Azure SQL DB Managed Instance

A *Mostly* Full-Featured SQL Server in the Cloud

Chris Seferlis

youtube.com/bizdataviz
chris@bizdataviz.com

t: @bizdataviz
in: cseferlis

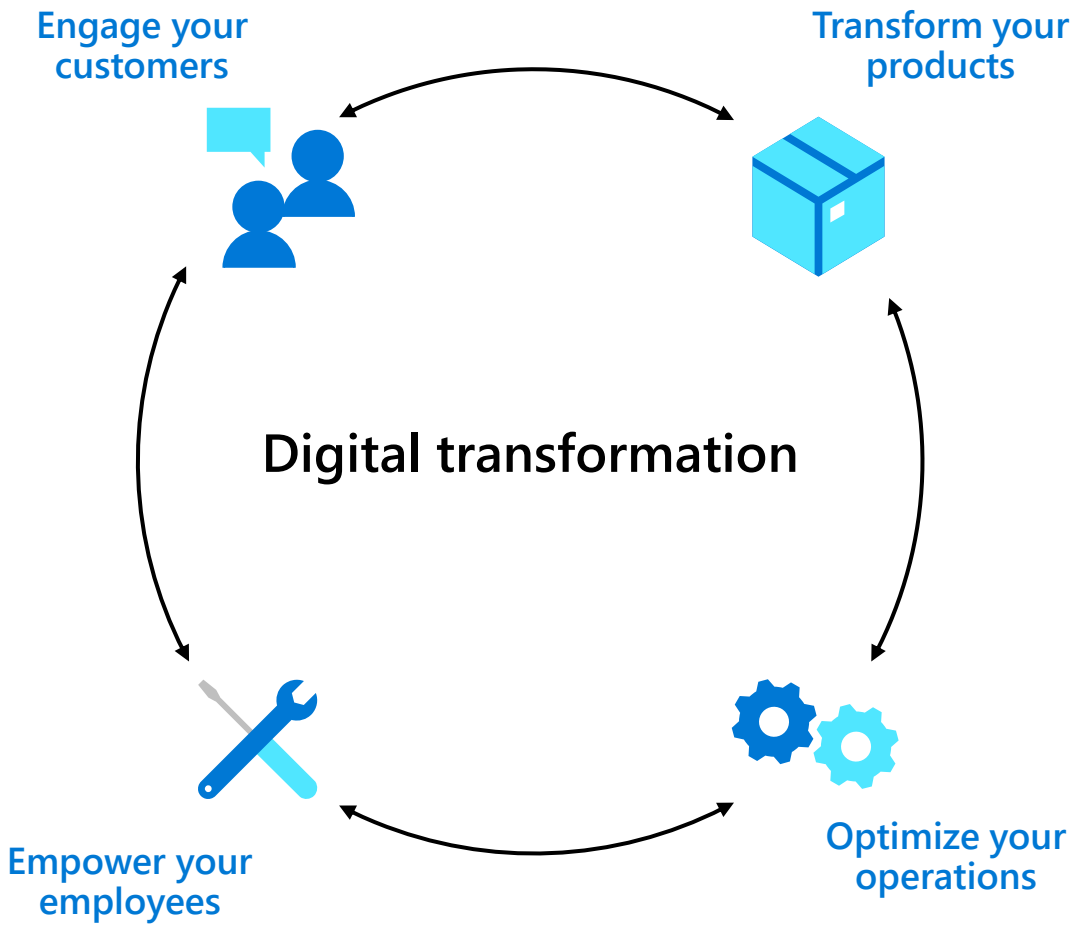
About me:

- Microsoft Sr Azure Data Specialist
- Former CIO – 20+ years in IT
- Worked with Microsoft Data Platform for ~12 years
- MBA from UMass
- Speak, blog, tweet @bizdataviz
- US Army Veteran
- LinkedIn: cseferlis
- Youtube.com/bizdataviz

Things to note

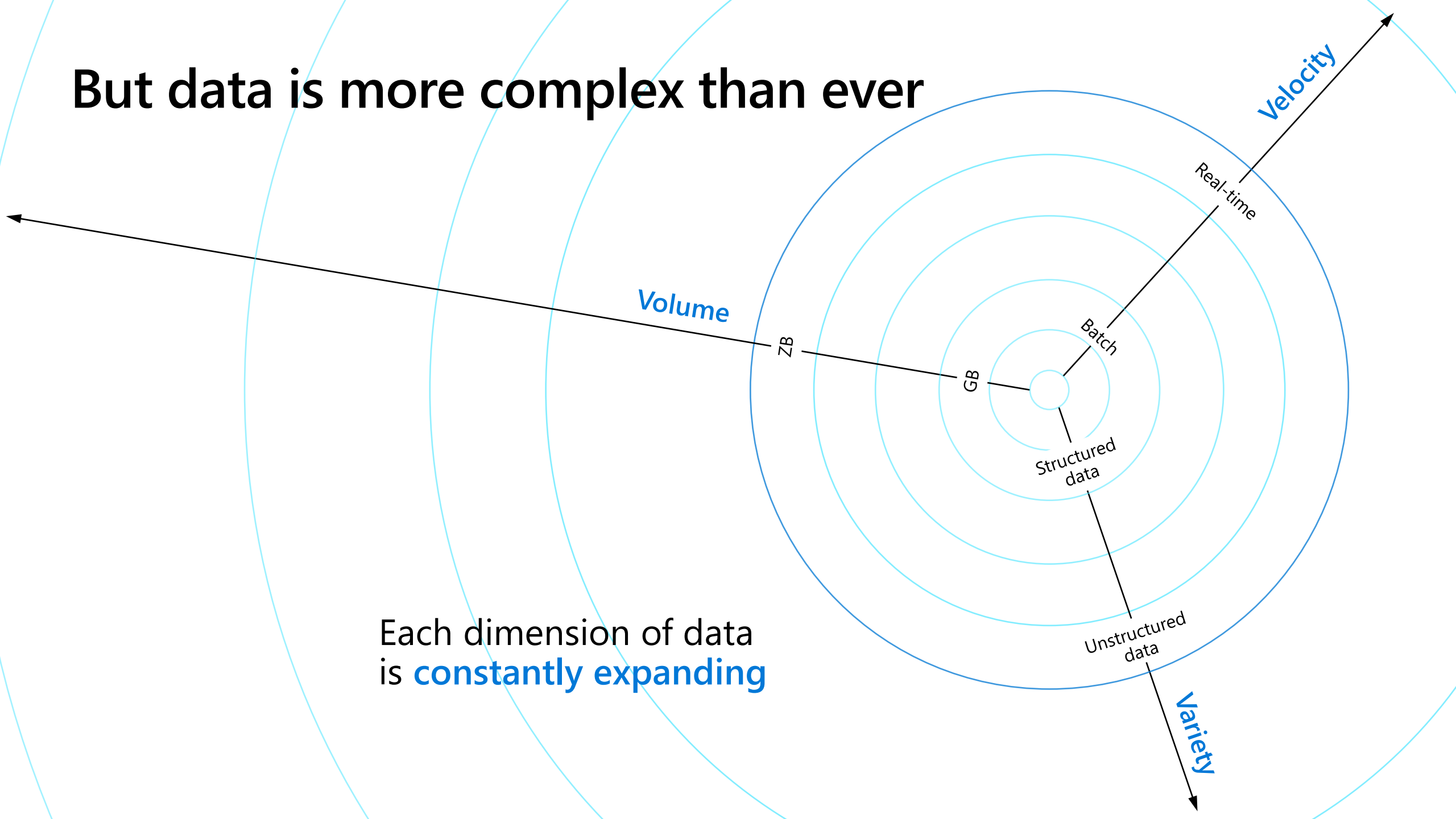
- There are no right or wrong solutions – only optimal solutions
- We lead with certain solutions and customize based on customer scenarios
- Customer voice and product/service maturity governs lead solutions
- Consider price/perf, ease of use, ecosystem acceptance as factors
- Competitor SWOT also plays a role
- Everything is fluid – what is a lead solution today, may become non-optimal tomorrow, based on above factors and new releases

Technology is shaping how businesses innovate and grow



Since 2000: **52%** of Fortune 500 Companies are gone!

But data is more complex than ever



Each dimension of data
is **constantly expanding**

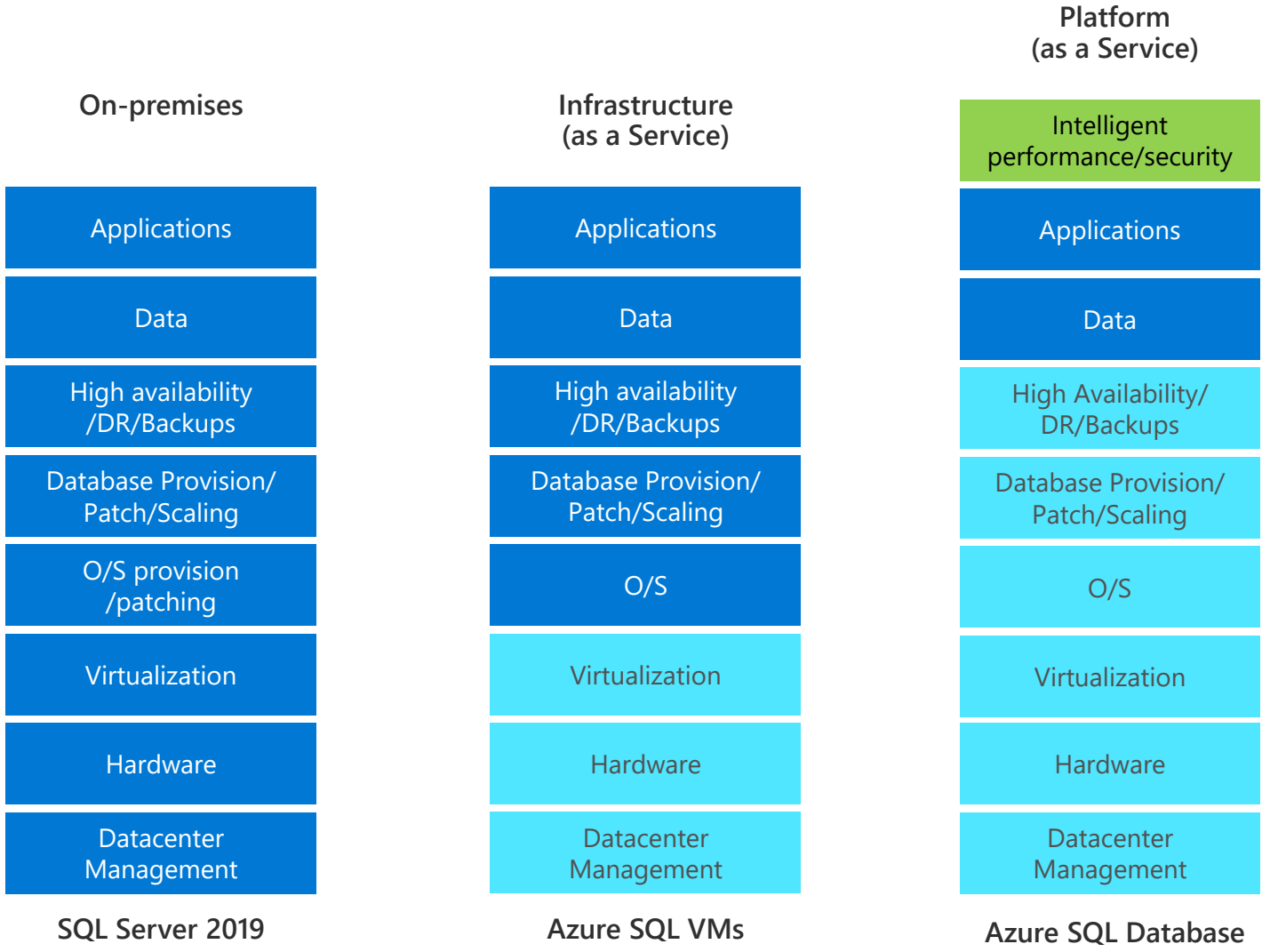
Saving opportunity for modernizing your data estate is significant

On-premises costs tend to be driven by hardware and data center management costs

Infrastructure-as-a-Service reduces cost categories related to data center and compute

Platform-as-a-Service off-loads customers' most administrative tasks to Azure, further improving efficiency with machine-learning capabilities for performance and security

- **Managed Instance**: instance-level deployment for lift-shift existing apps to Azure, fully backward compatible
- **Single database**: database-level deployment for new apps



Focus on your business

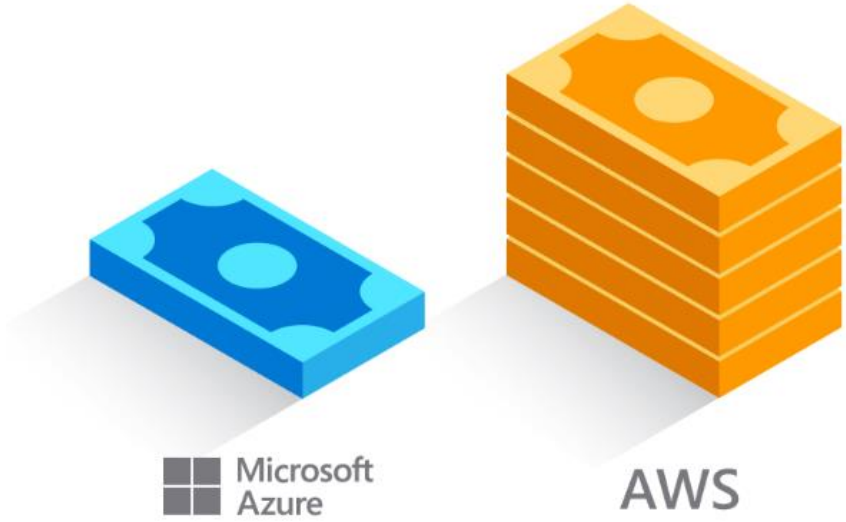
Your work so far	How SQL Database helps
Hardware purchasing and management	**Built-in** scale on-demand
Protect data with backups (with health checks and retention)	**Built-in** point-in-time restore
High availability implementation	**Built-in** up to 99.995% SLA and auto-failover
Disaster recovery implementation	**Built-in** geo-redundancy and geo-replication
Ensure compliance with standards on your own	**Built-in** easy to use features
Secure your data from malicious users and mistakes	**Built-in** easy to use features
Role out updates and upgrades	**Built-in** updates and upgrades
Monitor, troubleshoot, and manage at scale	**Built-in** easy to use features
Tune and maintain for predictable performance	**Built-in** easy to use features

We take care of database chores

Azure is the most cost-effective cloud for SQL Server

Azure Hybrid Benefit, an Azure-only benefit for customers with active SA or subscriptions on SQL Server cores

- Significantly reduce the costs of migrating to the cloud
- Pay only the 'base rate' in Azure on SQL Server on Azure VM (IaaS), Azure SQL Database (Paas), and ADF v2 SSIS
- Available for SQL Server core licenses only
- Customers can use on premises cores or cloud vCores
- Cores can be used on-premises and in Azure simultaneously for up to 180 days, to allow for migration



AWS is 5x more expensive than Azure

Azure vs. AWS homepage
5x substantiation page

The Total Economic Impact of Azure SQL Database Managed Instance

Microsoft commissioned Forrester Consulting to conduct a Total Economic Impact™ study to examine potential cost savings and business benefits enterprises would achieve from migrating on-premises workloads to Azure SQL Database Managed Instance.

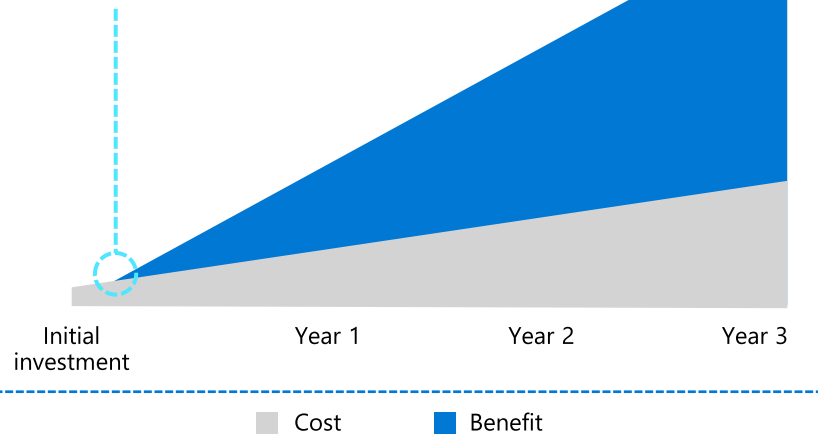
Key report benefits and findings

212% Total ROI

3 years after initial investment & migration to Azure SQL Database Managed Instance

6 months or less

Payback post migration



$1.8M

Savings from avoided hardware, network, storage and ongoing maintenance costs

40%

Improvement in productivity for in-house DBAs

20%

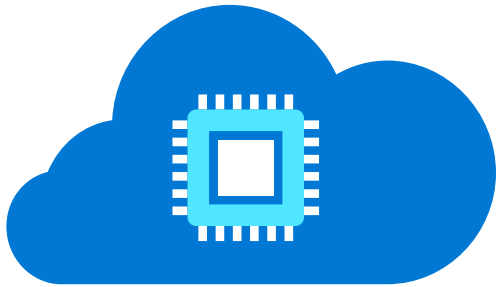
Increase in productivity for IT teams

> **Azure SQL Database Managed Instance** is part of our strategic mandate to move all of our application, database, and services footprint to the Azure cloud. **We can quickly integrate and are more nimble and more efficient as a result.**
>
> *Head of development, technology company*

Download the full Total Economic Impact™ of Azure SQL Database Managed Instance report at aka.ms/ForresterTEI_SQLDB_ManagedInstance

SQL on Azure: committed to choice

What is a virtual core (vCore)?



Flexible, transparent, independently-defined resource options

- Representation of compute power in the cloud via the logical CPU available for your server
- Configure compute and storage independently
- Enables right-sizing the destination environment by translating on-premises requirements
- Best if you value flexibility, control and transparency

Choose from three storage architectures in the vCore-based model

	General purpose	Hyperscale	Business critical
Best for	Most budget-oriented workloads	VLDB workloads with highly scalable storage and read-scale requirements	Critical business applications with high IO requirements.
Compute tiers	1, 2, 4, 8, 16, 24, 32, 40, 80 vCores		
Storage	**Premium remote** 32GB – 8TB per instance	**Local SSD** Supports up to 100TB of storage	**Local SSD** 32GB – 4TB per instance
HA	1 replica, no read-scale	Multiple replicas, up to 15 read-scale, partial local cache	3 replicas, 1 read-scale replica, zone-redundant HA
In-Memory	Not supported	Not supported	Supported

The vCore-based model opens the door to additional savings from Azure Hybrid Benefit, reserved capacity pricing and dev/test pricing

Azure SQL Databases

Azure SQL Database deployment option

Azure SQL Database

Single

Database-scoped deployment option with predictable workload performance

Best for apps that require resource guarantee at database level

Elastic Pool

Shared resource model optimized for greater efficiency of multi-tenant applications

Best for SaaS apps with multiple databases that can share resources at database level, achieving better cost efficiency

Managed Instance

Instance-scoped deployment option with high compatibility with SQL Server and full PaaS benefits

Best for modernization at scale with low friction and effort

Service Tiers

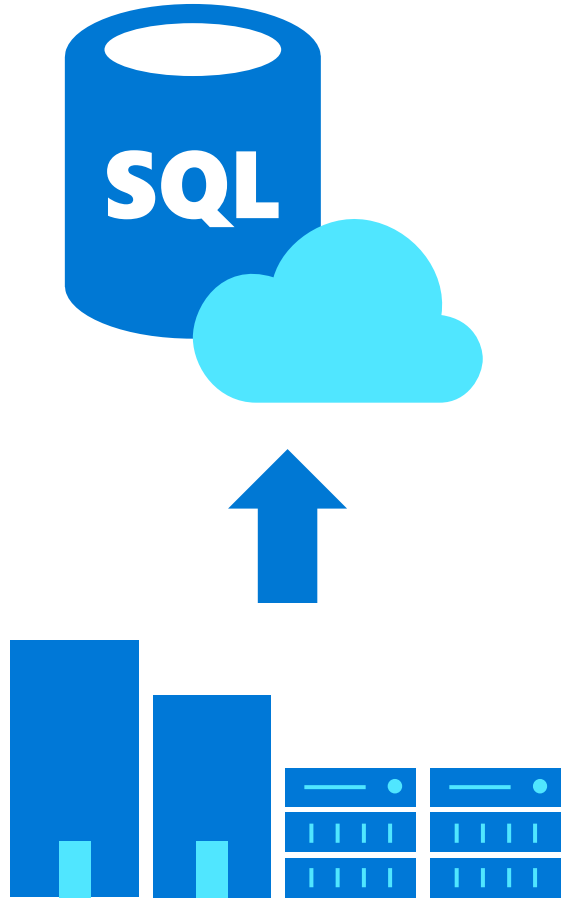
- General Purpose
- Business Critical
- Hyperscale
- Serverless

Azure SQL Database Managed Instance

Combining the best of SQL Server with the benefits of a fully-managed, intelligent service

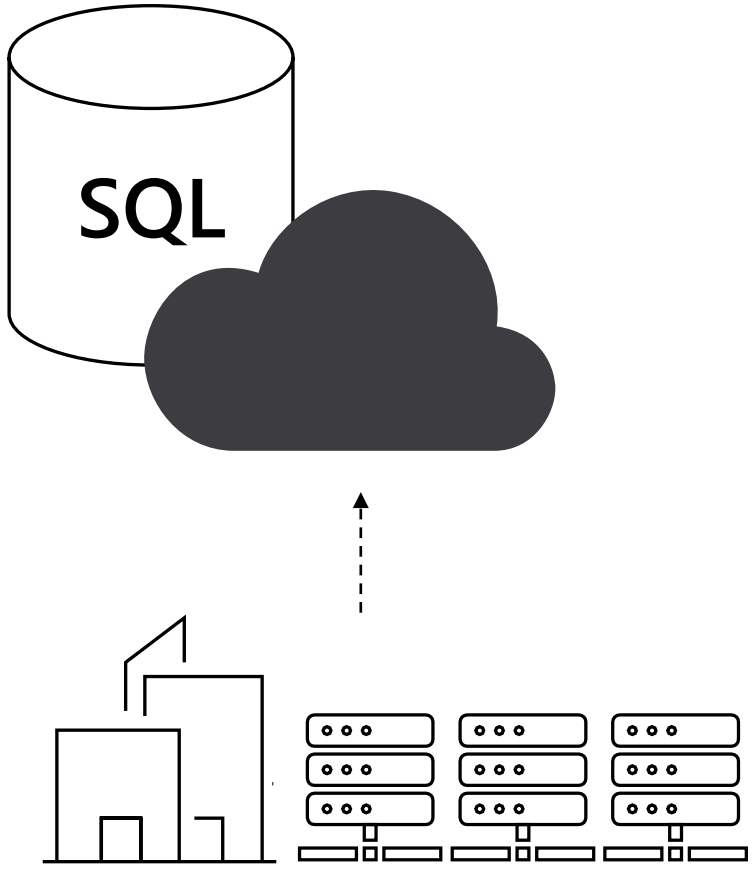
- Full SQL Server surface area
- Native VNET integration
- Always up to date
- Built-in HA with Always-on
- Up to 99.995% SLA out of the box
- Built-in intelligent performance and security

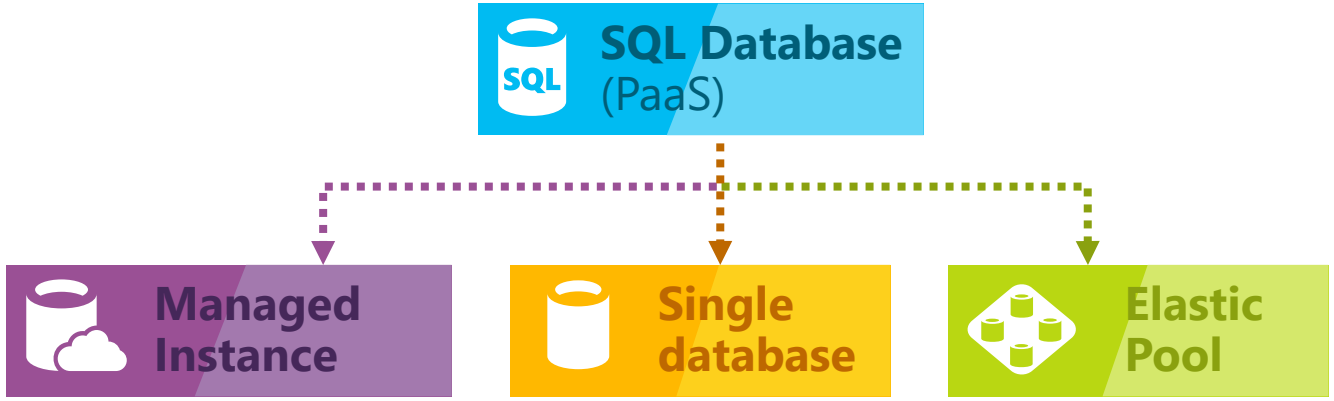
Migrating to Managed Instance means virtually no code changes to your apps



Who is Managed Instance for?

Customers looking to **migrate a large number of apps** from on-premise or IaaS, self-built or ISV provided, with as **low migration effort as possible** & **cost being a crucial factor**





Fully-managed service

- Built on the same infrastructure as SQL Database
- Provides the same benefits (PaaS)

SQL Server compatibility

- Fully-fledged SQL instance with nearly 100% compat with on-premise

Full isolation and security

- Contained within your VNet
- Private IP addresses
- Express Route / VPN connectivity

New pricing options

- Transparent
- Frictionless
- Competitive

Put your DBs on autopilot and focus on your business…

Tired of managing hardware, software & business continuity?

You can stop doing it, Managed Instance has it built-in	
✓	Compute & storage provisioned on demand Fast & online scaling Full stack updates and patches
✓	Backups with health checks Point-in-time restore (configurable retention*)
✓	99.99% availability with automatic failover Disaster recovery with single geo secondary (multiple*)

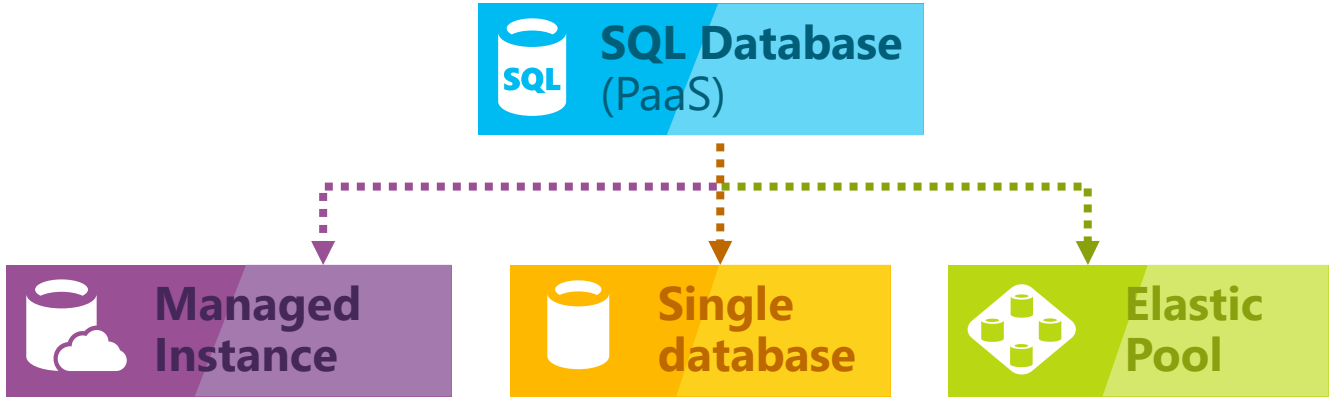
* - features coming soon

Put your DBs on autopilot and focus on your business…

Is it hard to secure data and ensure standards compliance?
Is it hard to monitor and tune all your workloads?

It's much easier with the Managed Instance	
✓	Compliance with all major industry standards Threat detection with automatic alerting
✓	Intelligent query processing Automatic performance tuning*
👍	Monitoring at scale with Intelligent Insights Data discovery and classification* Vulnerability assessment

* - features coming soon



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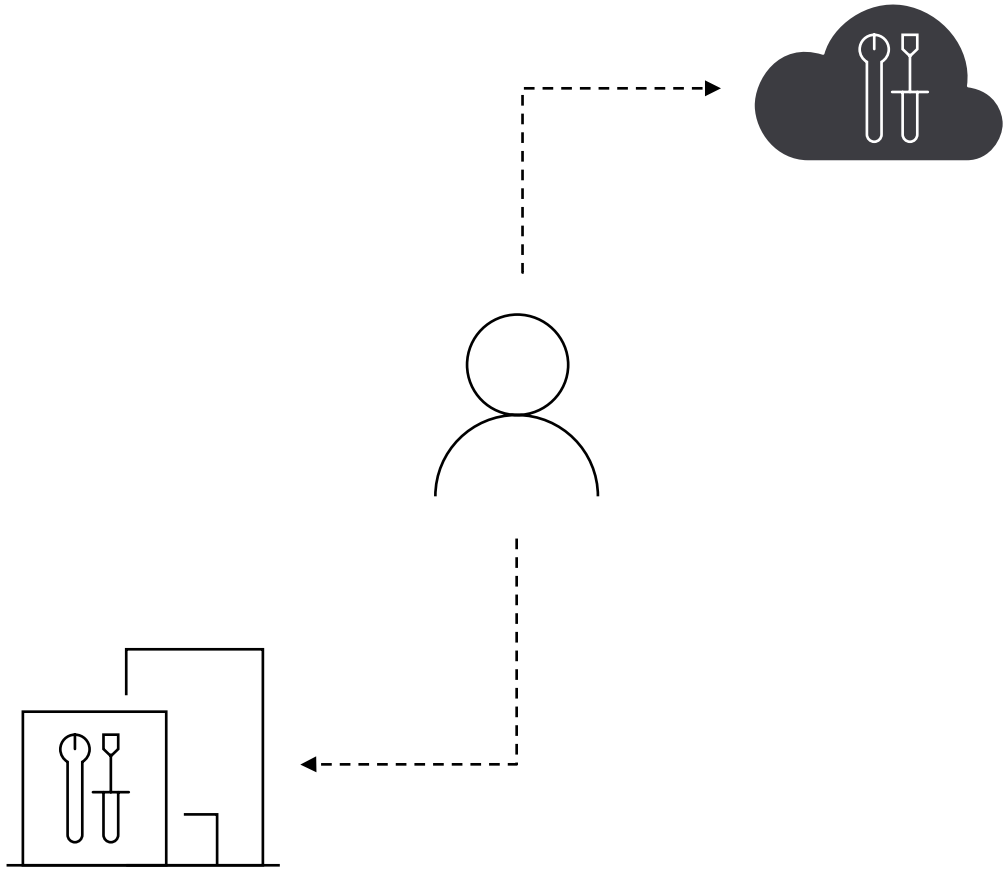
Save time with familiar SQL Server tools and resources

Eliminate app changes with full SQL Server programming surface

Use familiar SQL Server features in SQL Database Managed Instance

Full compatibility with SQL Server 2005+



Easily migrate from SQL Server & modernize

How many of your applications could migrate today?

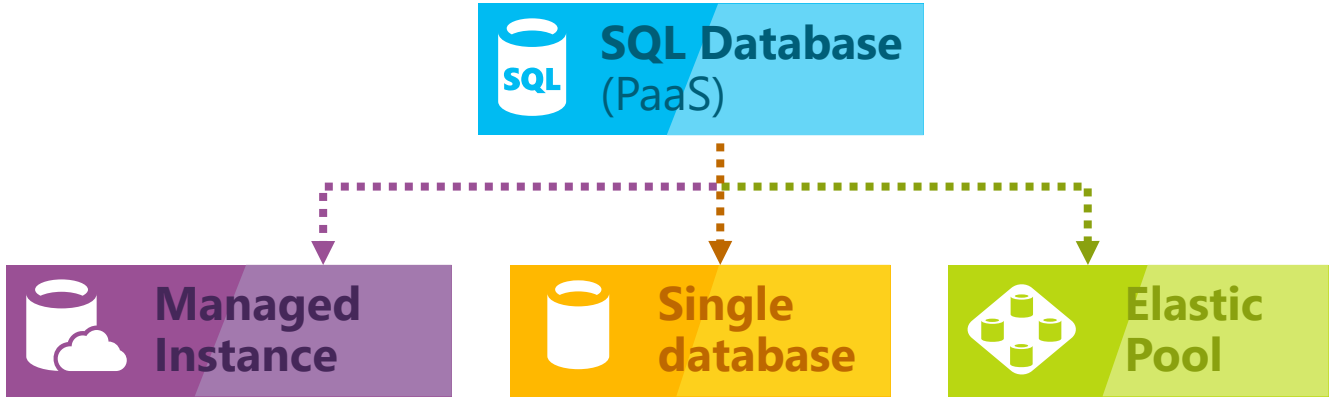
Most of them, because Managed Instance is compatible	
✓	Cross-DB queries & transactions, linked servers to SQL .NET CLR modules Service Broker Change Data Capture Transactional Replication
✓	Choice of instance collations and instance time zone R services*
🕒	MSDTC for distributed transactions Filestream / Filetable, Polybase

* - features coming soon

Easily migrate from SQL Server & modernize

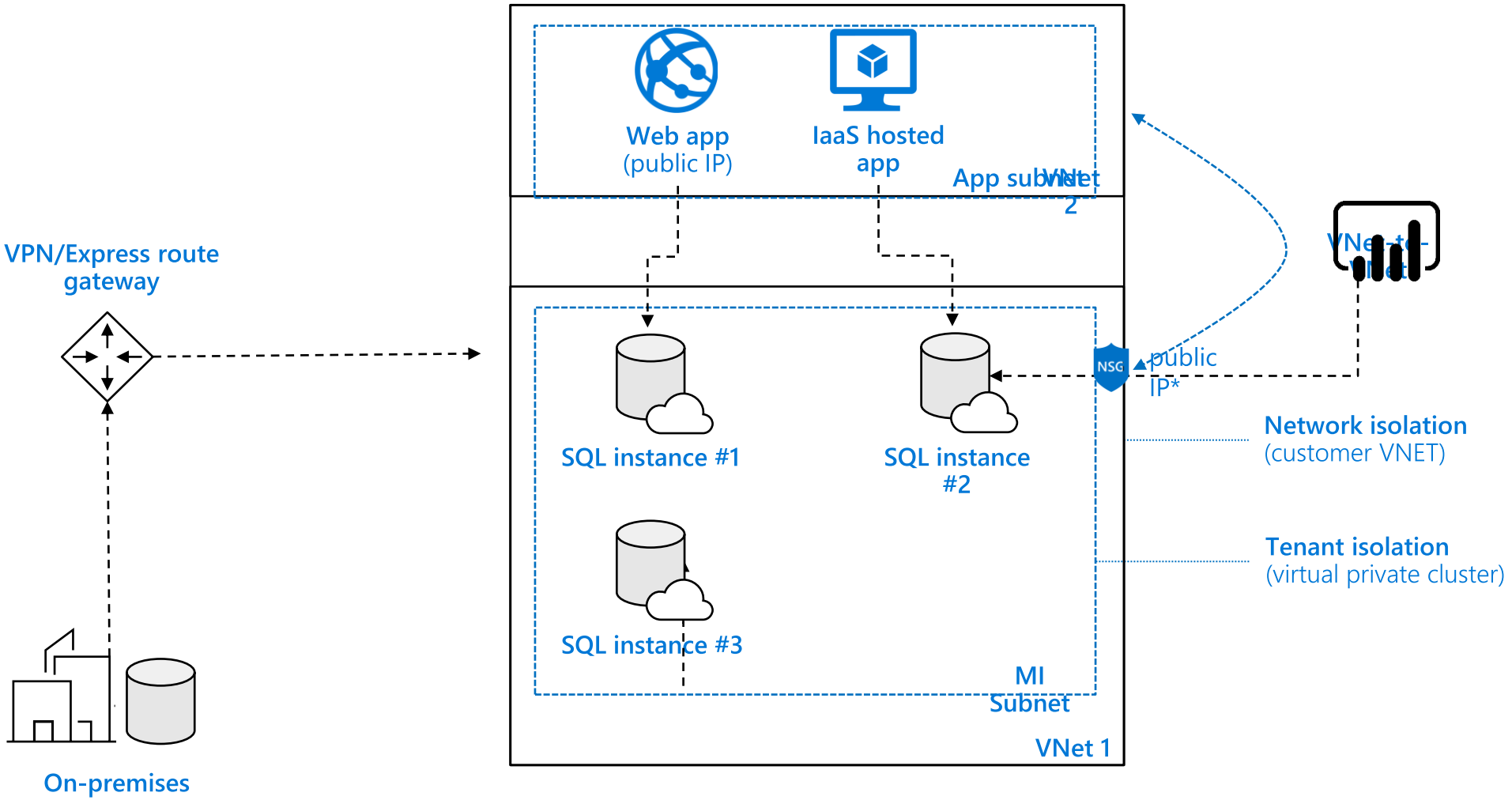
Will your IT face a steep learning curve or feel loss of control?

No, because Managed Instance lets you modernize at your pace	
✓	DMVs, XEvents, Query Store SQL Agent and DB Mail sysadmin privileges and Resource Governor
☁	Built-in HA replaces on-prem setups Replace MDW with OMS monitoring
✓	SQL Auditing, Row Level Security TDE, Always Encrypted, and Dynamic Data Masking
☁	Network security with VNETs and private IPs Integrated auth. with Azure AD

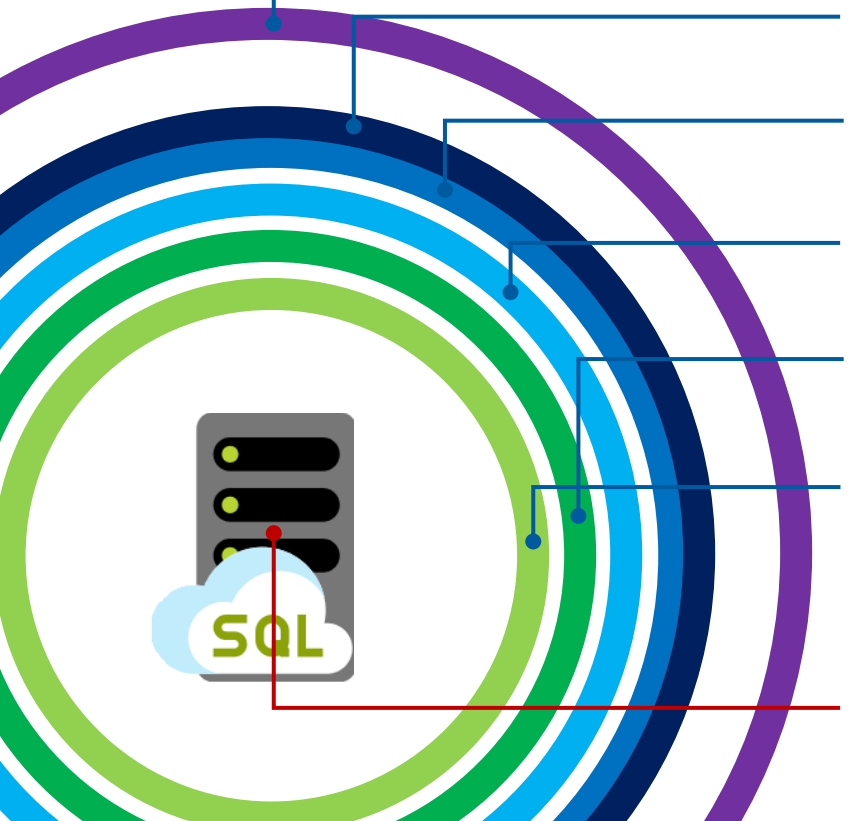


Fully-managed service	SQL Server compatibility	Full isolation and security	New pricing options
• Built on the same infrastructure as SQL Database • Provides the same benefits (PaaS)	• Fully-fledged SQL instance with nearly 100% compat with on-premise	• Contained within your VNet • Private IP addresses • Express Route / VPN connectivity	• Transparent • Frictionless • Competitive

Isolation and connectivity of Managed Instance



Enterprise-grade security that is easy to use



PHYSICAL SECURITY

NETWORK SECURITY

CLUSTER SECURITY

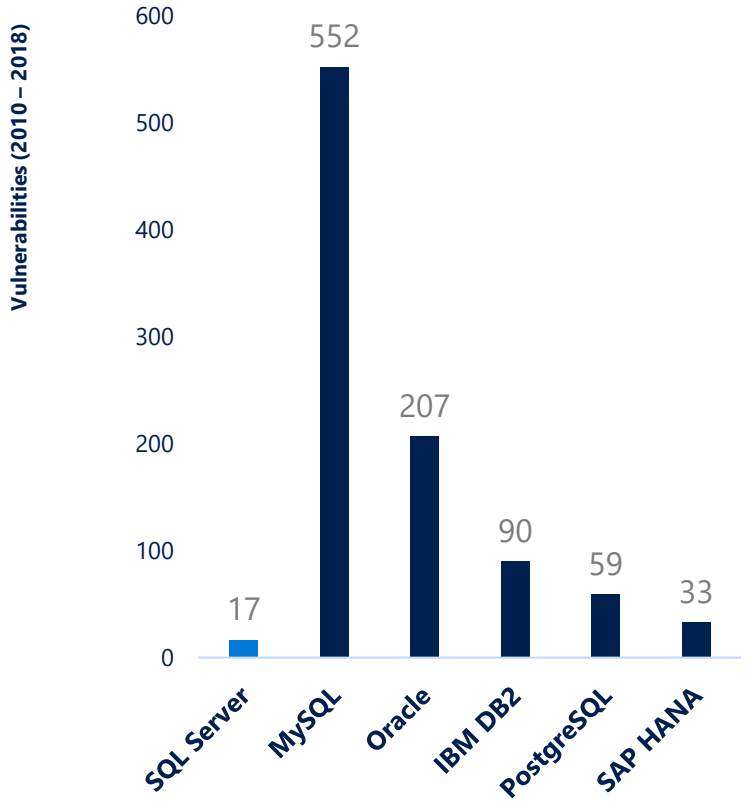
ACCESS MANAGEMENT

THREAT PROTECTION

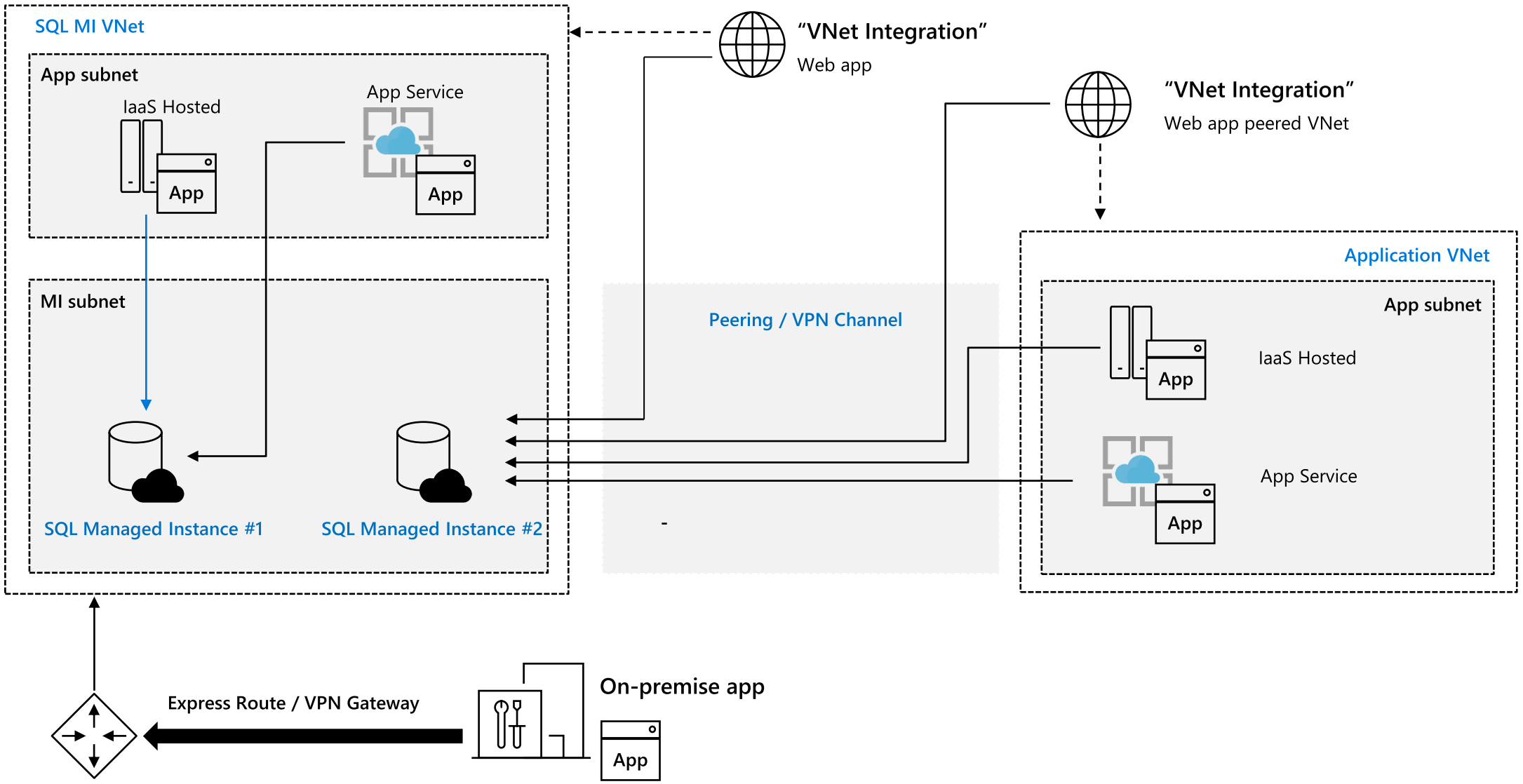
INFORMATION PROTECTION

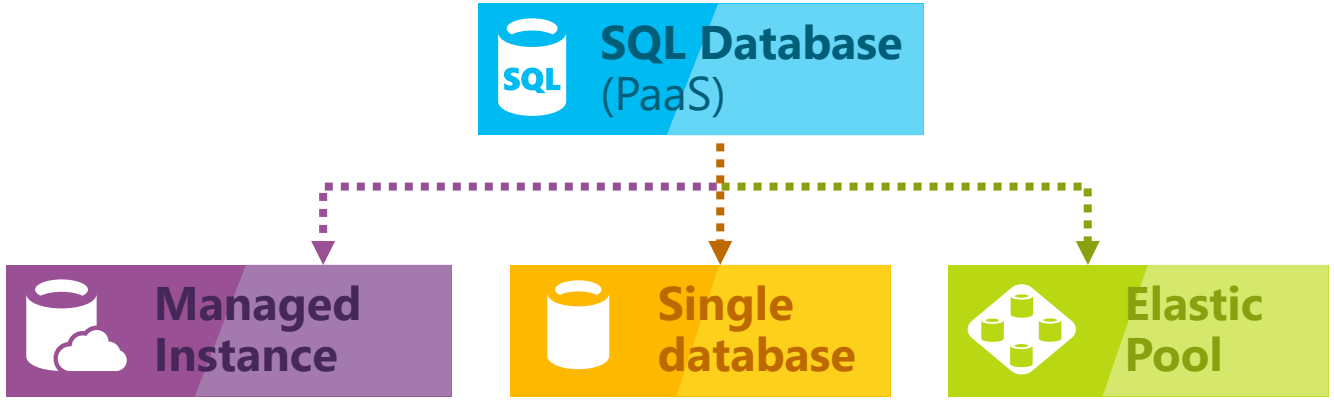
CUSTOMER DATA

Trusted: most secure over last 7 years



Host your application in the cloud or keep on-premises





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Managed Instance: Service Tiers

Capability \ Service tier	General Purpose	Business Critical
Best for	Apps with typical availability and common IO latency requirements	Apps with highest availability and lowest IO latency requirements.
Compute (vCores)	4, 8, 16, 24, 32, 40, 64, 80	4, 8, 16, 24, 32, 40, 64, 80
HA / Recovery Time Objective	Remote storage based / Good	Always On AG based / Better
Storage type / size	Fast remote (Azure Premium) / Up to 8 TB	Super-fast local SSD / Up to 4 TB
Read scale out (read-only replica)	No	Yes
In-Memory OLTP	No	Yes
Price competitive with AWS?	Yes, ~33% lower (license included)	Yes, ~46% lower (license included)

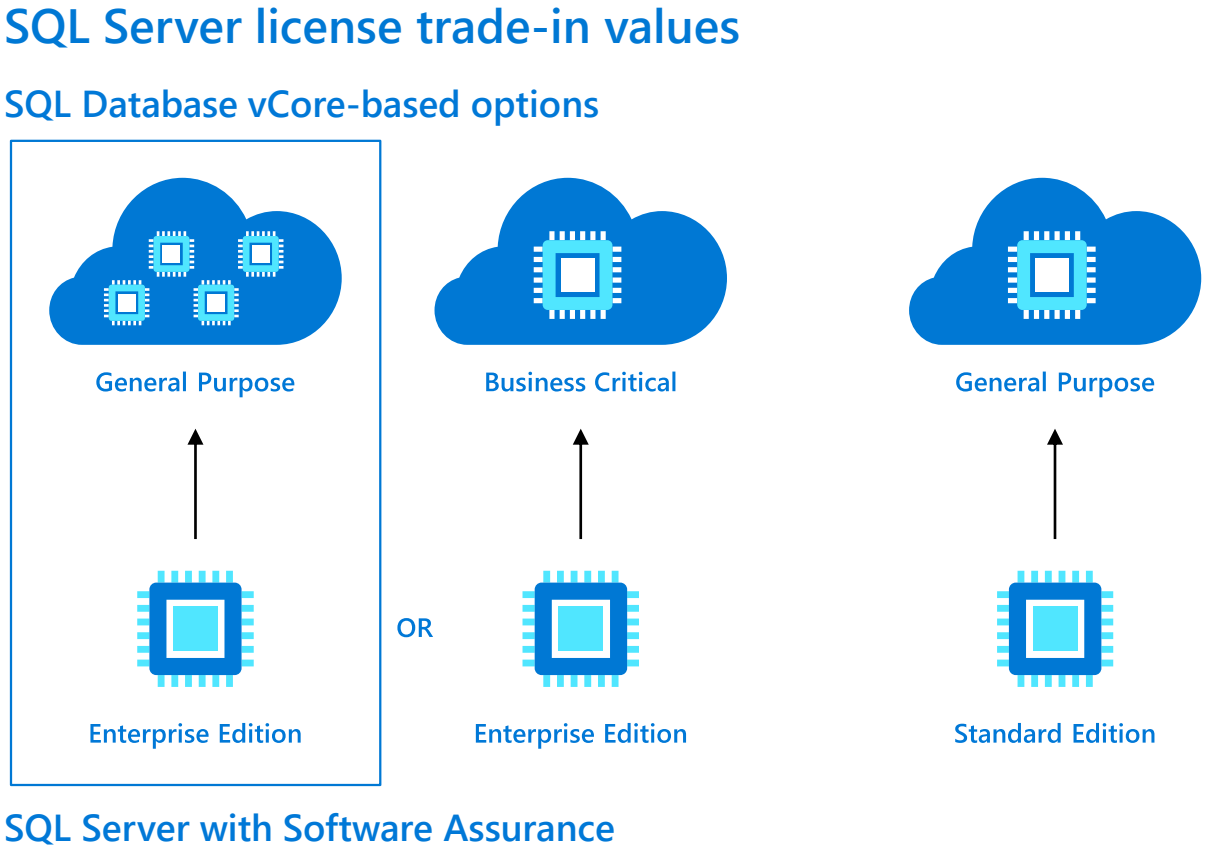
Note: pricing for an Azure SQL DB Managed Instance on US East price, under fully priced model (license included), on Sept 14, 2018. Comparable AWS RDS SQL is db.r3.2xlarge. AWS prices based on US East (N. Virginia). SE single AZ in AWS RDS compared to SQL MI General Purpose. EE multi-AZ in AWS RDS compared to SQL MI Business Critical.

Unique benefit for highly virtualized workloads

Azure Hybrid Benefit for SQL Server provides a unique benefit for highly virtualized workloads

Convert on-premises cores to vCores to maximize value of investments

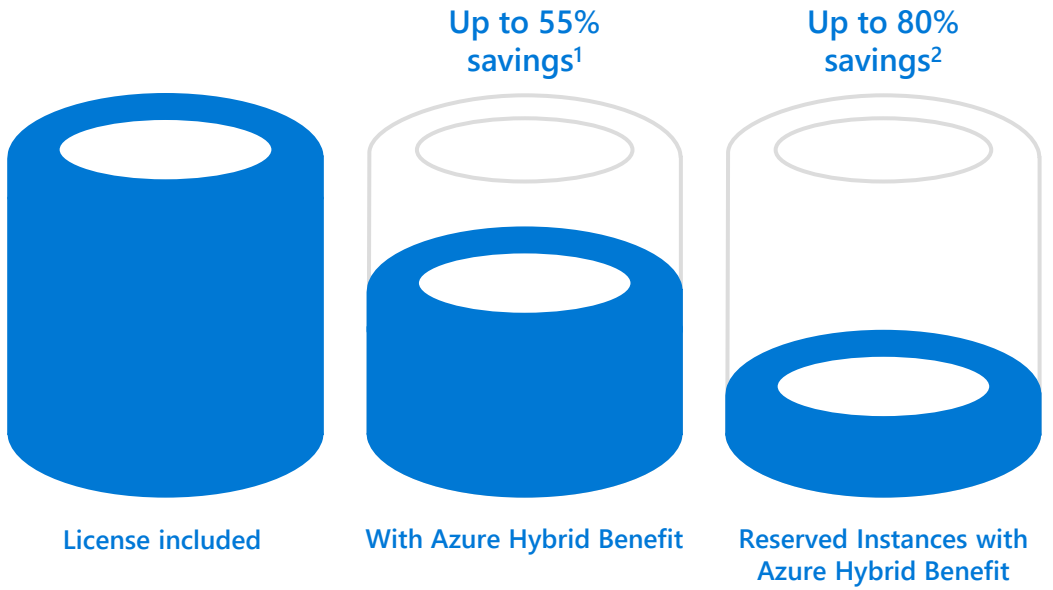
1 Enterprise license core =
4 General Purpose cores (virtualization benefit)



Reserved Capacity for Azure SQL Database

Prepay Azure SQL Database resources in advance and save up to 33%

- Budget and forecast better with upfront payment for one-year or three-year terms
- Exchange or cancel reservations as your needs evolve
- Scale up or down within a performance tier and region with auto-fit
- Move SaaS apps between elastic pools and single databases and keep your reserved instance benefit



[1] Savings based on eight vCore Managed Instance Business Critical in East US Region, running 730 hours per month. Savings are calculated from full price (license included) against base rate (applying Azure Hybrid Benefit for SQL Server), which excludes Software Assurance cost for SQL Server Enterprise edition, which may vary based on EA agreement. Actual savings may vary based on region, instance size and performance tier. Prices as of May 2018, subject to change.

[2] Savings based on eight vCore SQL Database Managed Instance Business Critical in West 2 US Region, running 730 hours per month. Savings are calculated from on demand full price (license included) against base rate with Azure Hybrid Benefit plus 3-year reserved capacity commitment. Savings excludes Software Assurance cost for SQL Server Enterprise edition, which may vary based on EA agreement. Actual savings may vary based on region, instance size and performance tier. Prices as of May 2018, subject to change.

Roadmap

App development made easier!

Recently added features:

- Local time zone
- Custom instance collation
- Public endpoint
- 4 vCore instances, instance pools
- Dev/test offer
- AAD instance logins
- Failover groups

SQL MI is always on Evergreen SQL version

Take advantage of rich development feature set (**In-Memory OLTP, Columnstore, Temporal, JSON, Graph Database,** etc.)

Certify your code for database compatibility level not for an engine version!

Microsoft Database Compatibility Level Protection:

Full functional protection once assessment tool runs clean.

Overall process

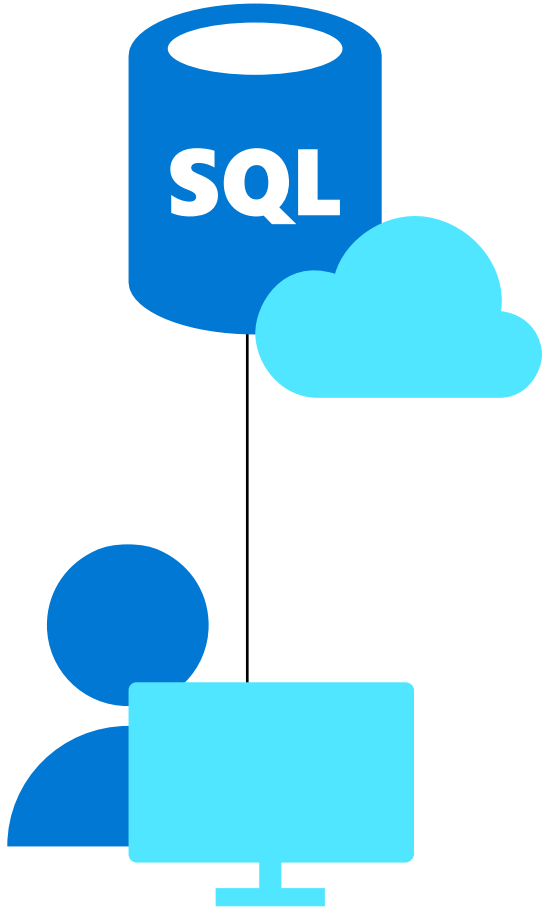
1. Use **Database Migration Assistant** and **Database Experimentation Assistant** for assessment.
2. Keep source Database Compatibility Level on target.
3. Perform minimal testing or as determined by your organization

Azure Dev/Test pricing for SQL Database

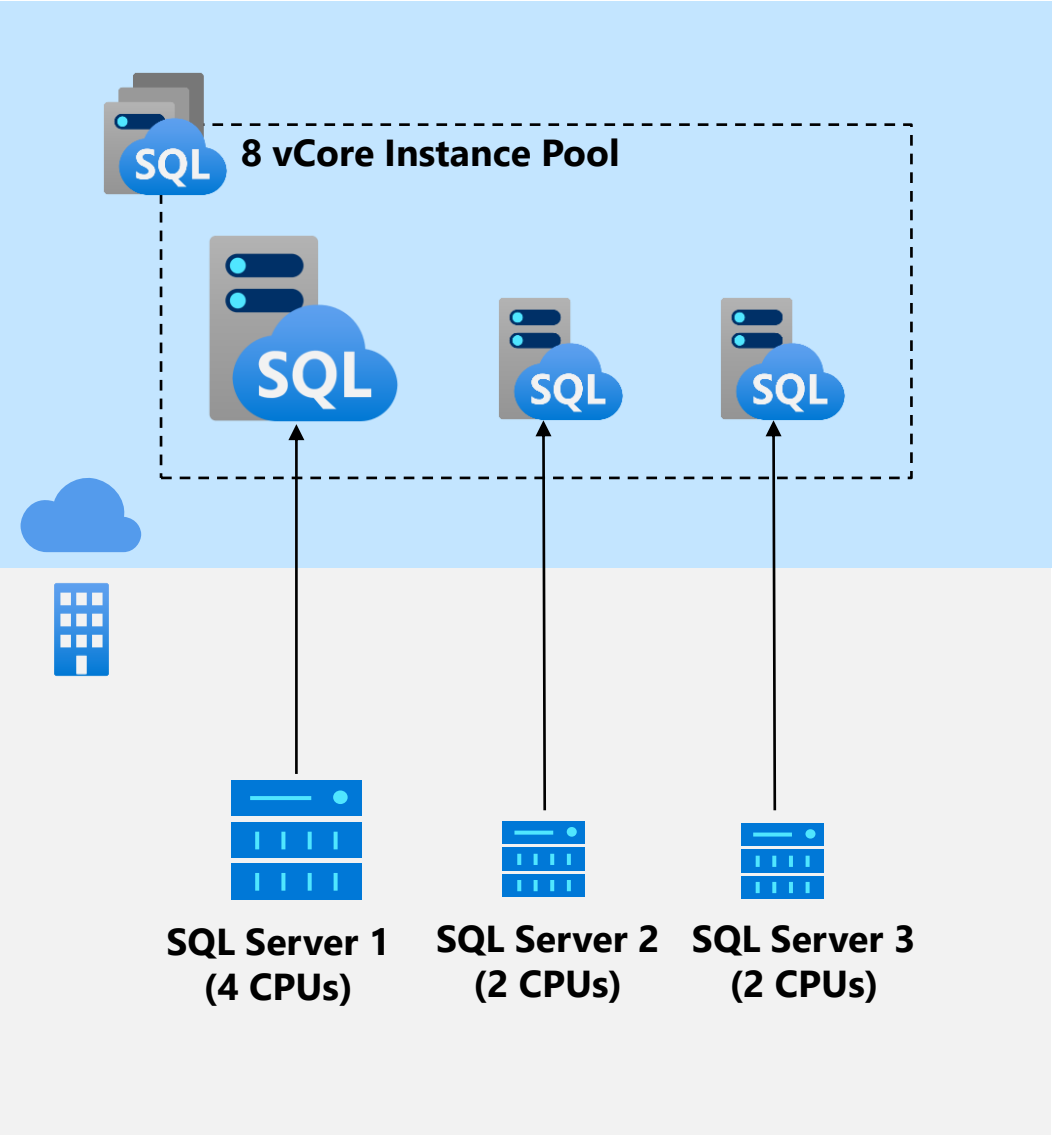
Discounted rates up to 55% off to support your ongoing development and testing

Dev/Test pricing available for vCore-based deployment options

Eligible with active Visual Studio subscription



Instance Pools (in public preview)



Leverage 2vCore instance size available in pools only

Benefit from fast provisioning and scaling and the smallest IP address footprint

Scenarios

- Small instance size consolidation (2v Cores)
- Dev/test/lab with fixed budget
- Cost effective active database archive

Try out instance pools and influence product roadmap. Share your feedback with ***MDCS SQL Managed Instance PMs*** *mdcssqlmipm@microsoft.com*

Features

FY19 H2
Jan-Jun 2019

https://feedback.azure.com/forums/915676-sql-managed-instance

FY20 H1
July-Dec 2019

App compat
- Custom time-zones (non-UTC)
- Rename database

Networking and connectivity
- Removing the Internet and Azure DNS dependencies
- Optional public endpoint (easy integration with PaaS services)
- Redirect connection type

Deployment
- 4 vCore instances
- MSDN subscriptions, larger quotas

PaaS
- Geo-restore
- Data discovery and classification

Regional Availability
- UK South, West US , UAE, South Africa, Australia Central, France South, Brazil South, South Africa, UAE

App compat
- Trace flag support
- AAD logins (GA)

Network and connectivity
- Intrusion prevention: inbound limited to Management IP ranges
- Use of Service Endpoints enabled

Deployment
- Instance pools (preview)

PaaS
- Failover Groups (GA)
- TDE BYOK (GA)
- PITR for deleted databases (Portal)

Regional Availability
- Germany, Switzerland
- Sovereign clouds (US, China)
- Norway

SQL MI Roadmap CY2020 (1)

Limitless storage scale, read scale out

Hyperscale service tier in SQL MI

SQL MI Roadmap CY2020 (2)

Modern development scenarios and increased app compat

- [ ] **Data virtualization and querying external big data stored in Azure**
- [ ] **ML Services: Python & R**
- [ ] **Distributed transactions between SQL MI instances**
- [ ] **Hosting SSRS databases on SQL MI, support for all SSIS deployment models with ADFv2**

SQL MI Roadmap CY2020 (3)

Improved availability

- [ ] **Maintenance policy**
- [ ] **Accelerated database recovery (ADR)**
- [ ] **Long-term backup retention (LTR)**

SQL MI Roadmap CY2020 (4)

Networking security and connectivity options

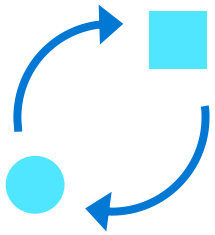
- [ ] **Instance aliases**
- [ ] **Service Endpoint Policies for Azure Storage**
- [ ] **Global peering**
- [ ] **Heterogeneous resources allowed within MI subnet**

Migrations

Migrate to the cloud with Azure SQL Database

Unparalleled security and performance of SQL in a fully managed environment

Seamless and compatible



The broadest SQL Server compatibility and VNET support

Competitive TCO

Up to 80% savings with Azure Hybrid Benefit and reserved capacity

Breakthrough productivity & performance

Up to 100 TB of on-demand scalable storage per DB

Industry-leading security

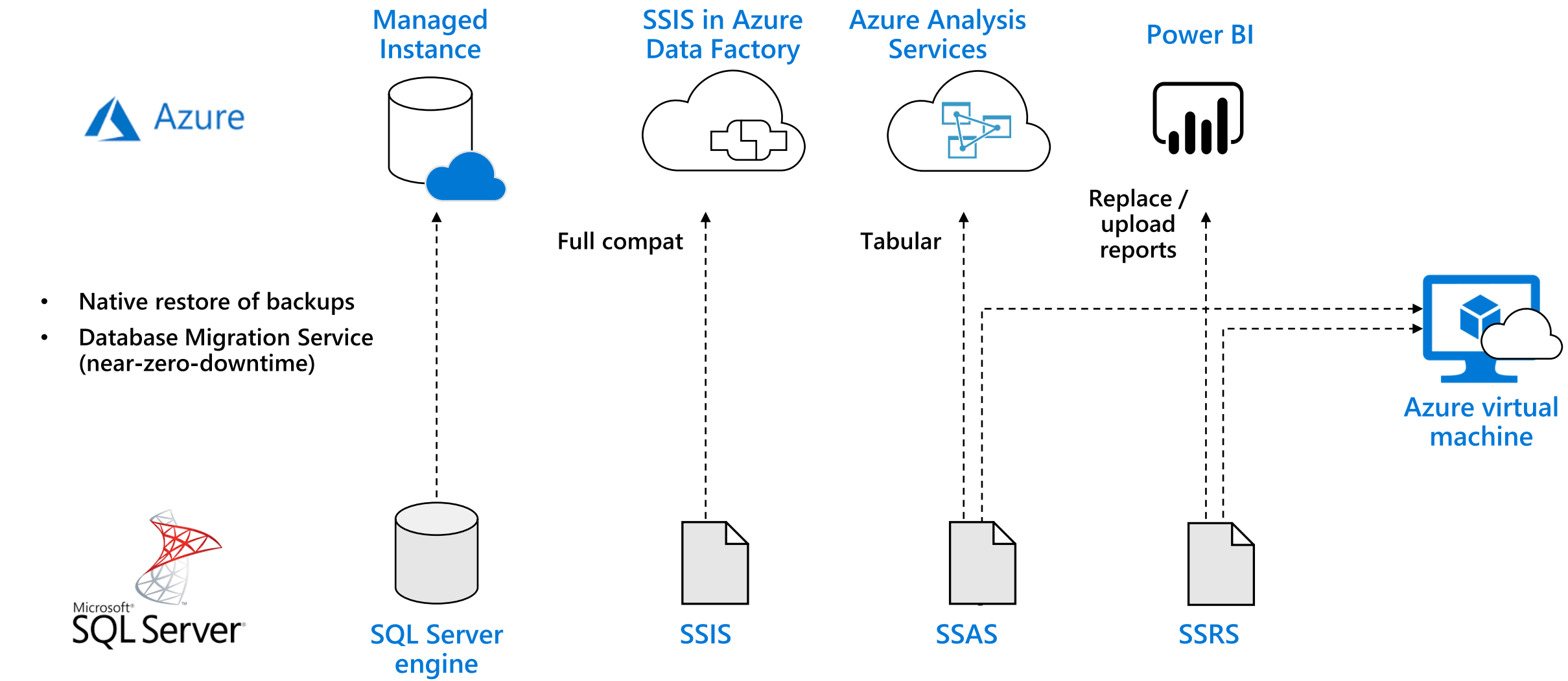
Layers of security and up to 99.995 percent availability SLA

Built-in intelligence

Intelligent performance tuning and intelligent protection

The best and most economical cloud destination

Migration to Azure



- Native restore of backups
- Database Migration Service (near-zero-downtime)

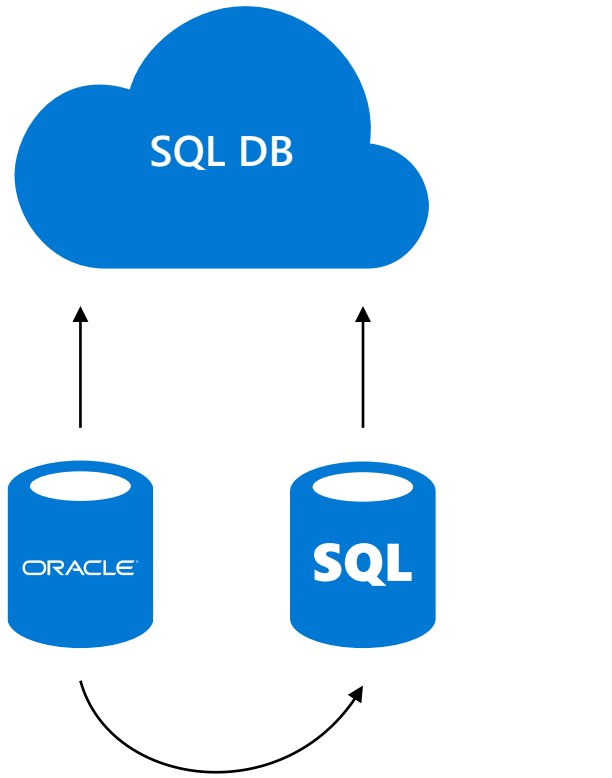
Accelerate the journey with Azure Database Migration Service

Fully managed Azure service platform for seamless and frictionless data migration at scale

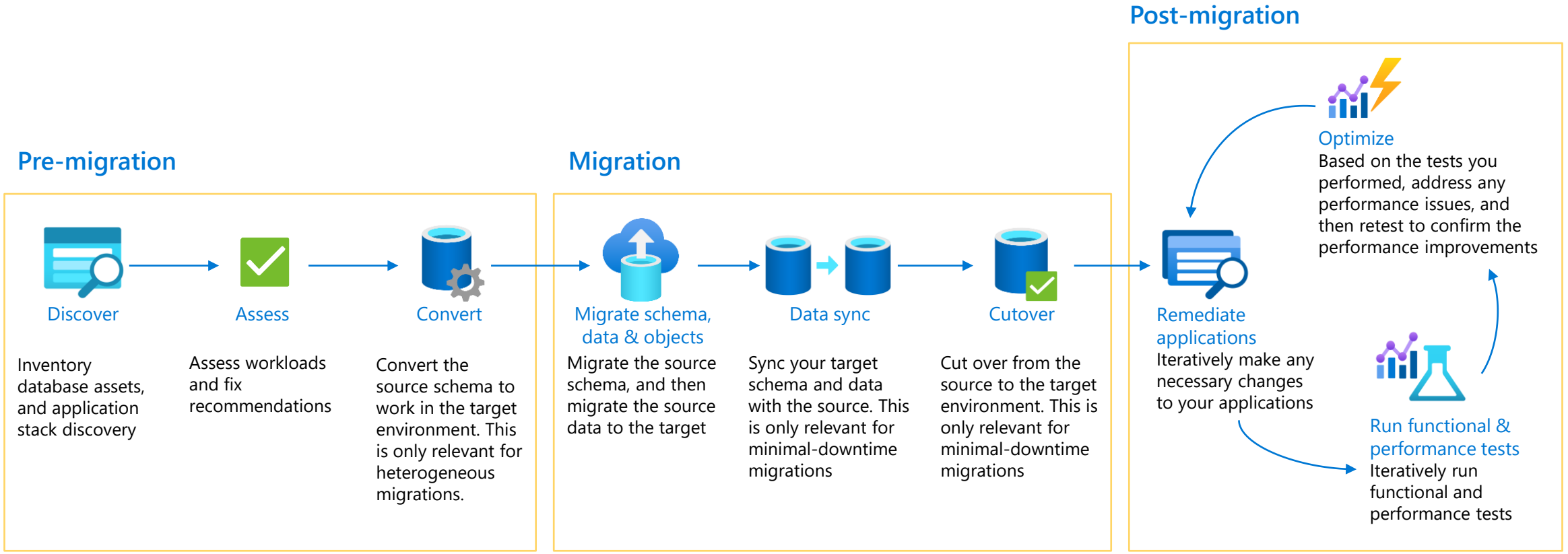
Database migrations with minimal downtime

Migrate SQL Server & 3rd party databases to Azure SQL Database

Built for scale and reliability



Database migration process overview



Backup/Restore/Replication

Backups are automatic

Database backup schedule is the same as Azure SQL Database

Full database backups occur weekly

Differential backups generally happen every few hours

Transaction log backups generally happen every 5–10 minutes

- Frequency is based upon performance level and amount of database activity

COPY_ONLY, URL-based backups can be used to perform manual full database backups

Not available on Azure SQL Database

Backup retention is 7 days by default

Configurable up to 35 days for General Purpose and Business Critical

Restore considerations

Point-in-time restores are possible and must be performed manually using the Azure Portal

Restoring automated backups from within SSMS is not allowed

You can only restore using the Azure Portal

COPY_ONLY, URL-based full backups can be restored using SSMS to a Managed Instance only

Cannot be restored to on-premises as Managed Instance uses a higher build than on-premises instances

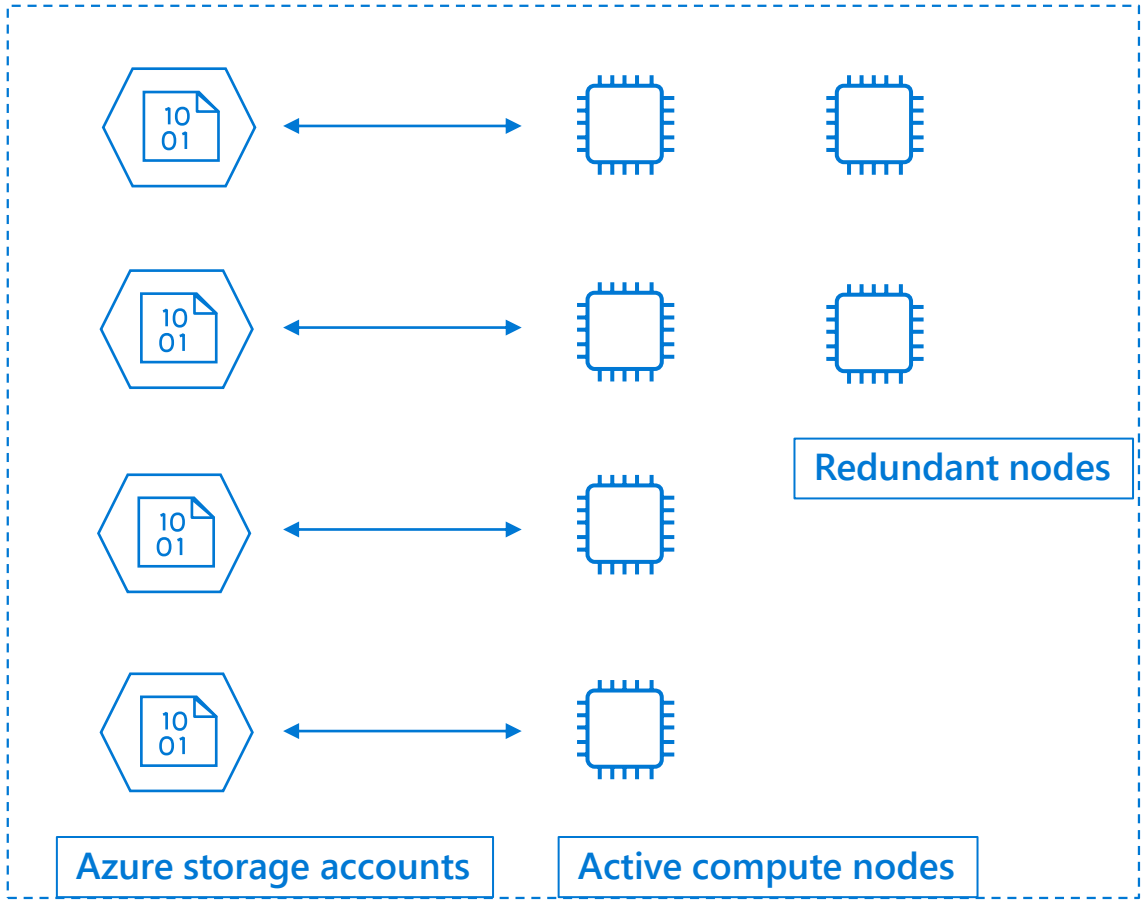
Databases with multiple log files cannot be restored

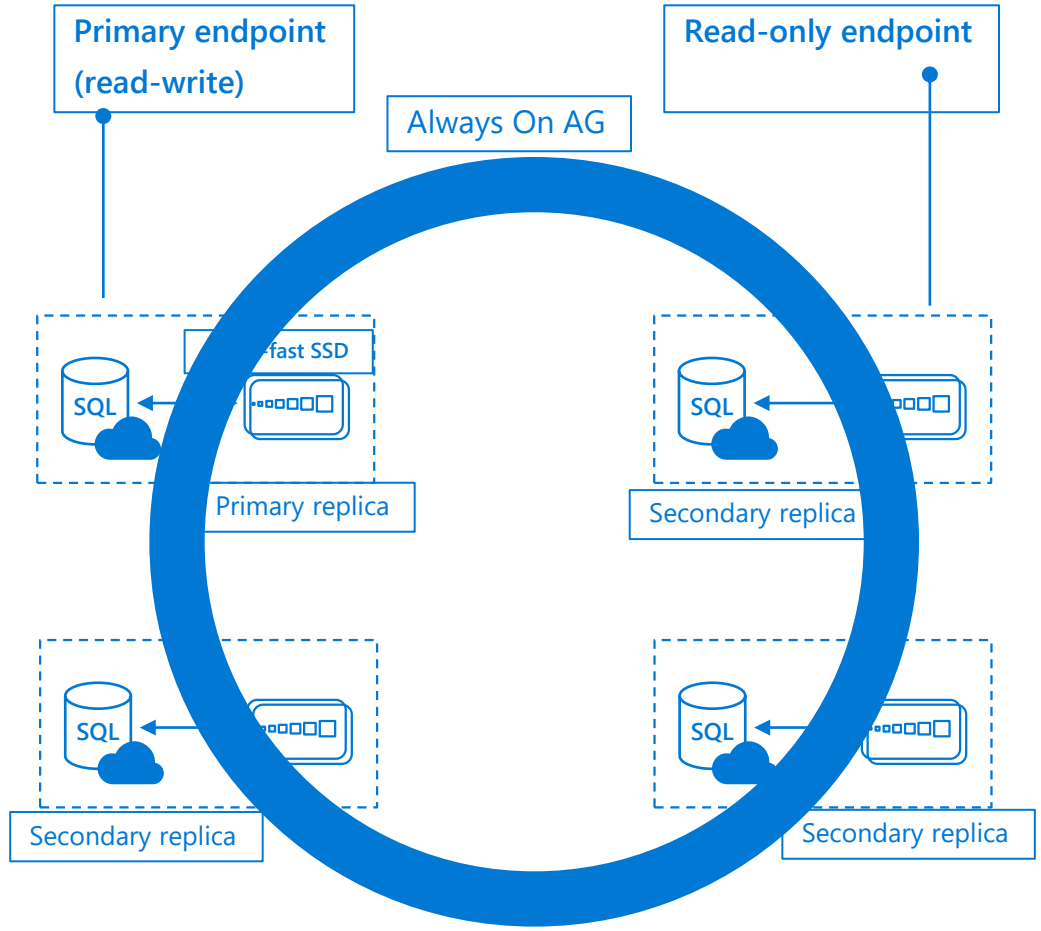
Secondary log files must be removed prior to backing up and restoring to a Managed Instance

Can restore backups in a specific DB Compatibility

Supports up to SQL 2005

Service tiers and high availability





General Purpose: HA based on reliable Azure Premium Storage

Business Critical service tier: collocated compute and storage

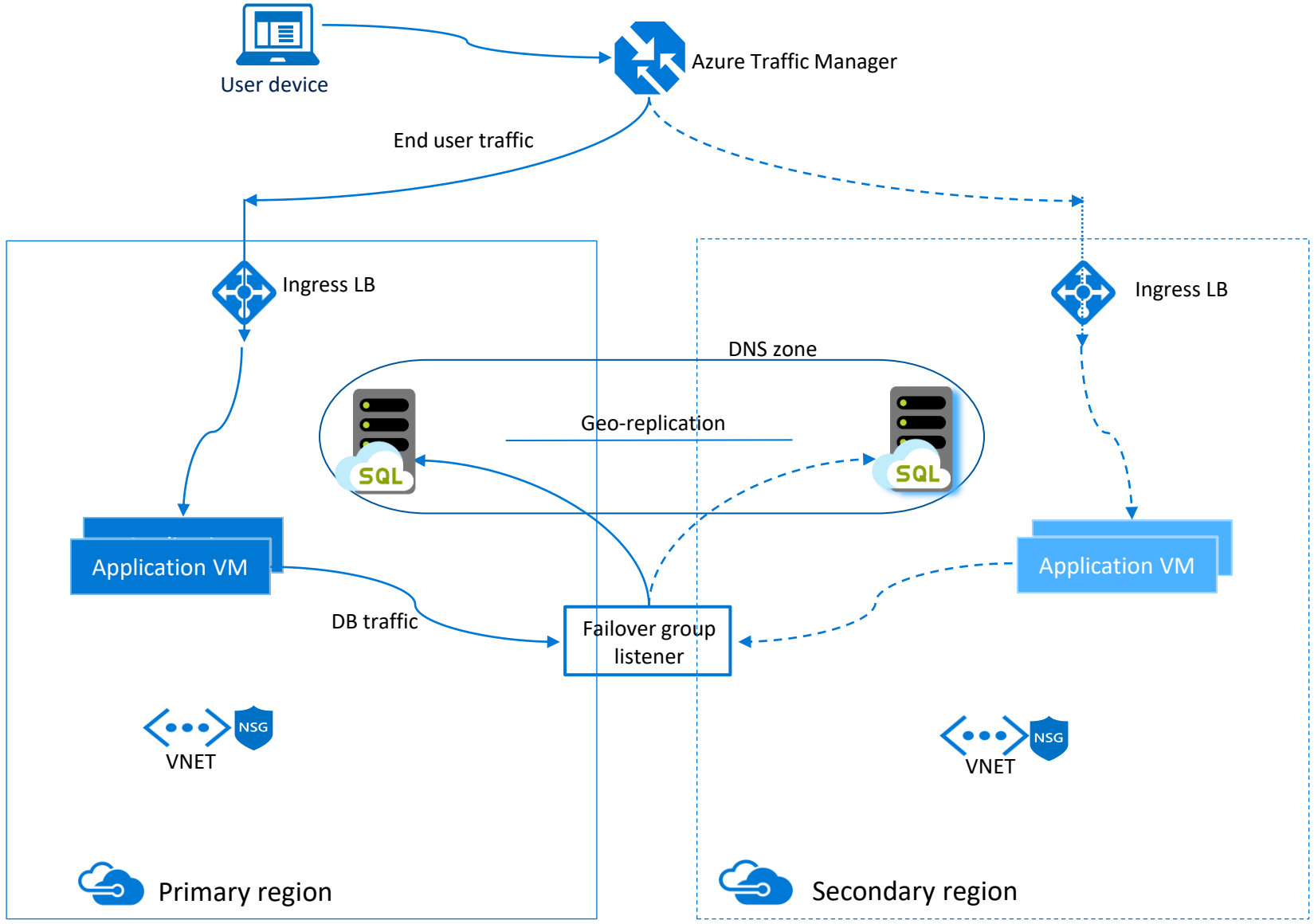
Using failover groups with Managed Instance

Capabilities

- Active / Standby
- All databases in the instance are automatically replicated
- Automatic or manual failover
- Read-write listener for read-write database connections
- Read-only listener for read-intended database connections

Scenarios

- Transparent recovery from outage
- Load-balancing read-only workloads
- Failback after outage is mitigated



[Best Practices Found Here]

Resources

Documentation

Document	When to use it
What is a Managed Instance	High level details about SQL MI – service description and positioning
Azure SQL Database pricing page	Business model and pricing details
Azure Hybrid Use Benefit (AHUB)	Discount details for customers with SQL Server licenses
Feature comparison: Azure SQL Database versus SQL Server	High level feature availability matrix and need comparison with SQL Server and rest of SQL Database
Azure SQL Database Managed Instance T-SQL differences from SQL Server	Detailed functional behavior of SQL MI
Create Managed Instance - Tutorial	How to create SQL MI and connect to it (quick getting started guide)
How To: Configure a VNet for Azure SQL Database Managed Instance	How to makes sure that VNet is compliant with SQL MI requirements
How To: Configure a Custom DNS for Azure SQL Database Managed Instance	Networking misconfiguration is currently the most frequent reason that prevents customers from deploying SQL MI successfully
Connect your application to Azure SQL Database	High level of detail how to connect app to MI (supported scenarios, high level steps, links on detailed how-to)
SQL Server instance migration to Azure SQL Database Managed Instance	Various options to migrate application to SQL MI
https://docs.microsoft.com/en-us/azure/sql-database/sql-database-managed-instance-resource-limits	Subscription-level quotas and official process to obtain larger quota
Azure Support plans	Explore the range of Azure support options and choose the plan that best fits, whether you're a developer just starting your cloud journey or a large org. deploying business-critical, strategic applications
How to create Azure support request	Step by step instructions to open support ticket

Blogs, best practices

Document	When to use it
Managed Instance ARM template reference Create SQL MI using ARM templates Change size of SQL MI using PowerShell	SQL MI management through ARM templates & PowerShell (official docs and blogs)
Cross-instance point-in-time restore in Azure SQL Database Managed Instance	How to restore database to another instance
CAT Blog: CPU and Memory Allocation on Azure SQL Database Managed Instance	Explains how to interpret various information exposed in SSMS and DMVs regarding resource allocation is SQL MI
CAT Blog: Storage best practices in General Purpose	In this article, we describe database storage architecture on Azure SQL Database Managed Instance (MI), for General Purpose (GP) instances specifically. We also provide a set of best practices to help optimize storage performance
CAT Blog: Consume SQL MI Error Log	How to filter out unnecessary info from SQL error log and focus on what's important to your app using **sp_readmierrorlog**
CAT Blog: Real time performance monitoring for Azure SQL DB Managed Instance	Configuring and suing **Telegraf** for real-time perf. monitoring in SQL Managed Instance
BLOG: How to send emails in SQL MI using DbMail	
SCOM Management Pack for SQL MI	The blog announcement for SCOM MP for SQL MI and scope details

Blogs, best practices

Document	When to use it
MI best practices migrating from on-prem	SQL MI management through ARM templates & PowerShell (official docs and blogs)
MI performance best practices articles	Various performance best practices for configuring and running Managed Instances
MI more memory tuning	Explains how to identify memory usage requirements for Managed Instance
MI real-time monitoring	Monitor Managed Instance database workload in real-time

Thank you!

Follow me on Twitter @bizdataviz

Check out my YouTube Channel: youtube.com/bizdataviz

Any questions: chris@bizdataviz.com