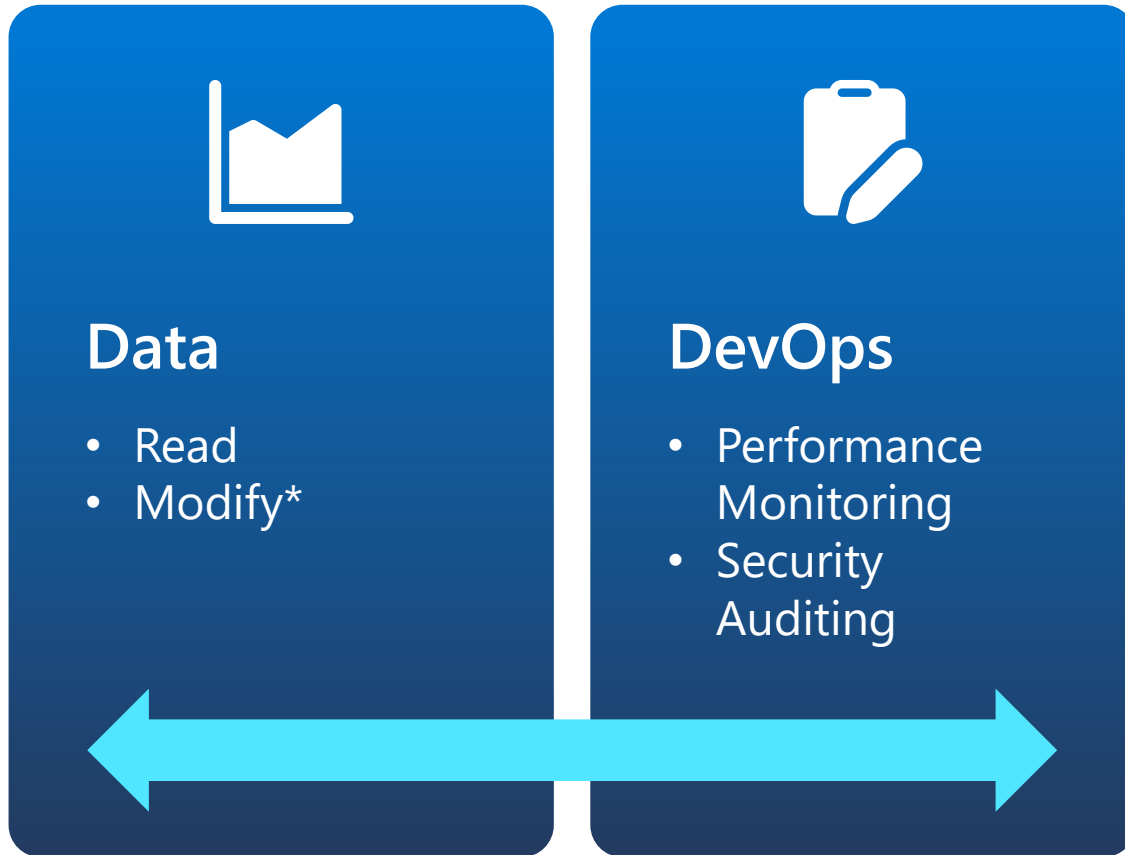
Insights, lineage, and governance over your entire data estate

Challenge: I need central insights and governance across all of SQL

- ✓ Automatically scan on-prem SQL Server to capture metadata
- ✓ Classify data using built-in and custom classifiers and Microsoft Information Protection sensitivity labels
- ✓ Track lineage for usage and dependencies
- ✓ Set up and control specific access rights to SQL Server with policies



Microsoft Purview access policies for SQL Server



- ☐ Publish a policy from Purview
- ☐ Works only with AAD accounts
- ☐ No explicit login required
- ☐ Engine understands policies to grant login and specific permissions
- ☐ Engine integrates policies with standard logins and permissions
- ☐ Works across multiple SQL instances
- ☐ Remove policy removes authentication

Futures:

More granular scope

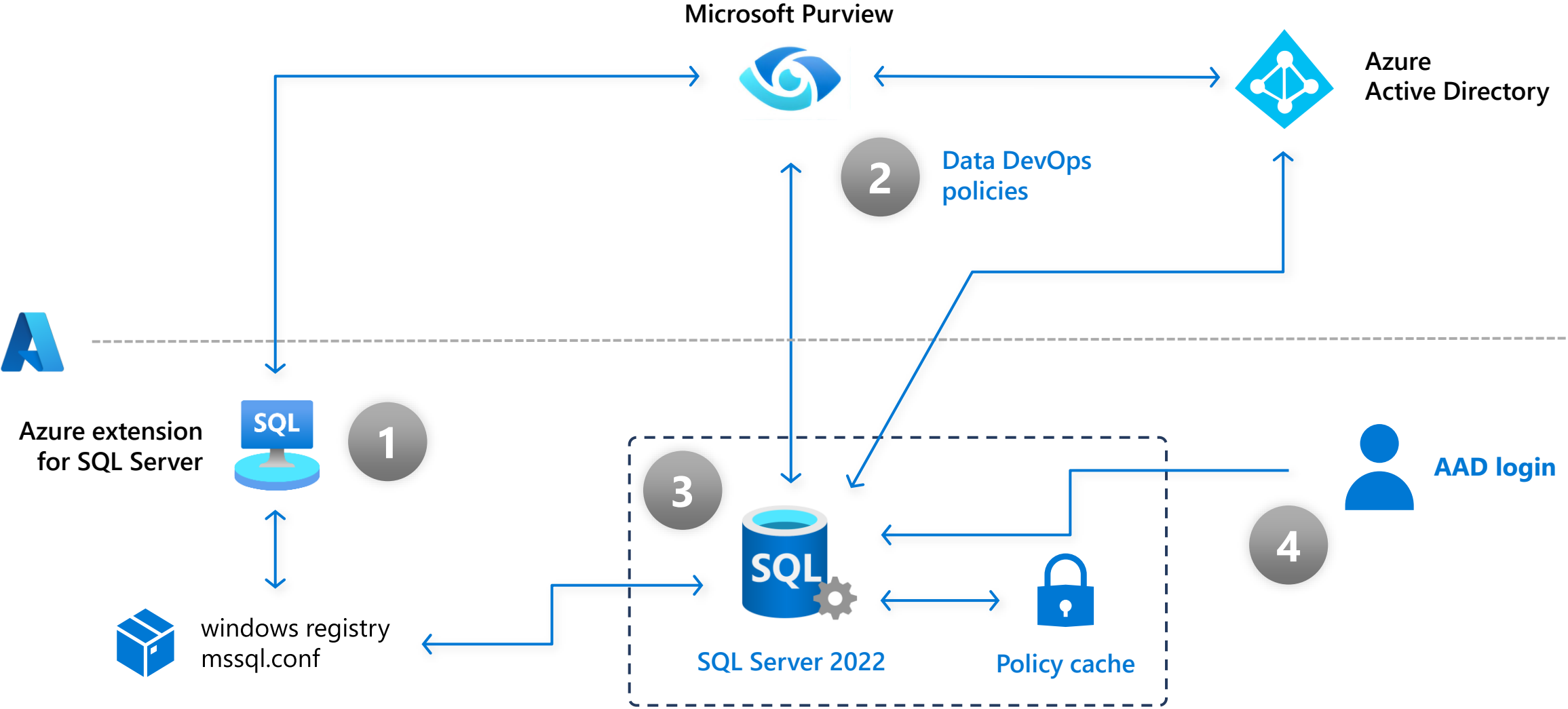
New policies

Self-service access

<https://aka.ms/purviewsqlaccesspolicies>

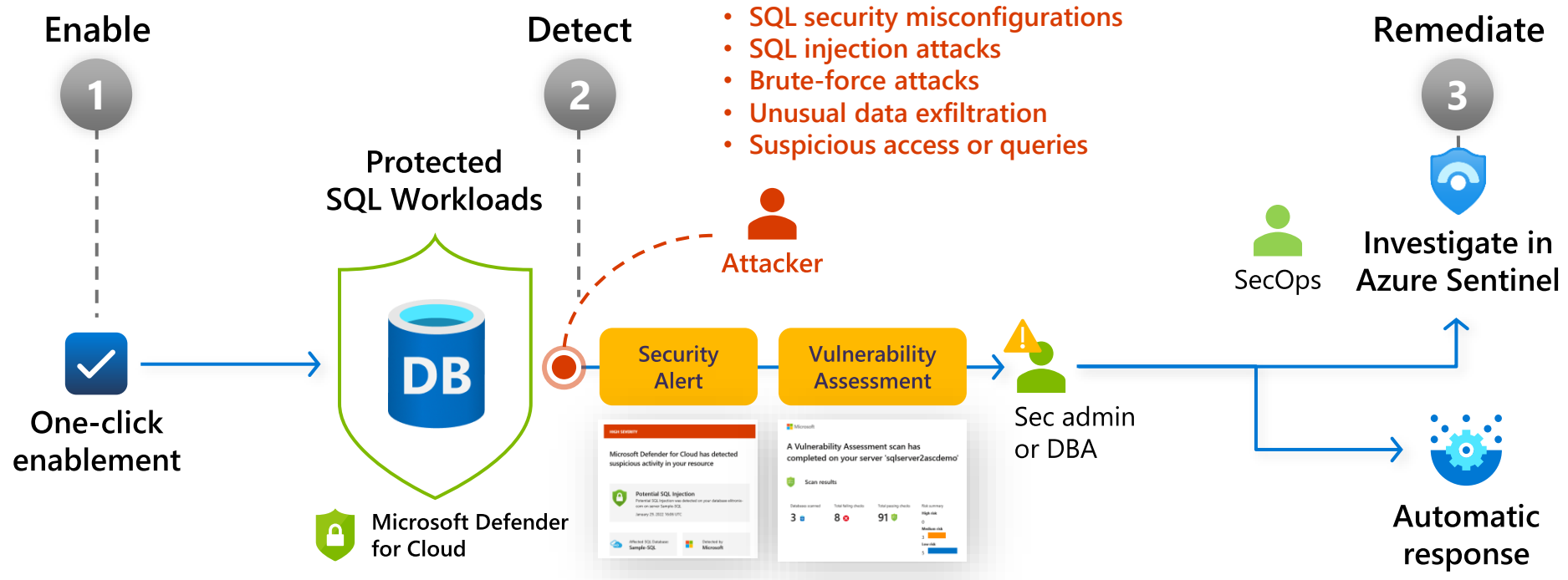
*Coming soon

Microsoft Purview SQL Server Policy Architecture



Microsoft Defender for Cloud—Databases Protection

Protect SQL workloads through security posture management and allow timely responses to threats



Cloud native security

1-click enablement of protect different type of SQL workloads (IaaS or PaaS)

Security posture management

Discover, track, and remediate SQL workloads security misconfigurations

Advanced threat protection

Detect and response unusual and harmful attempts to breach SQL workloads

Centralized and integrated

Centralize security across all data assets managed by Azure and built-in integration with Sentinel and Purview



Knowledge check

Link for Managed Instance feature is supported on which SQL Server versions?

- A.** SQL Server 2016
- B.** SQL Server 2019
- C.** SQL Server 2022
- D.** B and C
- E.** A, B, and C

SQL Server sends changes to Synapse Link to what location?

- A.** SQL Pools
- B.** Landing Zone
- C.** Azure Data Factory
- D.** Linked Service
- E.** Linked Connection



Knowledge check

Azure Active Directory (AAD) Authentication allows users to be created without logins?

- A.** True
- B.** False

Microsoft Purview policies provide access to SQL Server by:

- A.** You create a login and then map the login to a Purview policy
- B.** You create a policy in Purview based on an Azure Active Directory (AAD) account
- C.** You create a role in SQL Server that maps to a Purview policy
- D.** You create a AAD login and add it to a policy role in SQL Server
- E.** Purview scans SQL Server for logins

Summary

SQL Server is truly a **hybrid data platform**

Link SQL Server to Azure SQL Managed Instance for **managed disaster recovery**

Link SQL Server to Synapse for automatic **near real-time analytics**

Authenticate SQL Server logins and users with **Azure Active Directory (AAD)**

Publish **policies for data access** without creating logins or roles with Microsoft Purview



Module 3

Accelerate performance with built-in query intelligence

Overview

The new Query Store

IQP NextGen foundations

IQP NextGen with dbcompat 140+

IQP NextGen with dbcompat 160

Exercises

Knowledge Checks and Summary

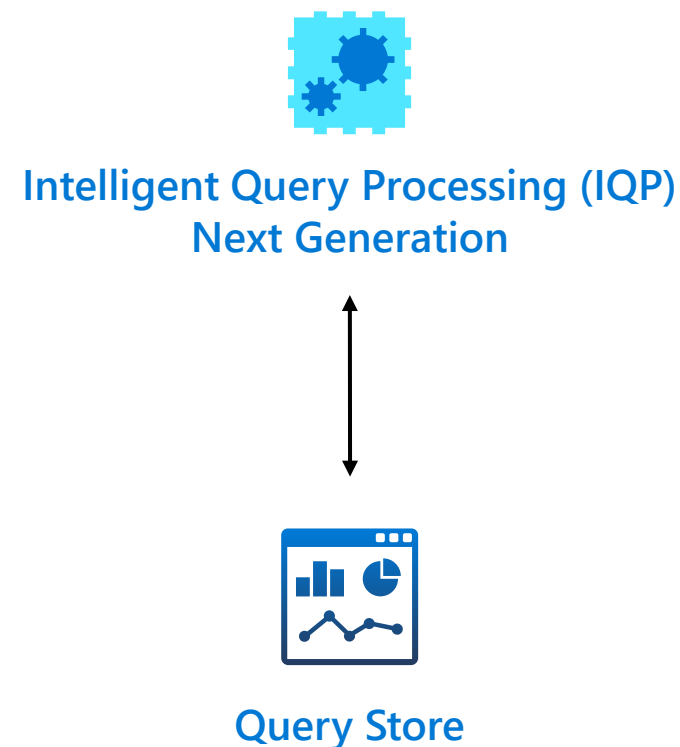
Query Store and Intelligent Query Processing

Accelerate query performance and tuning with no code changes

Challenge: Query tuning is expensive and time consuming

- ✓ Query Store on by default for new databases
- ✓ Query Store support for read replicas from availability groups*
- ✓ Query Store hints to shape plans with no code changes
- ✓ New IQP scenarios enabled through better together capabilities

* Currently requires trace flag 12606



Query Store and Intelligent Query Processing

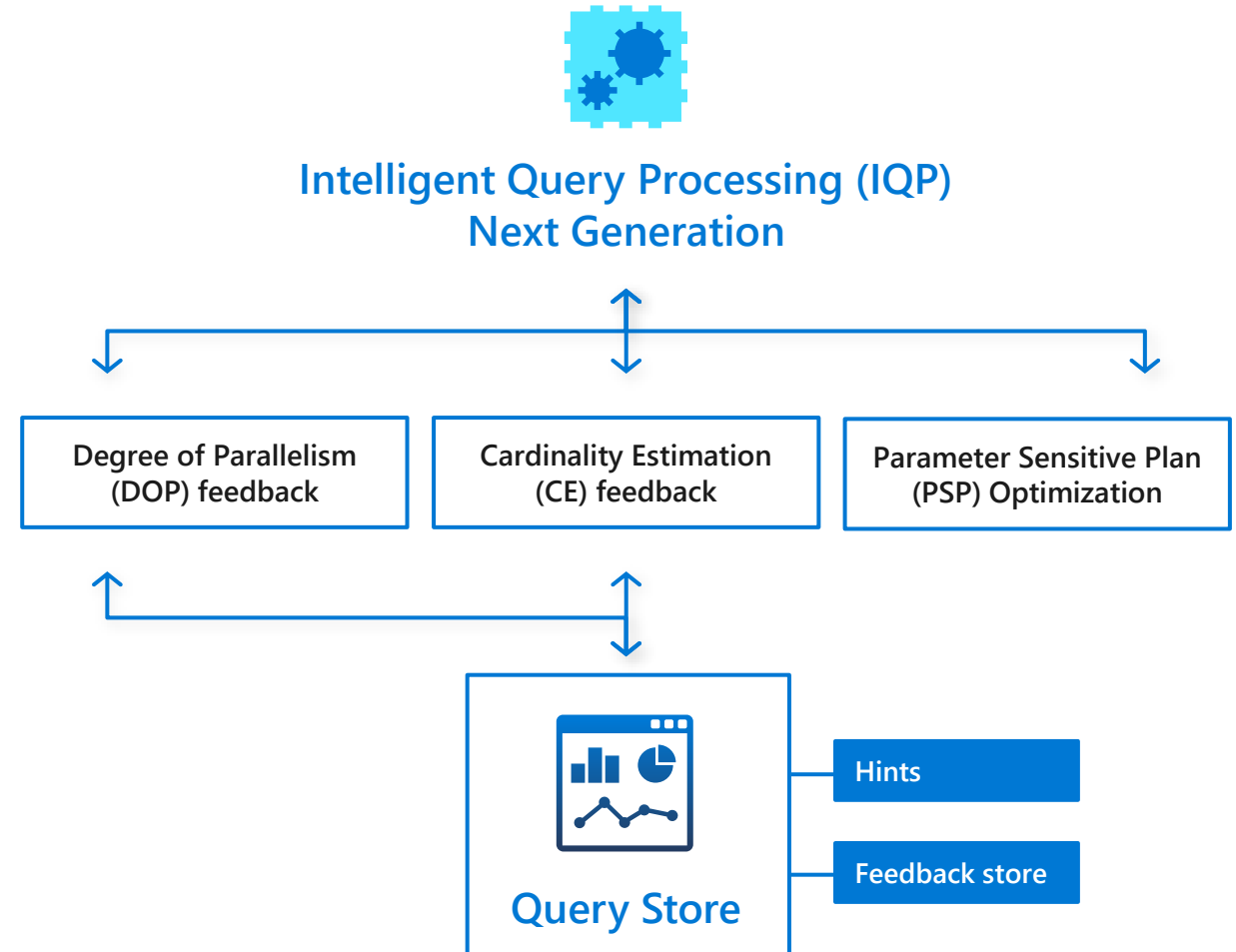
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Intelligent Query Processing (IQP) NextGen

Gain consistent performance with no code changes



Query
Store

Upgrade to SQL Server 2022



dbcompat 140+



dbcompat 160

Approximate Percentile

- ✓ Approximate versions for PERCENTILE_CONT and PERCENTILE_DISC

Optimized Plan Forcing

- ✓ Persist compile steps for forced plans
- ✓ Reduce compilation overhead



Memory Grant Feedback Percentiles

- ✓ Smooth out oscillation with percentile-based calculation

Memory Grant Feedback Persistence

- ✓ Persist feedback for cache eviction



Key principles

- "Do no harm"
- Options to disable

Adaptive Joins

Interleaved Execution

Memory Grant Feedback

Table Variable Deferred Compilation

Batch Mode on Rowstore

Scalar UDF inlining

Approximate Count Distinct

Parameter Sensitive Plan (PSP) Optimization

- ✓ Cache multiple query plans for the same parameterized statement
- ✓ Save the world from parameter sniffing?

Cardinality Estimation (CE) feedback

- ✓ Feedback loop for CE model choices and query execution
- ✓ Auto use query hints



Degree of Parallelism (DOP) feedback

- ✓ Feedback loop for DOP for a specific query
- ✓ Adjust query DOP without recompilation



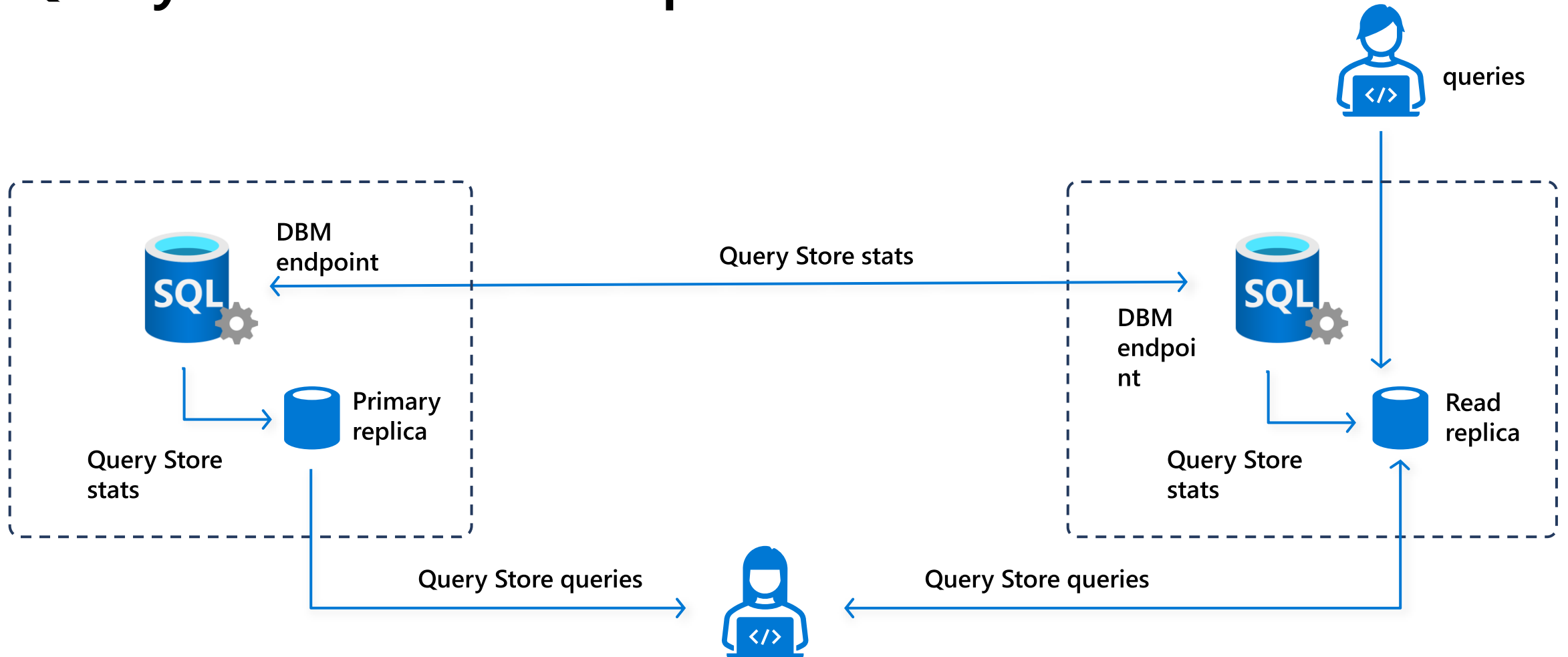
dbcompat 140 = IQP Gen1
dbcompat 150 = IQP Gen1+2

Query Store enhancements

- ✓ Query Store on by default for new databases
- ✓ Query Store support for read replicas from availability groups*
- ✓ Query Store hints to shape plans with no code changes
- ✓ Query store is the perfect “store” for IQP

*Currently requires trace flag 12606

Query Store for read replicas*



*Currently requires trace flag 12606

Intelligent Query Processing (IQP) NextGen

Gain consistent performance with no code changes



Query
Store

Upgrade to SQL Server 2022

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Intelligent Query Processing (IQP) NextGen

Gain consistent performance with no code changes



Query
Store

Upgrade to SQL Server 2022



dbcompat 140+

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- ✓ Adjust query DOP without recompilation



Exercises

Exercise 3.1—Parameter Sensitive Plan (PSP) optimization

Bonus: Exercise 3.0—Persisted Memory Grant Feedback

Advanced: Exercise 3.2—DOP feedback



Knowledge check

Query Store is now on by default for SQL Server 2022 under which circumstances:

- A.** Create a new database with SSMS in SQL Server 2022
- B.** Use CREATE DATABASE in SQL Server 2022
- C.** Restore a database backup from SQL Server 2019
- D.** A and B
- E.** Restore a version compatible backup from Azure SQL Managed Instance

Parameter Sensitive Plan optimization can help which scenario:

- A.** Data is skewed and you use ad-hoc queries with your application
- B.** Scenarios where more than one plan in cache would help with stored procedure performance
- C.** Stored procedure performance using parameters in filters with \geq operators
- D.** All of the above

Summary

The **new Query store** is on by default for new databases, provides hints, works with replicas, and is a store for new query intelligence

Upgrade to SQL Server 2022 with **any dbcompat** and get approx. percentile and optimized plan forcing

Upgrade and use dbcompat 140+ to enable **memory grant percentiles and feedback**

Upgrade and use **dbcompat 160** to light up parameter sensitive plan optimization, ce feedback, and dop feedback

Don't forget all the great innovations from **IQP Gen1 and 2** that come with dbcompat 140 and 150+



Module 4

Power your database with security, scalability, and availability

Overview

Security enhancements

Scalability enhancements

Availability enhancements

Other engine enhancements

Exercises

Knowledge Checks and Summary



Industry-proven database engine

Security, scalability, and availability

Σntain

Secure

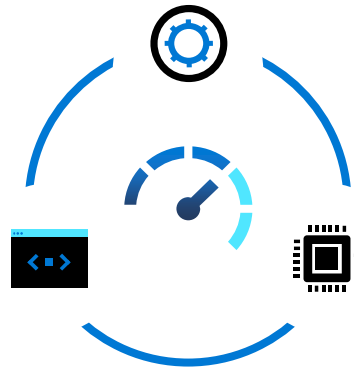


Ledger for SQL Server

Always encrypted enhancements

Strict connected encryption (TDS 8.0)

Scalable

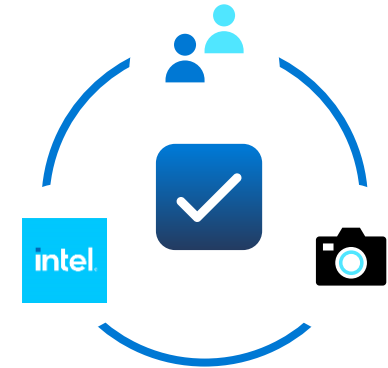


Buffer pool parallel scan

"Hands-free" tempdb

Auto async update stats concurrency

Available



Contained Availability Groups

Cross-platform SNAPSHOT backups

Intel QuickAssist™ Technology
backup compression

Security enhancements



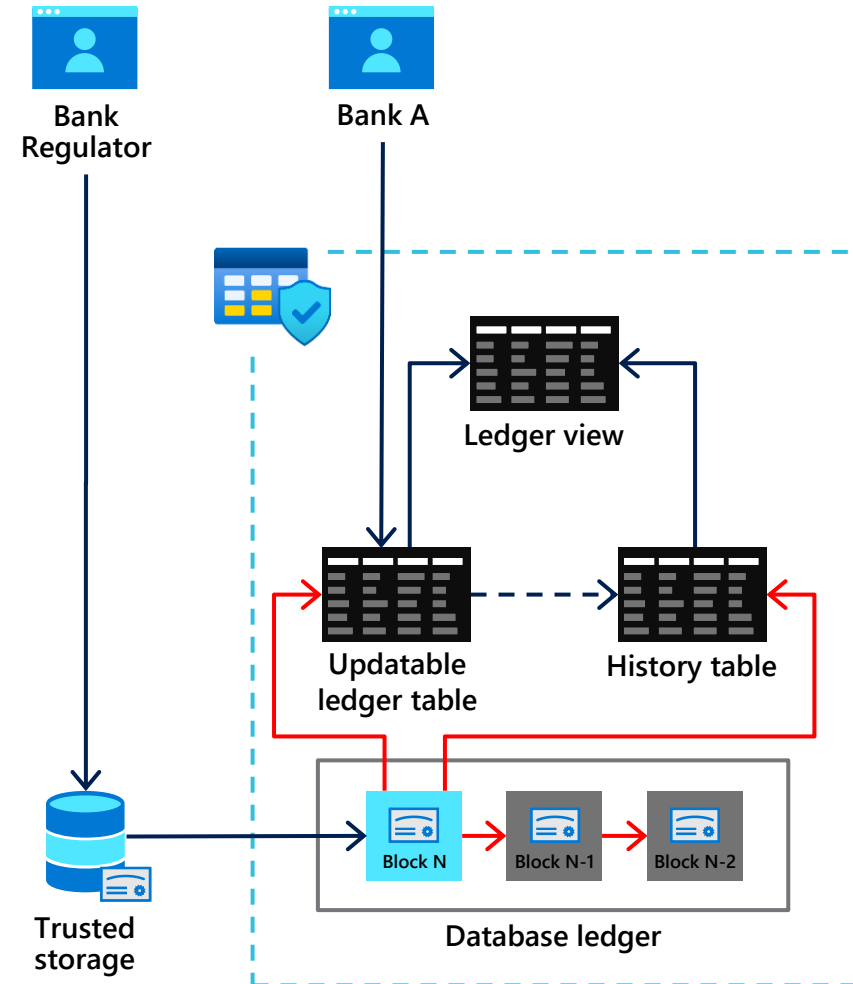
- ✓ Ledger for SQL Server
- ✓ Always encrypted enhancements
- ✓ Strict connected encryption (TDS 8.0 and TLS 1.3)
- ✓ PFX certificate support
- ✓ New granular fixed server roles
- ✓ Enhancements for Dynamic Data Masking

Ledger for SQL Server

Tamper-evidence track record of data over time

Challenge: I want the power of blockchain in a centralized system like SQL Server

- ✓ Use a cryptographically hashed ledger detect tampering by malicious actors
- ✓ Built into SQL Server with T-SQL
- ✓ Establish digital trust in a centralized system using blockchain technology.
- ✓ Attest to other parties that data integrity has not been compromised
- ✓ Automatic digest storage



How to use Ledger for SQL Server

Create a Ledger table

Updateable or
Append Only

Make changes

INSERT, UPDATE/ DELETE
(only updateable)

Save digest

Manual or auto

View ledger history



Verify Ledger



Ledger FAQ

How is this different from a temporal table?

- Built-in transaction auditing
- Append-only
- Database Ledger and digest for tamper evidence

How is this different than SQL Server Audit?

- Transaction history and audit built into database
- Digest verification

Can I disable ledger from a table?

- You cannot ALTER a table to “turn off” ledger
- You cannot turn off system versioning

Can I drop a ledger table?

- Yes, but a history of the dropped table and ledger is kept

Ledger FAQ

How often do I need to save the digest?

- As frequent as you need to ensure the ledger is tamper proof

Does Ledger require more space?

- Updateable requires similar extra space as temporal
- **Plus** database ledger requires some minimal extra space for hashes and blockchain
- Digests small and separate but you may need a long history
- You can't archive or truncate ledger tables and database ledger

Any perf impact?

- Append only should see minimal impact
- Updateable would have similar impact as temporal

Scalability enhancements



- ✓ Buffer pool parallel scan
- ✓ “Hands-free” tempdb
- ✓ Auto async update stats concurrency
- ✓ Auto drop statistics
- ✓ XML compression
- ✓ Advanced Vector Extension (AVX) 512 extension to improve batchmode operations.
- ✓ Improved columnstore segmentation
- ✓ Ordered clustered columnstore index

"Hands-free" tempdb



Pre SQL Server 2019

1 file = PFS, GAM, SGAM contention

Add multiple files

Trace flags 1117 and 1118

SQL 2016 setup auto adds multiple files

Trace flags not required by SQL Server 2016



SQL Server 2019

PFS concurrency

Autogrow and uniform default for tempdb

Now system table pages become hotspot

Tempdb metadata optimization ON

SGAM and GAM contention remain



SQL Server 2022

SGAM and GAM concurrency

Latch contention gone

Availability enhancements



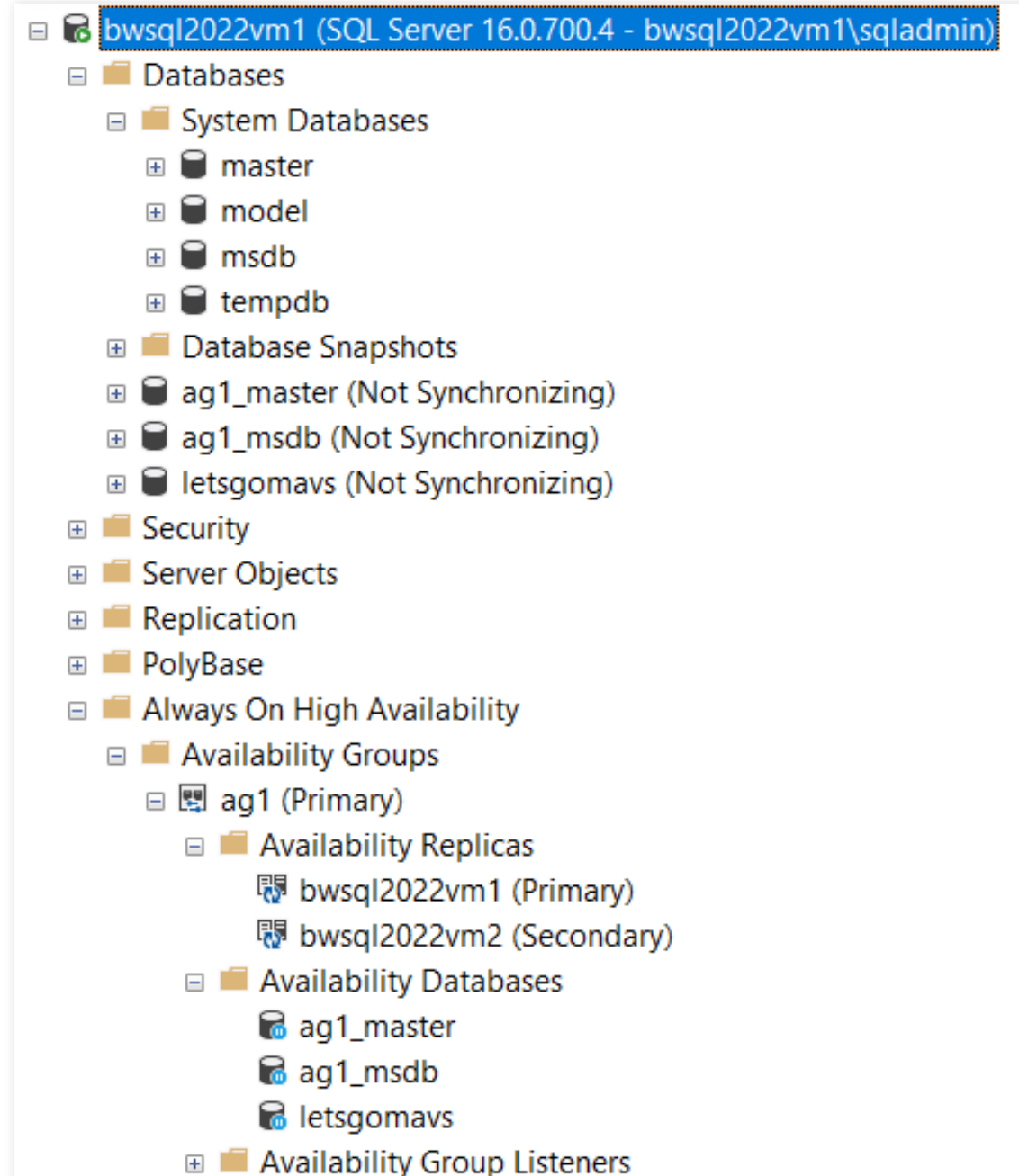
- ✓ Contained Availability Groups
- ✓ Cross-platform SNAPSHOT backups
- ✓ Intel QuickAssist™ Technology backup compression
- ✓ ADR enhancements
- ✓ In-memory OLTP memory enhancements
- ✓ Shrink database concurrency
- ✓ Parallel redo enhancements
- ✓ DAG enhancements
- ✓ Resumable ADD CONSTRAINT
- ✓ Last valid restore time in backupset msdb table
- ✓ LWW wins auto conflict peer-to-peer replication

Contained Availability Groups

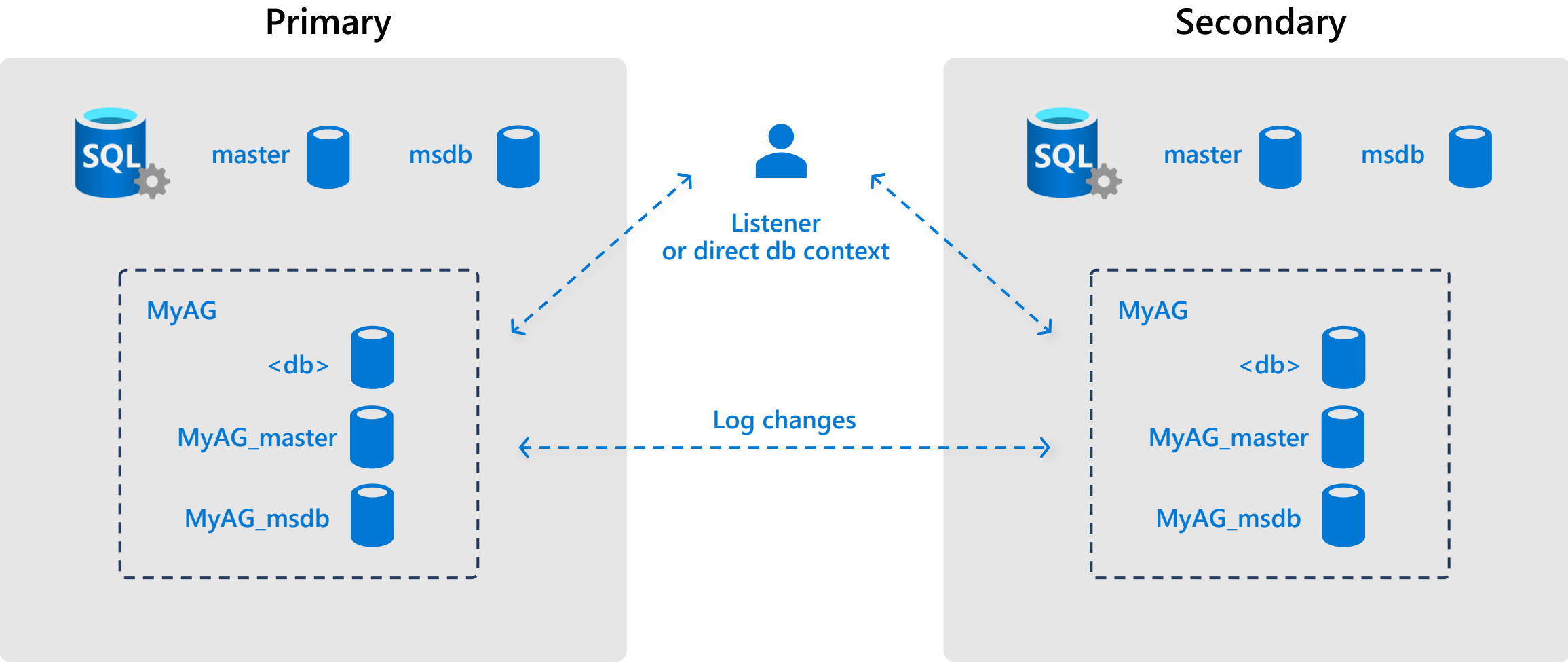
Synchronize instance level objects with data

Challenge: I have to manually synchronize instance level objects with Availability Groups

- ✓ Create an Availability Group and declare it be CONTAINED
- ✓ We add a contained master and msdb database to the AG
- ✓ Connect with listener and contained master and msdb are used
- ✓ Connect directly and default master and model are used.
- ✓ SQL Server agent enhanced to understand contained msdb



How Contained AGs work



Cross-Platform Snapshot Backups

Before

VDI Program

VSS and SQL Writer

Now

T-SQL suspend I/O

Perform your snapshot

T-SQL resume I/O

- ✓ Why? Backup TB in minutes
- ✓ Use storage that supports snapshots—Tip: Azure Storage does by default
- ✓ Works on Windows and Linux
- ✓ Users most likely see WRITELOG waits on suspend
- ✓ **Tip:** Use undocumented and unsupported trace flag 3661 to test it

SQL Server 2022—Hardware acceleration & offloading

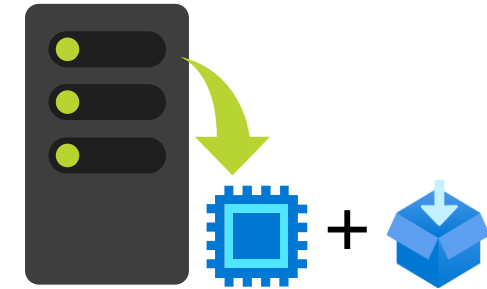
Current customer demands

Stability for critical workloads

Consistent performance without oversizing

Remove scalability blockers

Make the most of current hardware



Intel QuickAssist Technology (QAT)

[Intel QuickAssist Technology \(QAT\)](#) provides a compression solution that integrates hardware acceleration of compute-intensive workloads on Intel platforms.

[Intel QuickAssist Technology \(QAT\) with SQL Server 2022](#) off-loads data compression, enabling faster OLTP operations while reducing the impact on the system's transaction throughput.

Database Backup Improvements for SQL Server 2022 with Intel QuickAssist Technology (QAT):



Up to 2.3x
speedup in database
backup time¹



Up to 6%
reduction in backup
storage capacity¹

¹ **SOFTWARE BASELINE:** Test by Intel as of 10/26/2021. 1-node, 2x Intel® Xeon® Platinum 8358 Processor on Wilson City (ref. platform), 32 cores with 1024 GB (16 slots/ 64GB/ 3200[3200]) total DDR4 memory, ucode 0xD000323, HT on, Turbo on, Windows Server 2019,10.0.17763.1999, [Hyper-V VM], 1x Intel X550, SQL Server 2022 CTP1.1 private test build, 525GB Database, Database Backup with Compression. **WITH INTEL® QUICKASSIST ADAPTER 8970 TECHNOLOGY:** Test by Intel as of 10/26/2021. 1-node, 2x Intel® Xeon® Platinum 8358 Processor on Wilson City (ref. platform), 32 cores with 1024 GB (16 slots/ 64GB/ 3200[3200]) total DDR4 memory, ucode 0xD000323, HT on, Turbo on, with Intel® QuickAssist Adapter 8970, 1.70.16.4 driver version, Windows Server 2019,10.0.17763.1999, [Hyper-V VM], 1x Intel X550, SQL Server 2022 CTP1.1 private test build, 525GB Database, Database Backup with Compression. **WITH INTEL® Intelligent Storage Acceleration Library:** Test by Intel as of 10/26/2021. 1-node, 2x Intel® Xeon® Platinum 8358 Processor on Wilson City (ref. platform), 32 cores with 1024 GB (16 slots/ 64GB/ 3200[3200]) total DDR4 memory, ucode 0xD000323, HT on, Turbo on, with Intel® Intelligent Storage Acceleration Library v2.30.0.0, Windows Server 2019,10.0.17763.1999, [Hyper-V VM], 1x Intel X550, SQL Server 2022 CTP1.1 private test build, 525GB Database, Database Backup with Compression. Results may vary.

Purvi's list

- ✓ Reduce Buffer Pool I/O promotions
- ✓ Enhanced core spinlock algorithms
- ✓ Improved Virtual Log File (VLF) algorithms
- ✓ Instant File Initialization (IFI) for Log file growth



Knowledge check

Independent verification for Ledger for SQL Server is done by:

- A.** The database ledger through system tables
- B.** The Ledger history view
- C.** Database digests
- D.** Blockchain data in SQL Server tables

SQL Server 2022 now eliminates what type of bottleneck for tempdb:

- A.** PAGEIOLATCH
- B.** PAGELATCH
- C.** Spinlocks
- D.** A and B
- E.** Row locks on system pages



Knowledge check

A Contained Availability Group replicates which objects:

- A.** Linked Servers
- B.** SQL Server Agent jobs
- C.** Logins
- D.** All of the above

What are benefits of using Intel QuickAssist with SQL Server 2022?

- A.** Improved backup compression
- B.** Cross-platform backups on SQL Server for Linux
- C.** Offload CPU resources for SQL query workloads
- D.** A and C
- E.** All of the above

Summary

SQL Server 2022 is an industry proven engine with enhancements in **security, scalability, and availability**

Ledger for SQL Server provides a tamper evidence record using blockchain technology

Latch page concurrency improvements made management of **tempdb “hands-free”**

Enhancements in availability include contained AG, cross-platform snapshot backups, and Intel QuickAssist backup compression

There are over **25+ major engine enhancements** in SQL Server 2022



Module 5

Access new sources with data virtualization and object storage

Data Virtualization with Polybase

Data Virtualization with SQL Server 2022

Backup and Restore with S3 Object Storage

Exercises

Knowledge Checks and Summary

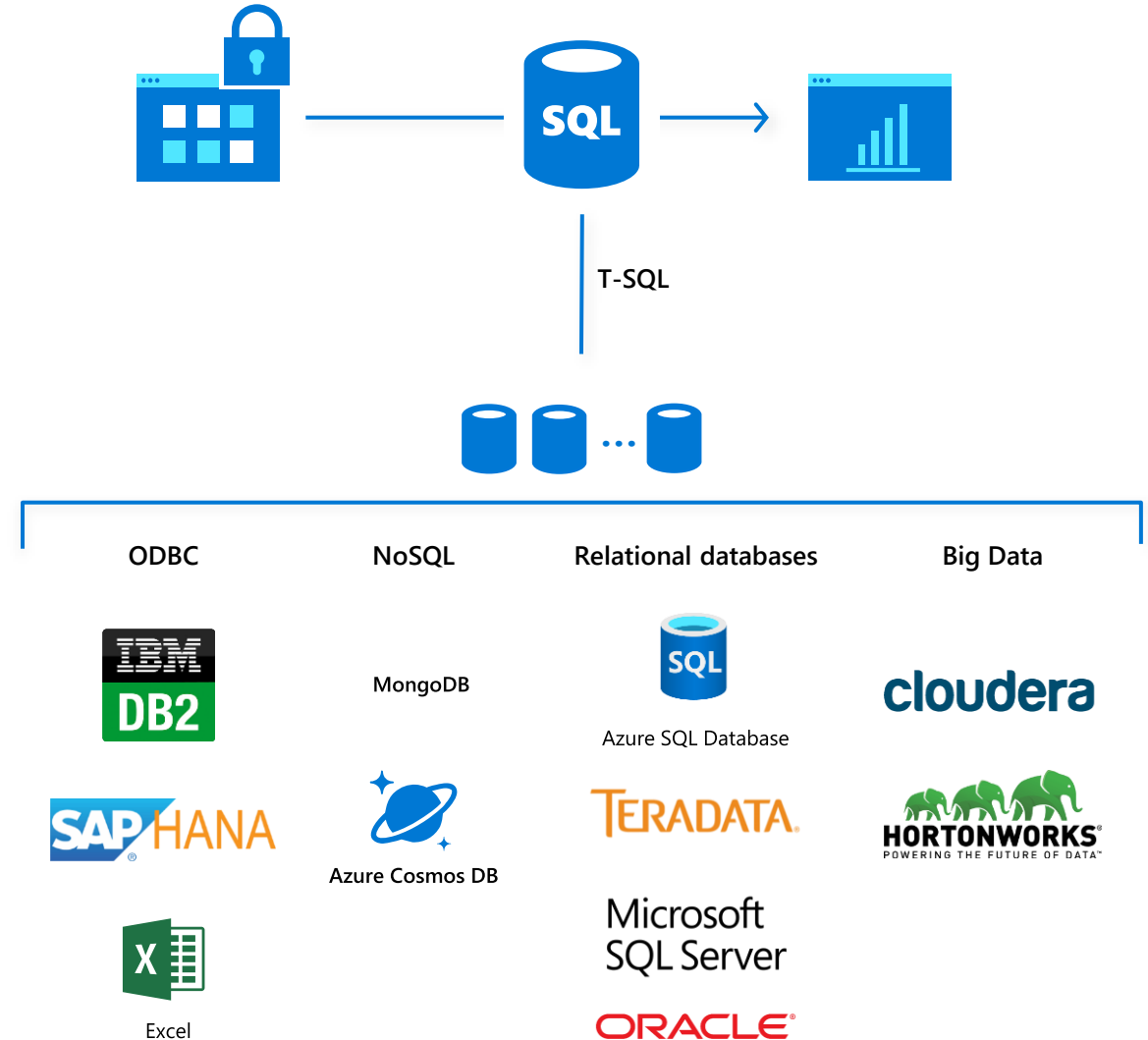
Remove data silos with Polybase—SQL Server 2019

Challenge: Integrating data from numerous data silos is complex with traditional ETL methods

Solution

Access from multiple sources without moving data

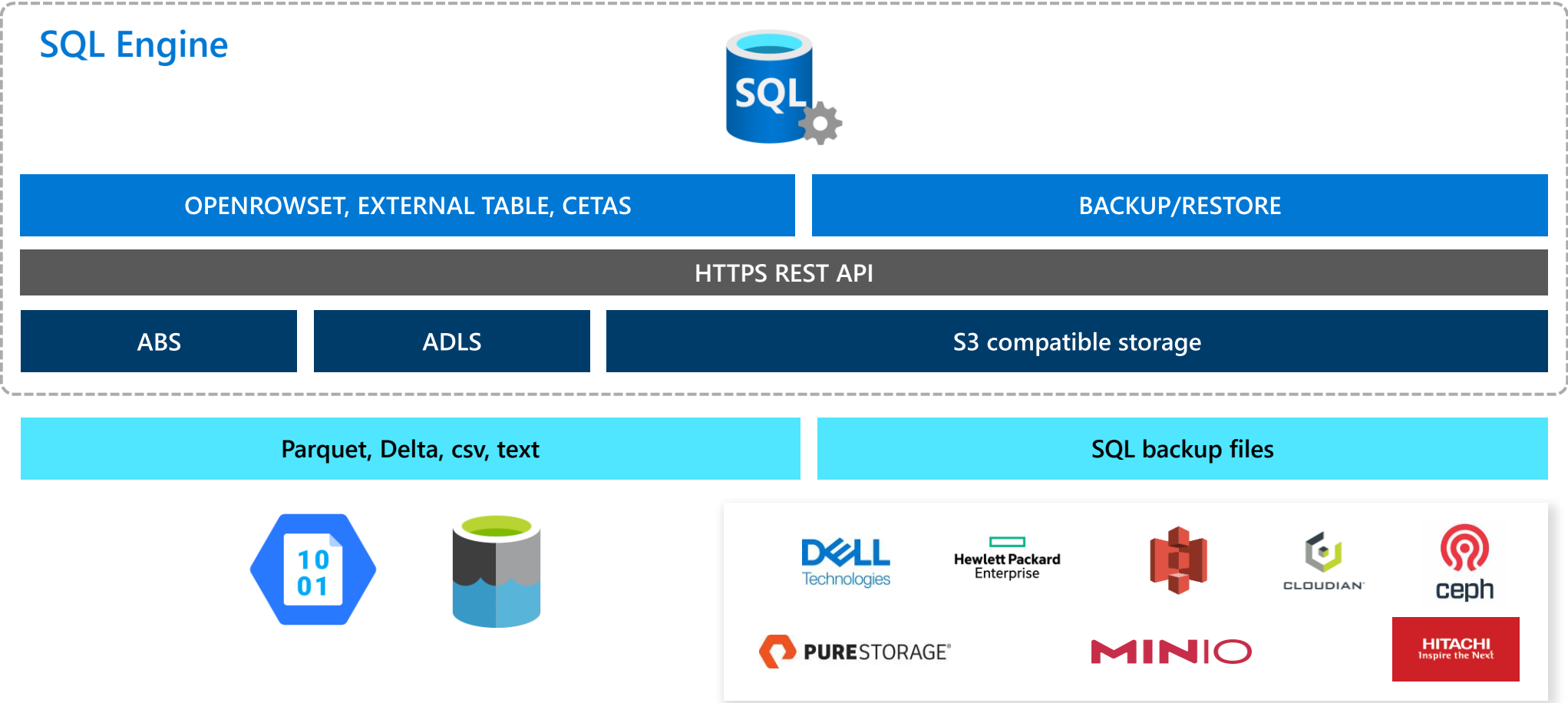
- We add a contained master and msdb database to the AG
- Connect with listener and contained master and msdb are used
- Connect directly and default master and model are used.
- SQL Server agent enhanced to understand contained msdb



Data virtualization and object storage

Directly access any data on object storage

Challenge: I need to access data on modern object storage systems through SQL



Why S3, parquet, and delta?



S3 created by Amazon
but...open protocol

Popular object
storage protocol

Inexpensive, durable,
unlimited



Parquet is an open-
source file format

Schema built-in

Columnar format for
efficient compression
and retrieval

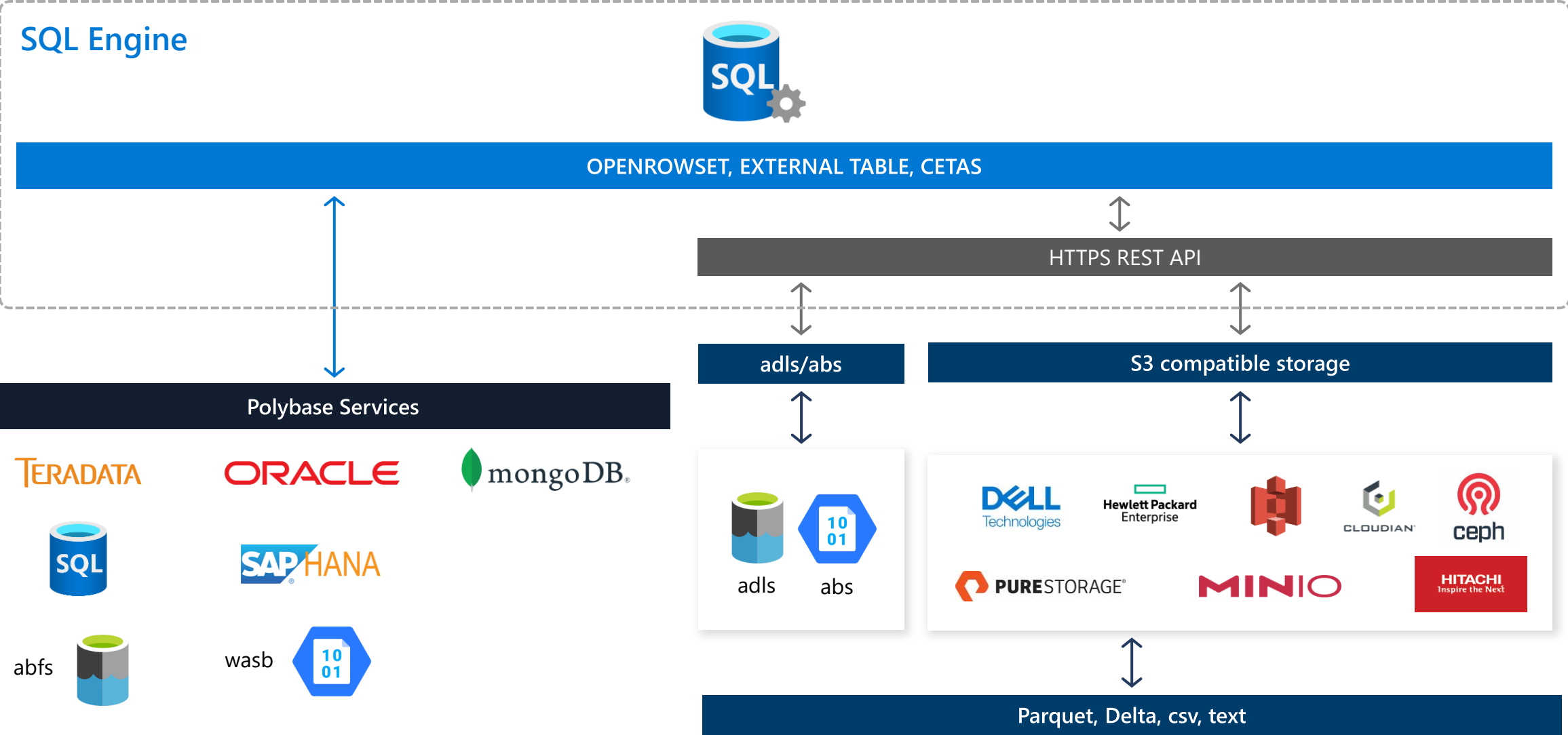


Delta lake is an
open-source storage
architecture with
delta tables

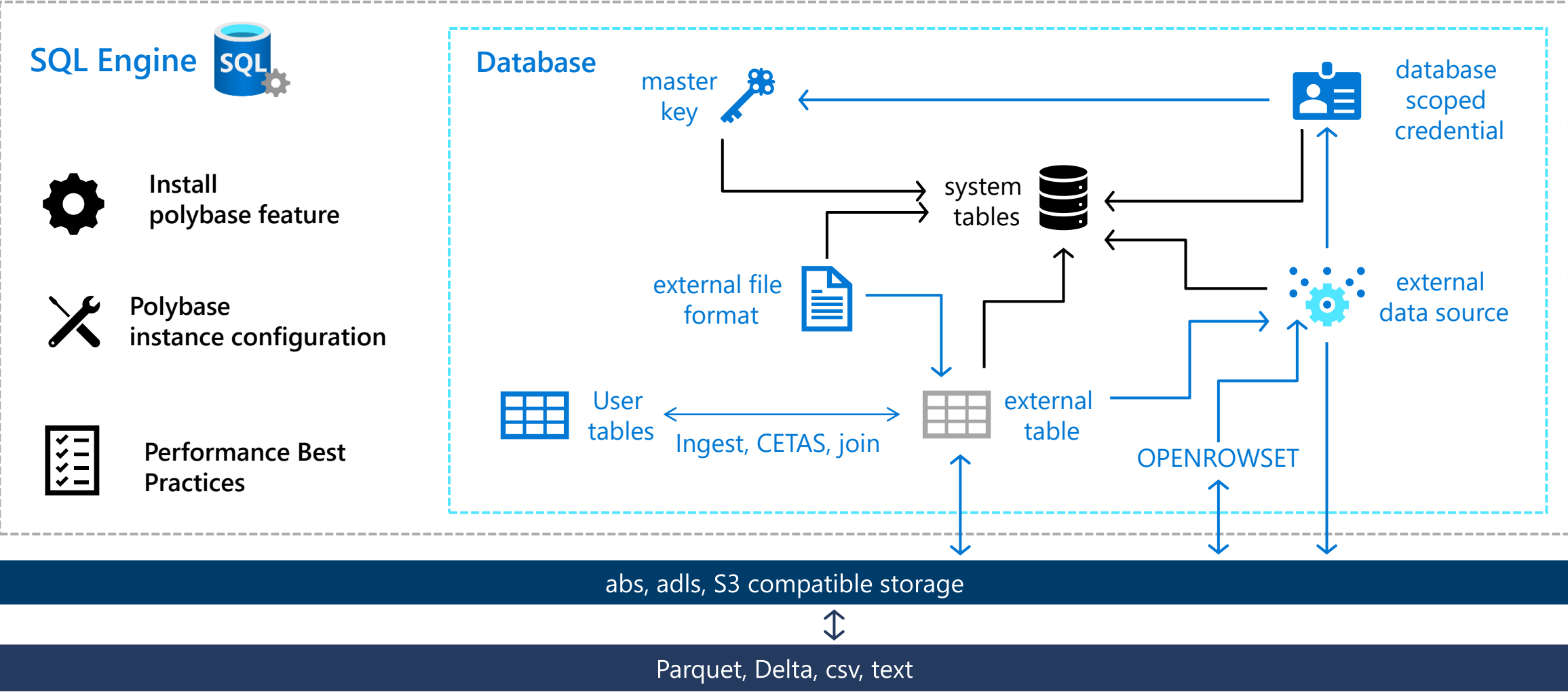
Parquet files +

Basic transaction
log support

Data virtualization in SQL Server 2022



Using REST API based data virtualization



Using BACKUP/RESTORE with S3 compatible object storage



```
BACKUP DATABASE <db>  
TO URL = 's3:<bucket>/<file>'
```

```
RESTORE DATABASE <db>  
FROM URL = 's3:<bucket>/<file>'
```



REST API



Can I migrate from
AWS RDS to SQL Server 2022?



Knowledge check

SQL Server 2022 can now access external data sources through:

- A.** Using REST API to S3 object providers
- B.** Create delta table files on REST API data sources from a SELECT
- C.** Access parquet files on ODBC data sources
- D.** A and B

You can restore a database from AWS RDS to SQL Server 2022:

- A.** True
- B.** False

Summary

New REST API data sources include Azure Blob Storage, Azure Data Lake Storage Gen2, and S3 compatible object store providers

SQL Server 2022 now natively recognizes **parquet and delta table** file formats

SQL Server and **backup and restore** native backups to and from **S3** compatible object store providers



Module 6

T-SQL

Enhance your application with new T-SQL capabilities

Overview

Exercises

Knowledge Checks and Summary

Language enhancements for developers

Use your T-SQL skills to do more than ever

Challenge: I want to get new features without learning a new language

{JSON}

ISJSON
JSON_PATH_EXISTS
JSON_OBJECT
JSON_ARRAY

T-SQL

GREATEST
LEAST
STRING_SPLIT
TRIM functions
DATETRUNC
IS [NOT] DISTINCT FROM
WINDOW clause
LEFT_SHIFT
RIGHT_SHIFT
BIT_COUNT
GET_BIT
SET_BIT



DATE_BUCKET
GENERATE_SERIES
FIRST_VALUE
LAST_VALUE



Knowledge check

Which T-SQL function can produce JSON formatted data?

- A.** JSON_OBJECT
- B.** JSON_ARRAY
- C.** JSON_TEXT
- D.** A and B
- E.** All of the above

Which important enhancement was added to the STRING_SPLIT function in SQL Server 2022?

- A.** separator
- B.** multi-value expression
- C.** ordinal
- D.** New string types

Summary

The **most enhancements** in T-SQL than many previous releases

Enhancements to process **JSON**

Core engine T-SQL enhancements for **ANSI compatibility** and **industry standards**

New T-SQL functions to process **time series data**



Module 7

Summary and closing

Summary of SQL Server 2022

Resources

Group Discussion and Final Q&A

Summary

SQL Server 2022 is **Azure-enabled** for disaster recovery, analytics, and security

Built-in query intelligence reduces query tuning and gains you performance with **no code changes**

SQL Server 2022 has new innovations in **security, scalability, and availability**

Data virtualization and object storage through standard SQL interfaces

Extending the T-SQL language for new developer scenarios

Learn more



Learn more about SQL Server 2022

aka.ms/sqlserver2022



Download SQL Server 2022

aka.ms/getsqlserver2022



Get our decks

aka.ms/sqlserver2022decks



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Take the Microsoft Learning Path*

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* Coming soon

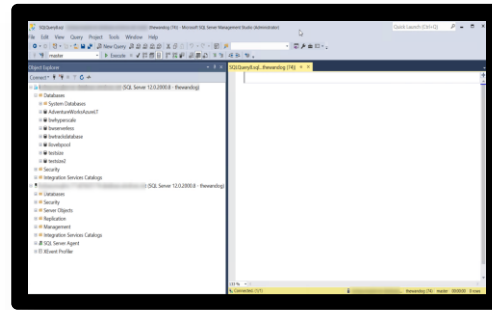
Thank you!



Enregistrez vous dès maintenant au prochain Webinars Data AI

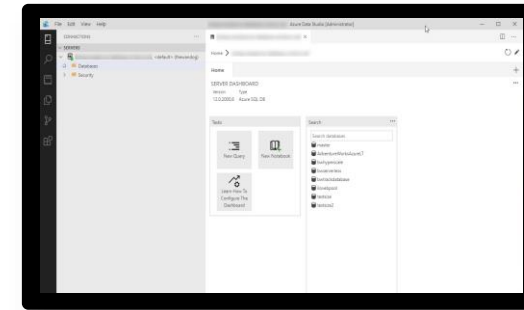
Event Webinar (Les jeudis de la Data & AI) - L200/300	Date	Duration (min)	Link
Azure Synapse	22/09/2022	120	https://msevents.microsoft.com/event?id=857781749
Les solutions SQL dans Azure (PaaS, IaaS, SaaS)	29/09/2022	120	https://msevents.microsoft.com/event?id=502366997
Déploiement et sécurisation des workspaces Azure Machine learning	06/10/2022	120	https://msevents.microsoft.com/event?id=1505714138
Azure Scale Analytics - Architectures Data Mesh dans Azure avec Azure Synapse, Microsoft Purview et Azure Data Share	13/10/2022	120	https://msevents.microsoft.com/event?id=139685175
MLOps avec Azure Machine Learning	20/10/2022	120	https://msevents.microsoft.com/event?id=1245885767
SQL Server 2022 et hybridation native avec Azure SQL Managed Instance	10/11/2022	120	https://msevents.microsoft.com/event?id=145826476
Machine Learning dans Azure Synapse Analytics	17/11/2022	120	https://msevents.microsoft.com/event?id=3637723312
Azure Cosmos DB et IA	24/11/2022	120	https://msevents.microsoft.com/event?id=2646013445
Azure et les Services Cognitifs	08/12/2022	120	https://msevents.microsoft.com/event?id=3772037220
La gouvernance de données dans Azure avec Microsoft Purview	15/12/2022	120	https://msevents.microsoft.com/event?id=1499560981
MLOps avec Azure Machine Learning	12/01/2023	120	https://msevents.microsoft.com/event?id=4115194515
Data processing dans Azure avec Azure Synapse, Azure Batch, Spark, Notebook, etc.	19/01/2023	120	https://msevents.microsoft.com/event?id=1537241181
Déploiement et sécurisation des workspace Azure Synapse	26/01/2023	120	https://msevents.microsoft.com/event?id=1806467748
Azure Machine Learning pour les Citizen Data Scientists	09/02/2023	120	En cours
PowerBI - Self Service Analytics	16/02/2023	120	https://msevents.microsoft.com/event?id=1401519679
L'IA responsable avec Azure machine learning	09/03/2023	120	https://msevents.microsoft.com/event?id=2072953112
Machine Learning dans Azure Synapse Analytics	16/03/2023	120	https://msevents.microsoft.com/event?id=3413014857
Les bases de données Open Source dans le cloud Azure	23/03/2023	120	https://msevents.microsoft.com/event?id=2727487131
Hybridation des services de Machine Learning Azure	06/04/2023	120	https://msevents.microsoft.com/event?id=1624914222
La gouvernance de données dans Azure avec Microsoft Purview	13/04/2023	120	https://msevents.microsoft.com/event?id=3909342839
Les solutions SQL dans Azure (PaaS, IaaS, SaaS)	04/05/2023	120	https://msevents.microsoft.com/event?id=1162207895
Data processing dans Azure avec Azure Synapse, Azure Batch, Spark, Notebook, etc.	16/05/2023	120	https://msevents.microsoft.com/event?id=3517068442
Hybridation des services de données Azure	24/05/2023	120	https://msevents.microsoft.com/event?id=2996507398
Self Service Analytics	01/06/2023	120	En cours

Applications, Tools, and T-SQL



SQL Server Management Studio (SSMS)

Windows Only
New 19.X version



Azure Data Studio

Powershell

sqlcmd

bcp

Tabular Data Stream (TDS) 8.0 and T-SQL

SSRS and SSAS in SQL Server 2022

SSAS

- Power BI support for SQL Server 2022 Analysis Services tabular models as a DirectQuery connection for composite models
- Improved MDX query performance
- Improved resource governance
- Query interleaving now includes short query bias with fast cancellation

SSRS

- Enhanced Windows Narrator support for the new Windows OS (Operating Systems) and Windows Server
- Security enhancements
- Browser performance improvements with Angular
- Accessibility bug fixes
- Support for SQL Server 2022 instances report server catalog
- Reliability updates

What is a hybrid data platform?



A product or service offered both on-premises and the cloud with consistency



A product on-premises connected to the cloud to enhance data capabilities



Notes about Synapse Link

Catalog views, DMVs, and Extended Events for monitoring and debugging

Datatypes not supported include image, text, xml, timestamp, UDT, geometry, geography

Can't be used with database that use these: temporal, memory optimized, CDC, columnstore, graph

Use scheduled mode to spend less on ingestion

Create separate linked connections for same databases to separate ingestion

Only committed transactions sent to Landing Zone (LZ)

"Think" replication. Transaction commit not affected but log can't be truncated until committed in LZ

Landing Zone is cleaned up periodically for files no longer needed

aka.ms/synapselinksqldb

