



Azure SQL Database Managed Instance

Technical overview

Szabolcs Baranyi

Agenda

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Managed Instance overview

[Managed Instance overview and architecture, Hands-on-lab](#)

Security & Networking

[Security overview, Networking considerations, demos](#)

Features and capabilities

[Key capabilities, limitations, backup & restore](#)

Replication & Monitoring

[Replication and Monitoring, demo](#)

Migration

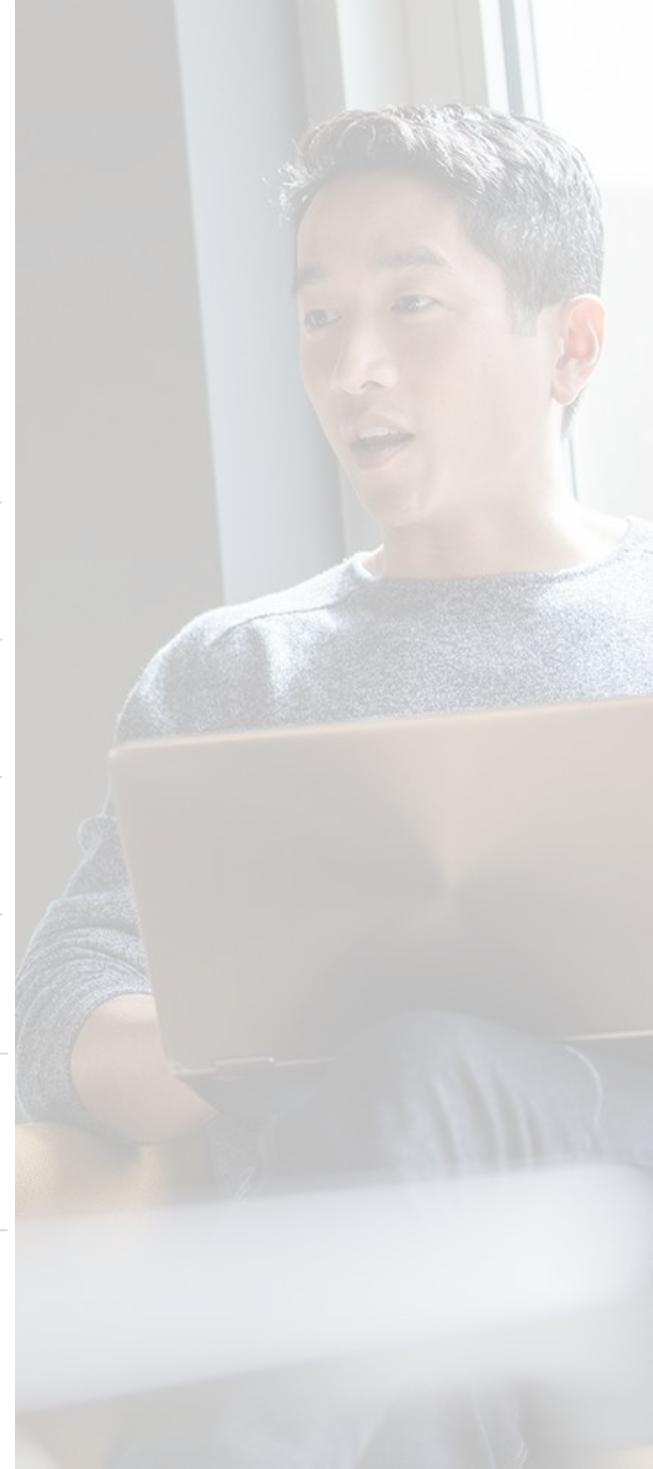
[Migration overview and options, Hands-on-Lab](#)

Data migration tasks

[Microsoft ETL/ELT Services, Hands-on-Lab](#)

Closing

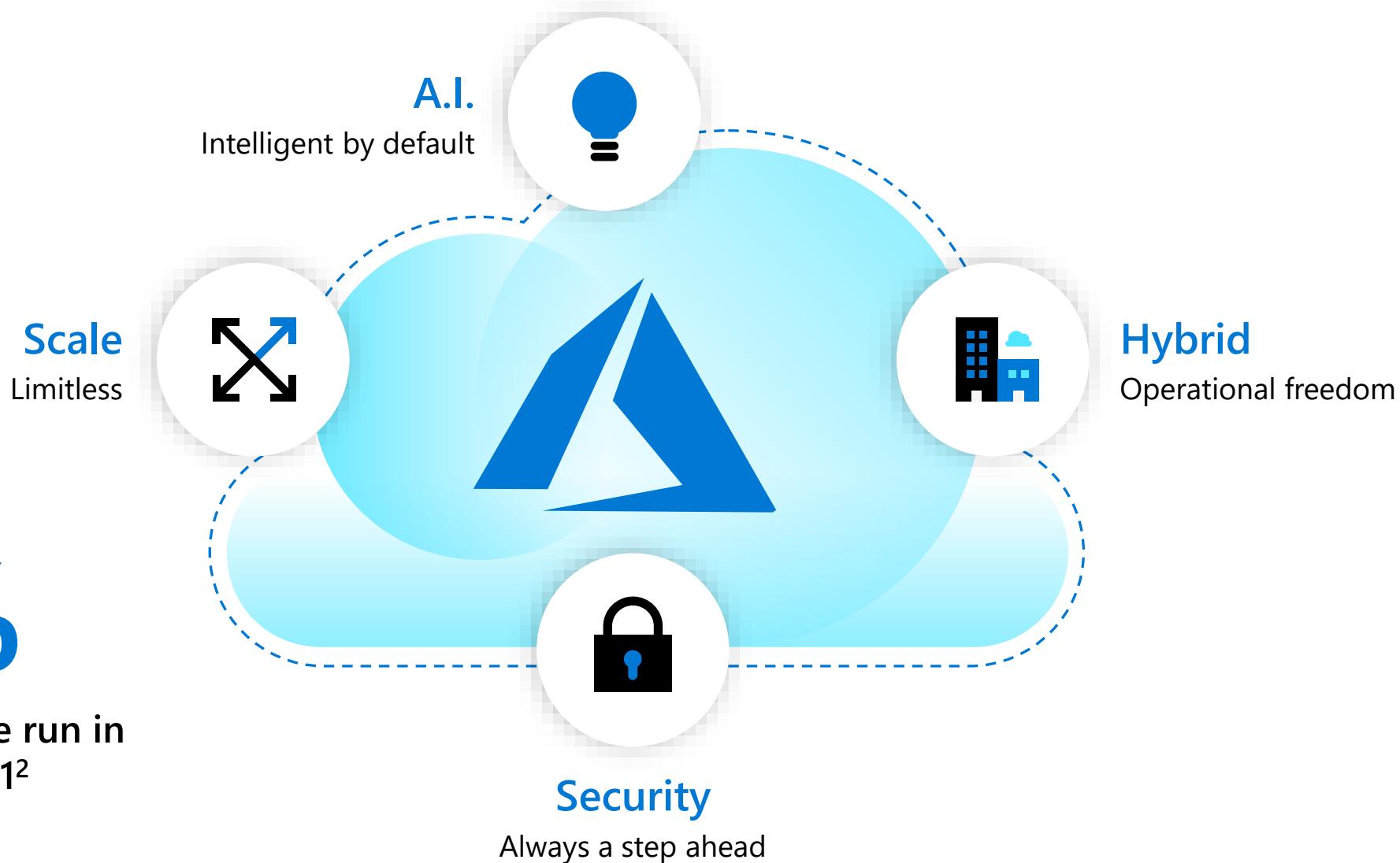
[Q&A, technical resources, etc.,](#)



Be future-ready with Azure

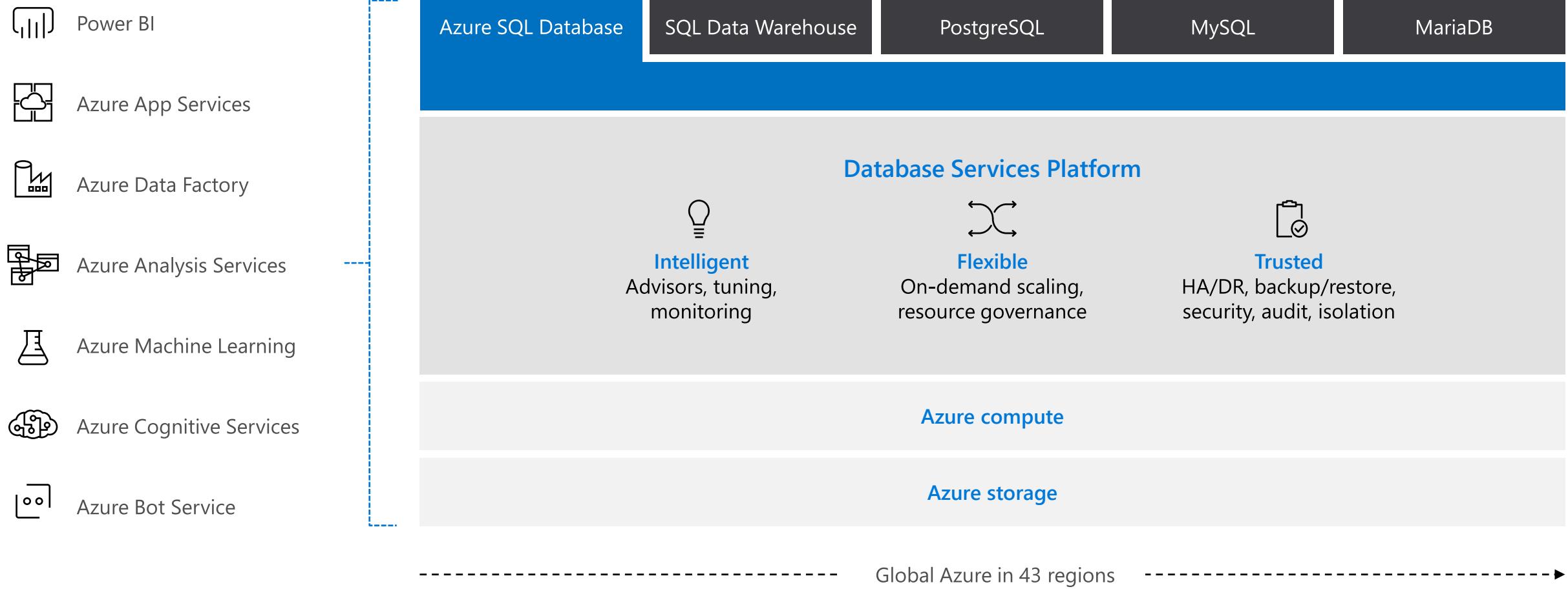
94%

of all workloads will be run in
the cloud by 2021²



1. Cisco Global Cloud Index (2016-2021)

Azure relational database platform



Azure managed databases offer more value



Azure SQL
Database



Azure SQL
Managed Instance



Azure Database
for PostgreSQL



Azure Database
for MySQL



Azure Database
for MariaDB



Azure Cache
for Redis



Azure
Cosmos DB

Managed, intelligent SQL
in the cloud

Enterprise-ready, fully managed
and scalable open-source databases

In-memory data
store to power fast,
scalable
applications

Globally distributed,
multi-model
dataset service for
any scale

Hyperscale

Breakthrough
productivity and
performance with large
workloads



Azure SQL Database solutions

- ✓ Support for 100TB+ databases with Hyperscale
- ✓ Faster app development and reduced database ops with a fully managed service
- ✓ Multi-tenant apps easily built in a preferred environment

Azure SQL

The family of SQL cloud databases



SQL Server on Azure Virtual Machines

Best for lift and shift and/or workloads requiring OS-level access

Infrastructure-as-a-Service

[Learn More](#)



Azure SQL Managed Instance

Best for modernizing existing apps



Azure SQL Database

Best for supporting modern cloud apps

Platform-as-a-Service

Azure is the cloud that knows SQL Server best

Trade in on-premises cores with Azure Hybrid benefit

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

1 Standard license core =

1 General Purpose core

1 Enterprise license core =

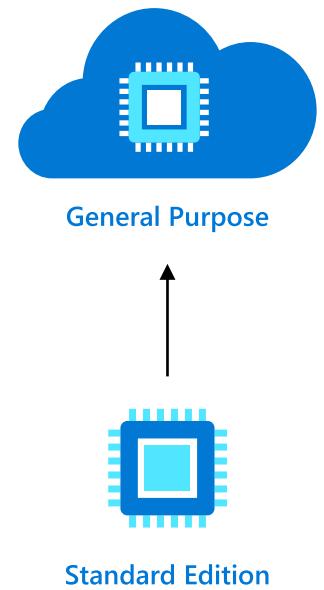
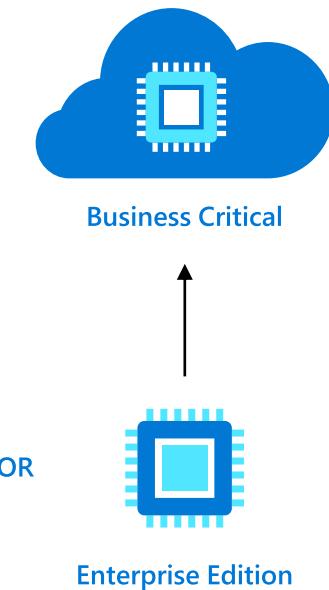
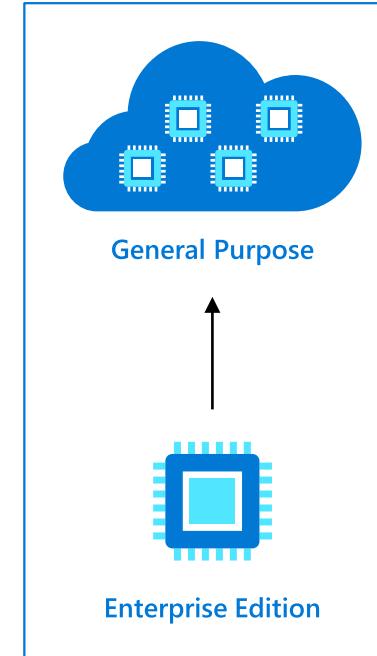
1 Business Critical core

1 Enterprise license core =

4 General Purpose cores (virtualization benefit)

SQL Server license trade-in values

SQL Database vCore-based options



SQL Server with Software Assurance

Reserved Capacity for Azure SQL Database

Reserve Azure SQL Database resources in advance and save up to 33%¹

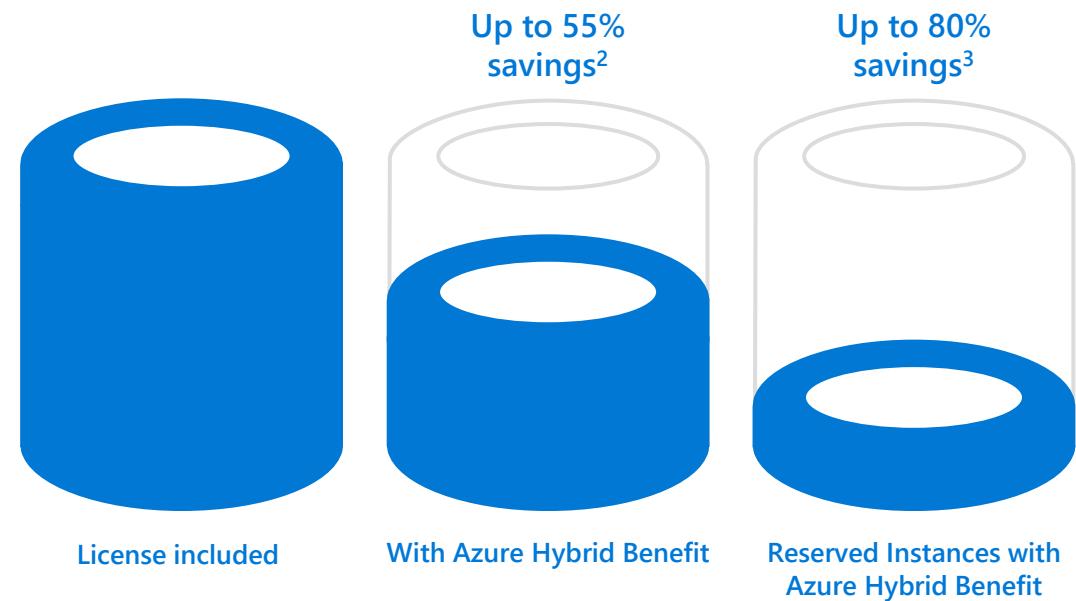
Budget and forecast better with upfront payment for one-year or three-year terms

Get prioritized compute capacity in Azure regions

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



¹Savings 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.

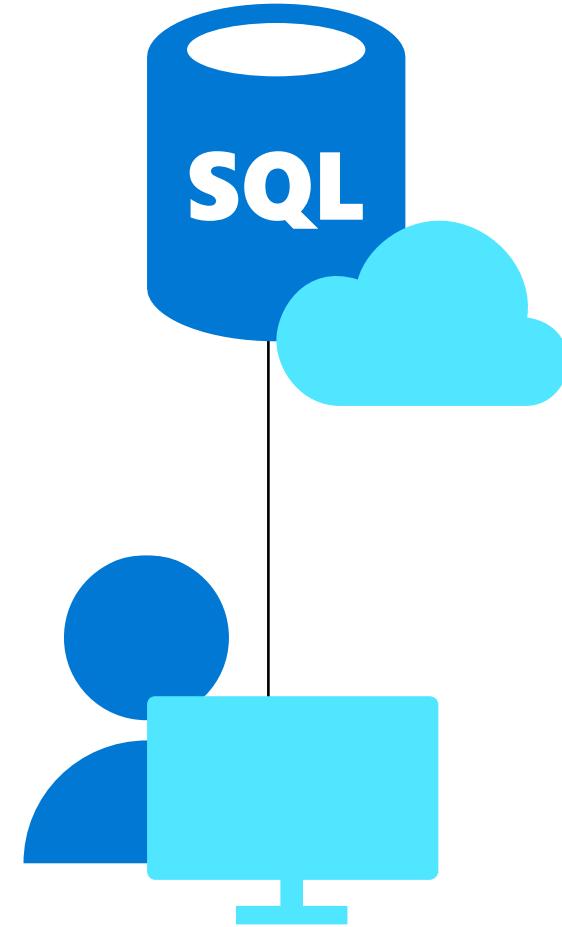
²Savings based on eight vCore SQL Database Managed Instance Business Critical in West 2 US Region, running 730 hours per month. Savings are calculated from on demand full price (license included) against base rate with Azure Hybrid Benefit plus 3-year reserved capacity commitment. Savings excludes Software 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.

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



Competitive TCO vs on-prem

Reduce capital and operational costs with a fully-managed service and achieve up to 406% ROI¹

Financially-backed 99.99% availability SLA²

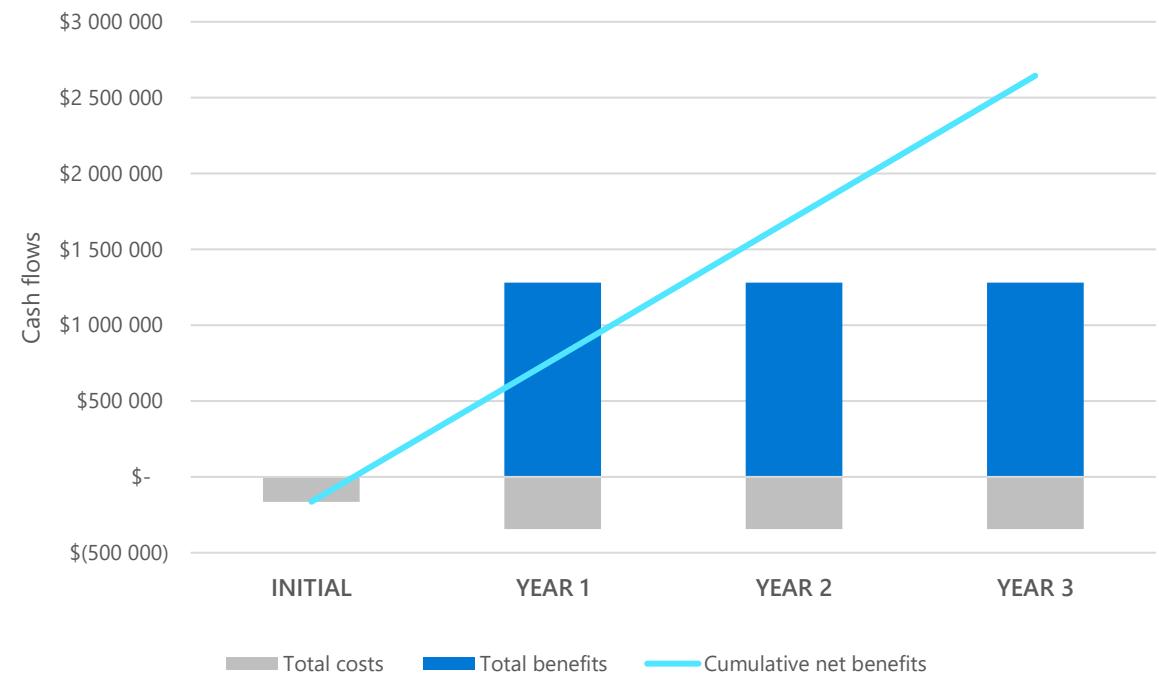
Promote business continuity with built-in capabilities

Maximize your on-premises investments with Azure Hybrid Benefit for SQL Server and reserved capacity pricing

Right-size on-premises workload requirements for the cloud with independent control of storage and compute

Up to 212% ROI with Azure SQL Database

Financial Analysis (risk-adjusted)



Customers can focus on their 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 99.99% 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 your database chores

Azure SQL

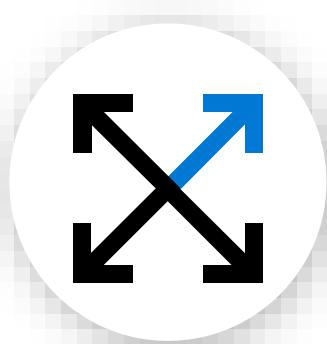
Azure SQL Database and Azure SQL Managed Instance

Streamline app modernization



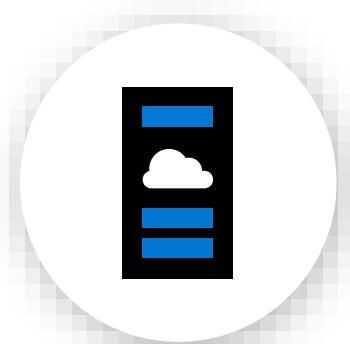
Accelerate app modernization with minimal code changes on the only cloud with evergreen SQL

Hyperscale demanding workloads



Rapidly adapt to changing requirements with Hyperscale storage up to 100 TB

Optimize price-performance with serverless compute



Build modern apps your way with flexible compute options that include auto-scaling serverless. Pay only for what you use.

Save with the best total cost of ownership



Meet mission critical requirements while costing up to 86% less than the competition

Built-in AI

Optimizes performance and durability for you

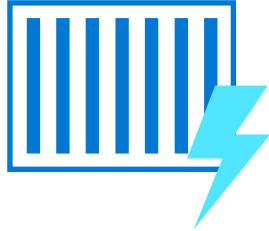
Advanced data security

Secure your data with layers of protection, built-in controls and leading compliance

Always On reliability

Maximize uptime with built-in high availability and an industry-leading availability SLA up to 99.995%

Breakthrough productivity and performance



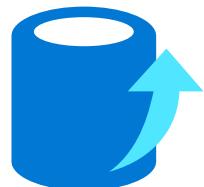
30x
faster transactions with in-memory OLTP



100x
performance gains with in-memory analytics

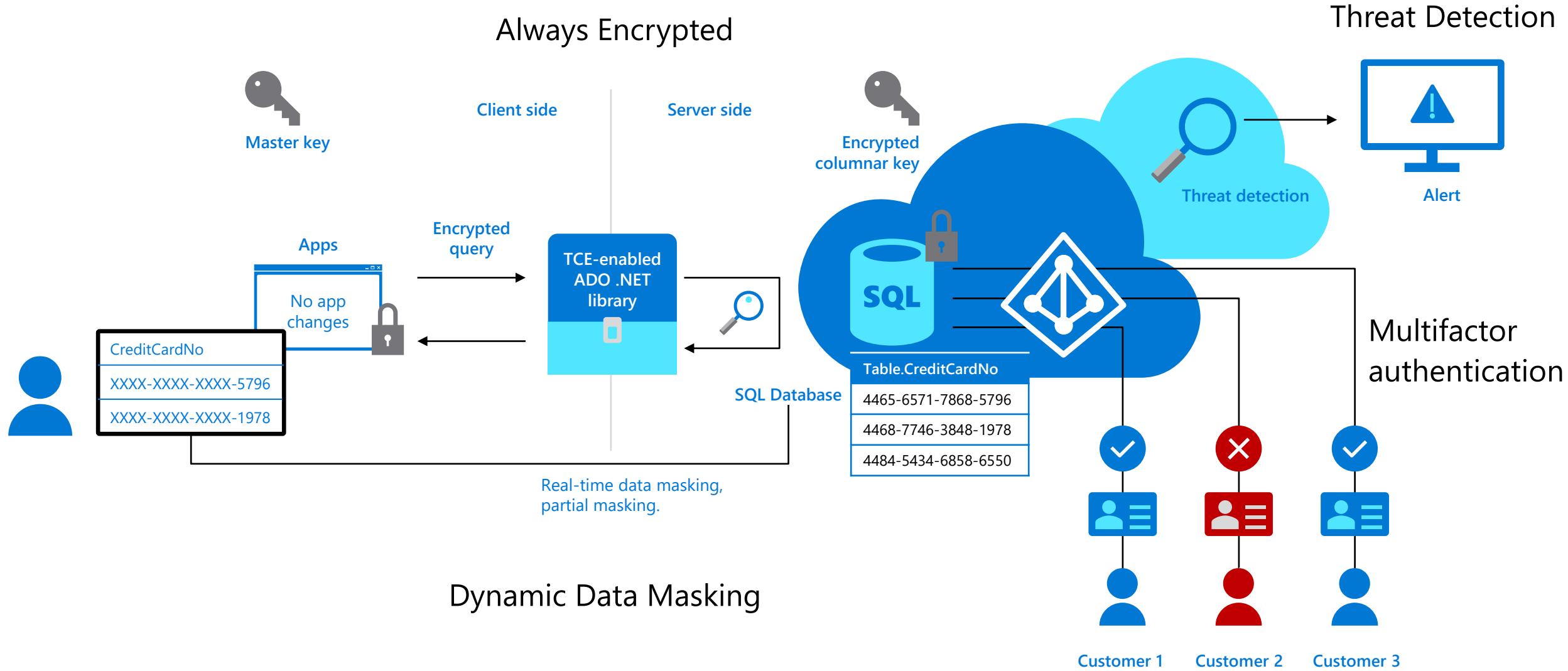


near **100%**
uptime with dynamic scalability

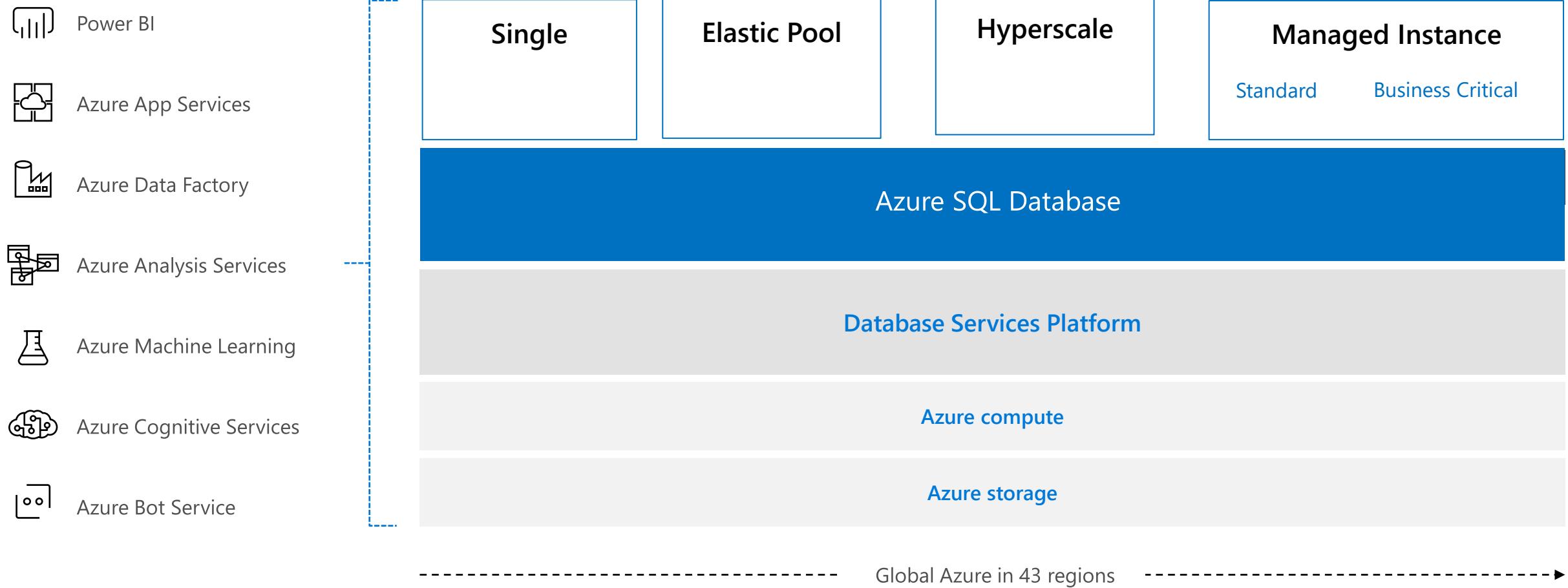


100TB +
Auto scaling up to 100TB with Hyperscale

Industry-leading security



Azure relational database platform



SQL Database deployment model overview

Azure SQL Database			
	'Single'	Elastic Pools	Managed Instance
Best for	New apps, with a 'one database per app pattern' and resources guaranteed at DB level	New SaaS apps or modernizing existing apps to SaaS, resource sharing across DBs of existing LOB apps for higher efficiency	Modernizing large number of existing SQL Server apps from on-premises or IaaS
Tiering	<ul style="list-style-type: none">Basic: designed for apps with light workloadsStandard: mid-level performance and business continuityPremium: low IO latency workloads and higher business continuity	<ul style="list-style-type: none">General Purpose"Business Critical"	
Unit of Monetization	DTU – "Database Throughput Unit" – measure of database performance that blends CPU, memory and I/O.	eDTU – elastic "Database Throughput Unit" – measure of database performance that blends CPU, memory and I/O.	<ul style="list-style-type: none">vCore for computeGBs for storageIOPs for IO
Pricing vs. Competitors	<ul style="list-style-type: none">Basic – very cheap because it priced to accommodate web customersStandard – comparable pricing but not easily explainable to customerPremium – expensive due to additional replicas and IOs	<ul style="list-style-type: none">Priced lower compared to AWS	
Hybrid Benefits	<ul style="list-style-type: none">No		Yes, EE customers also get 4 cores in General Purpose SKU

What is Hyperscale?

Hyperscale is an all new storage layer under the database

Hyperscale is architected for the cloud from the ground up

Hyperscale is fully compatible with Azure SQL Database

Hyperscale is no limits

Hyperscale is VLDB size without the VLDB headaches

Support for **100TB+**

Hyperscale your database

A new, highly scalable service tier that adapts on-demand to your workload's needs, auto-scaling up to 100TB per database.

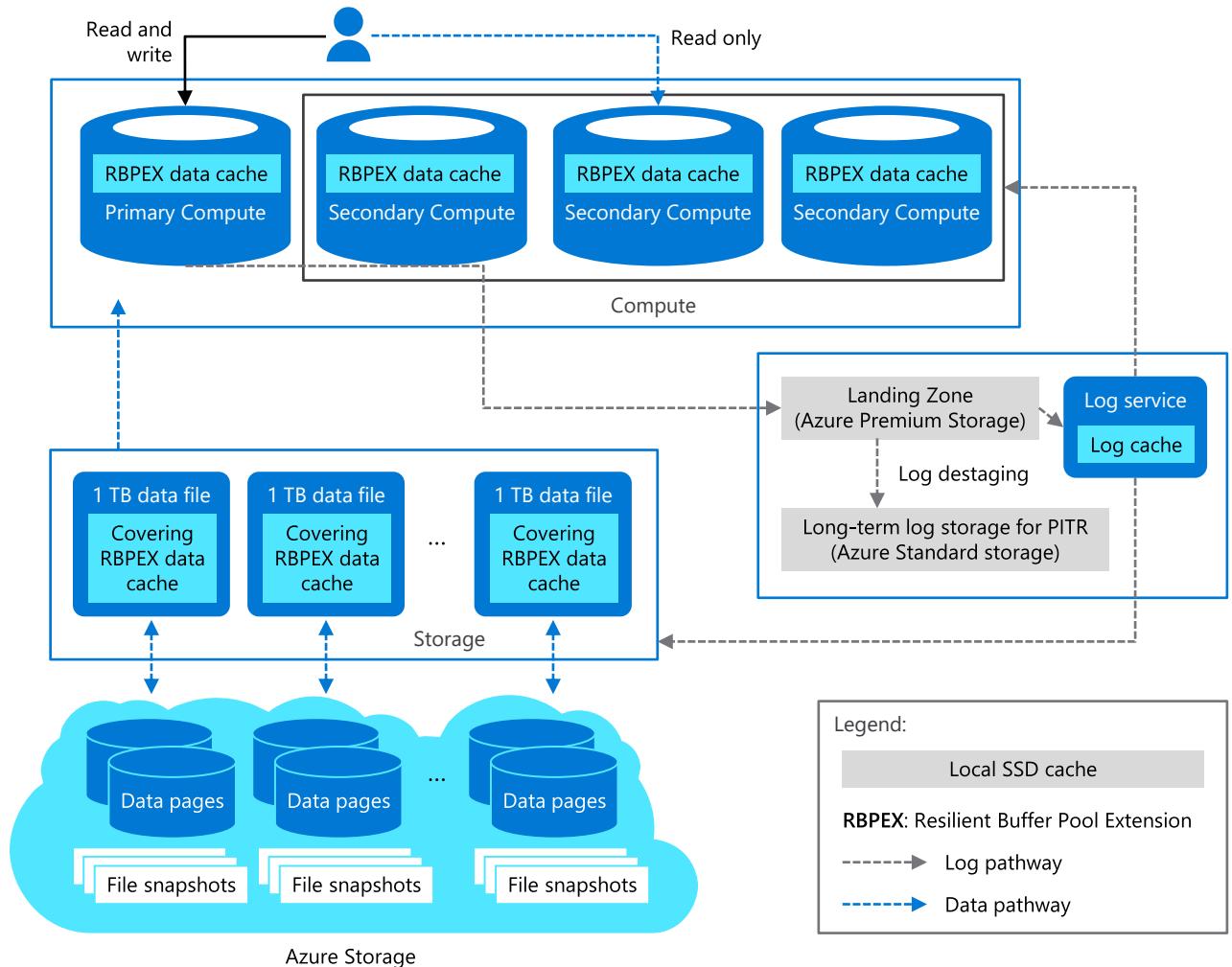
Storage dynamically adapts to your workloads' needs, auto-scaling up to 100TB.

Provision one or more additional compute nodes that can serve your read-only workload and use them as a hot-standby, in case of failover.

Perform operations in constant time, regardless of the size of the data operation.

Compute and storage resources scale rapidly and independently without sacrificing performance.

SQL Database Hyperscale

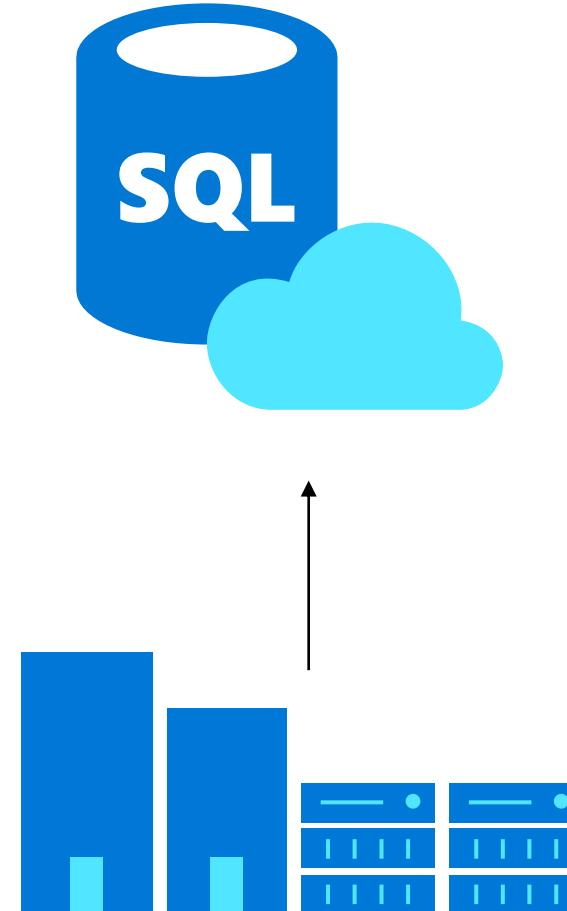


Demo

“Let’s create one”

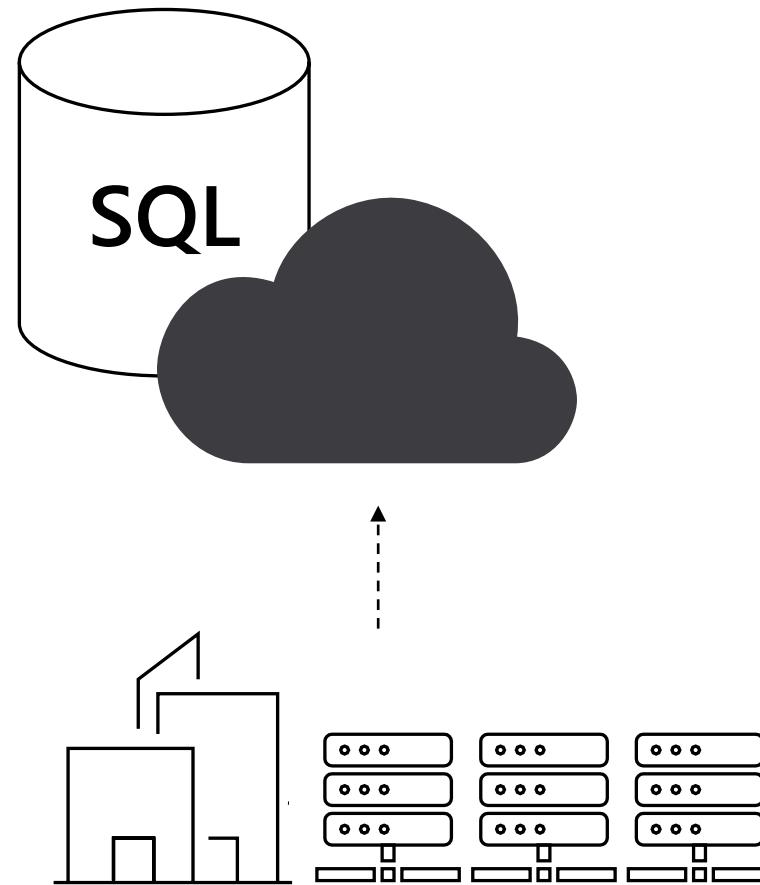
Azure SQL DB managed Instance

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**



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**



Seamless and compatible

Compatibility challenges

Migrating to the cloud is complex and time-consuming

Maintaining security isolation from other tenants in the cloud

Eliminating the costs of re-architecting apps for the cloud

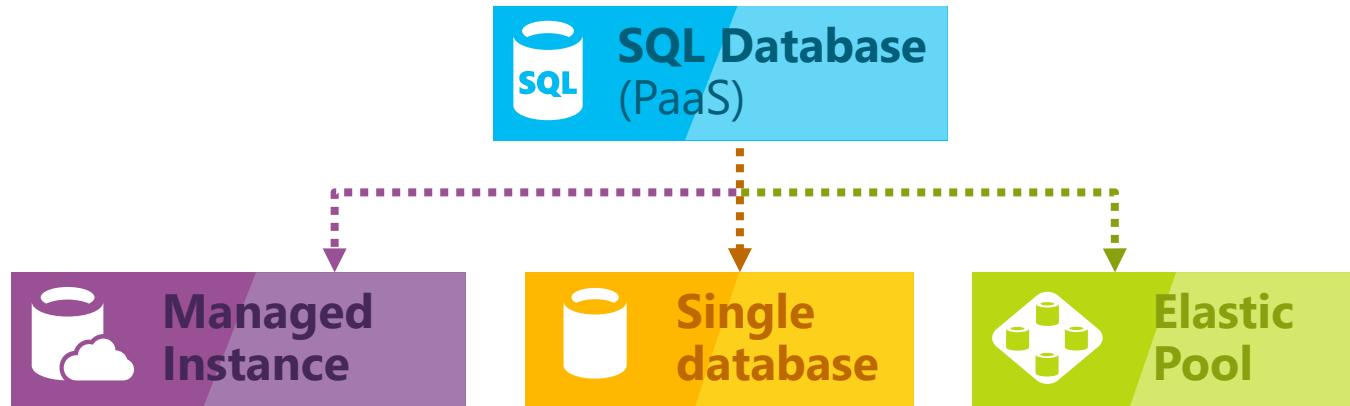


Azure SQL Database solutions

Database Migration Service migrates from multiple sources at scale to accelerate the transition to the cloud

Native Virtual Network (VNET) support with Managed Instance and fully-managed security

Managed Instance combines the best of SQL Server with the operational and financial benefits of the cloud



Fully-managed service	SQL Server compatibility	Full isolation and security	New pricing options
<ul style="list-style-type: none">Built on the same infrastructure as SQL DatabaseProvides the same benefits (PaaS)	<ul style="list-style-type: none">Fully-fledged SQL instance with nearly 100% compat with on-premise	<ul style="list-style-type: none">Contained within your VNetPrivate IP addressesExpress Route / VPN connectivity	<ul style="list-style-type: none">TransparentFrictionlessCompetitive

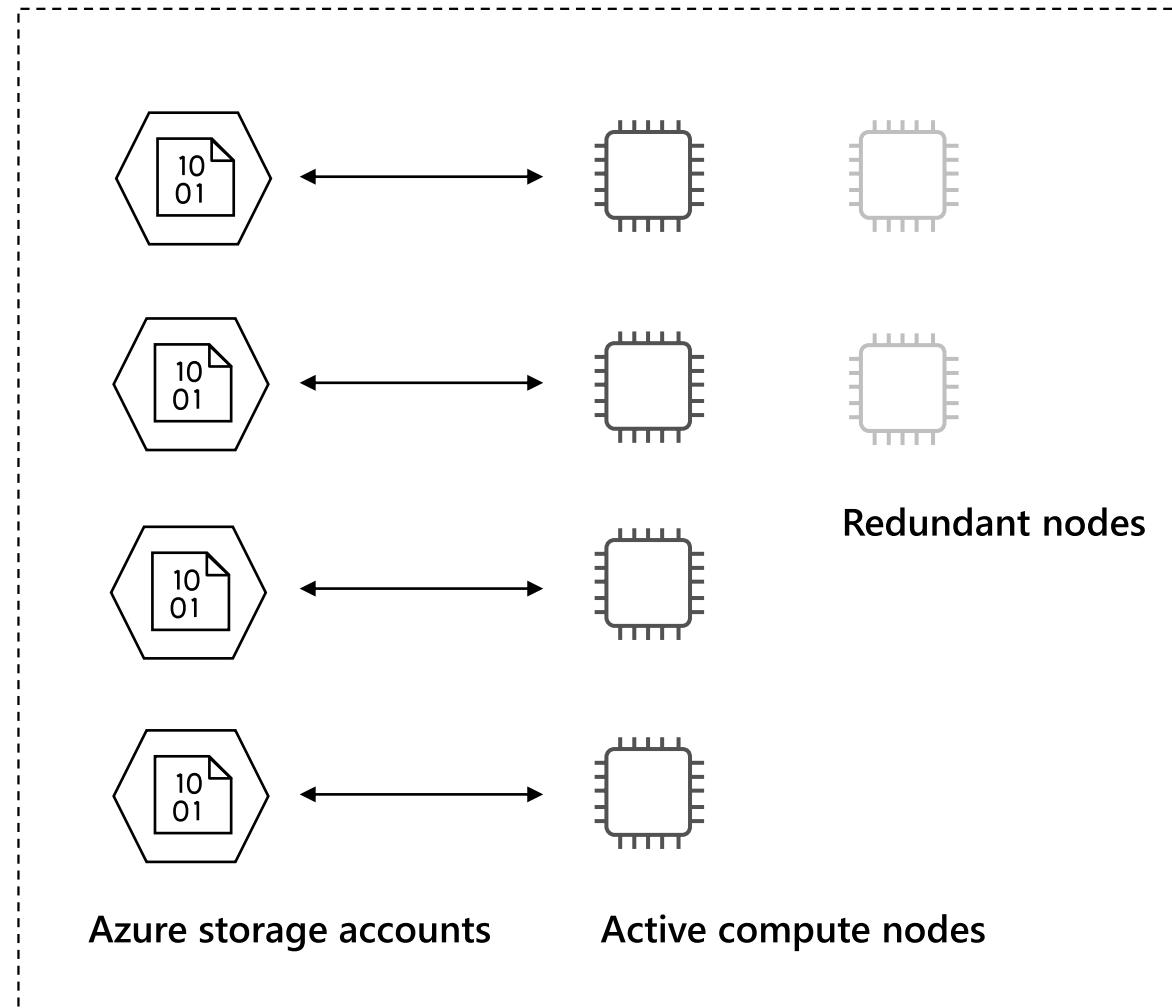
Managed Instance: Service Tiers

Capability \ Service tier	General Purpose (GA)	Business Critical (Public Preview)
Best for	Apps with typical availability and common IO latency requirements	Apps with highest availability and lowest IO latency requirements.
Compute (vCores)	8, 16, 24, 32, 40, 64, 80	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.

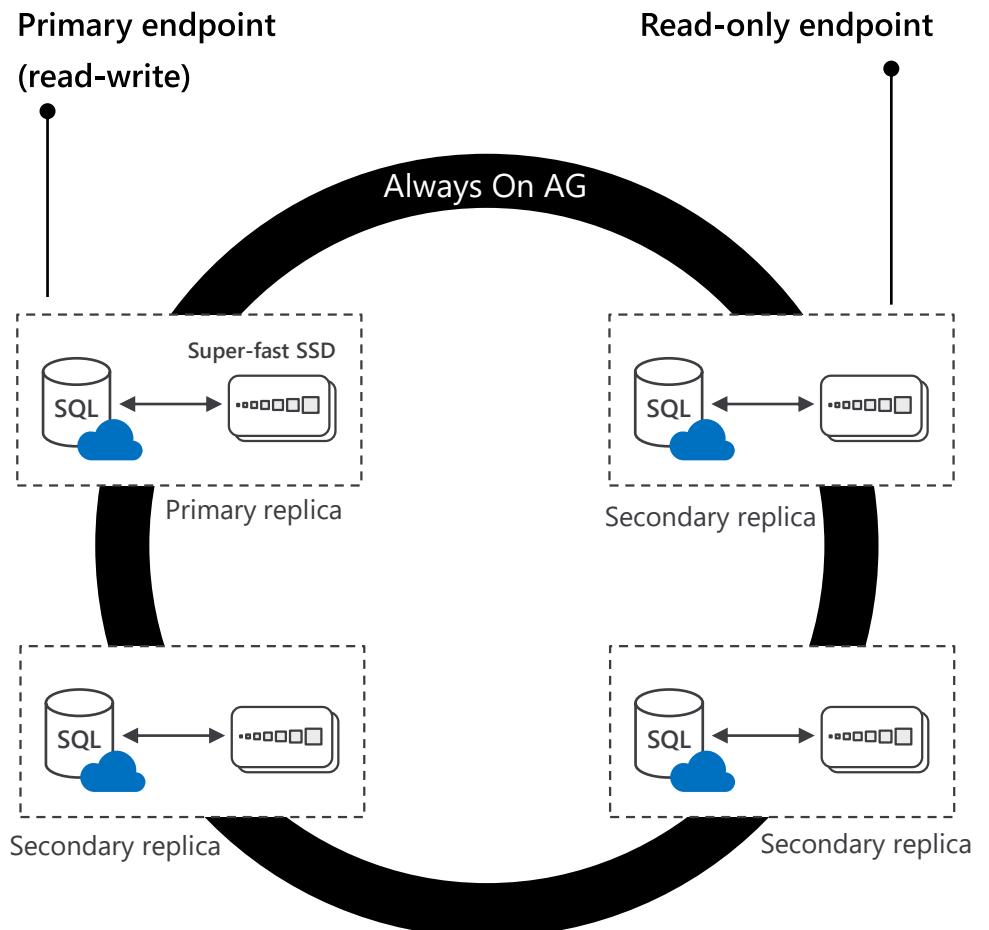
GENERAL PURPOSE

Feature	Description
Number of vCores*	8, 16, 24 (Gen 4) 8, 16, 24, 32, 40, 64, 80 (Gen 5)
SQL Server version / build	SQL Server (latest available)
Min storage size	32 GB
Max storage size	8 TB
Max storage per database	Determined by the max storage size per instance
Expected storage IOPS	500-7500 IOPS per data file (depends on data file). See Premium Storage
Number of data files (ROWS) per the database	Multiple
Number of log files (LOG) per database	1
Managed automated backups	Yes
HA	Based on remote storage and Azure Service Fabric
Built-in instance and database monitoring and metrics	Yes
Automatic software patching	Yes
VNet - Azure Resource Manager deployment	Yes
VNet - Classic deployment model	No
Portal support	Yes



BUSINESS CRITICAL

Feature	Description
Number of vCores*	8, 16, 24, 32 (Gen 4) 8, 16, 24, 32, 40, 64, 80 (Gen 5)
SQL Server version / build	SQL Server (latest available)
Additional features	In-Memory OLTP 1 additional read-only replica (Read Scale-Out)
Min storage size	32 GB
Max storage size	*Gen 4: 1 TB (all vCore sizes) Gen 5: 1 TB for 8, 16 vCores •2 TB for 24 vCores •4 TB for 32, 40, 64, 80 vCores
Max storage per database	Determined by the max storage size per instance
Number of data files (ROWS) per the database	Multiple
Number of log files (LOG) per database	1
Managed automated backups	Yes
HA	Based on Always On Availability Groups and Azure Service Fabric
Built-in instance and database monitoring and metrics	Yes
Automatic software patching	Yes
VNet - Azure Resource Manager deployment	Yes
VNet - Classic deployment model	No
Portal support	Yes



Business Critical service tier: collocated compute and storage

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

Dedicated resources and familiar tools

Enable full isolation from other tenants without resource sharing

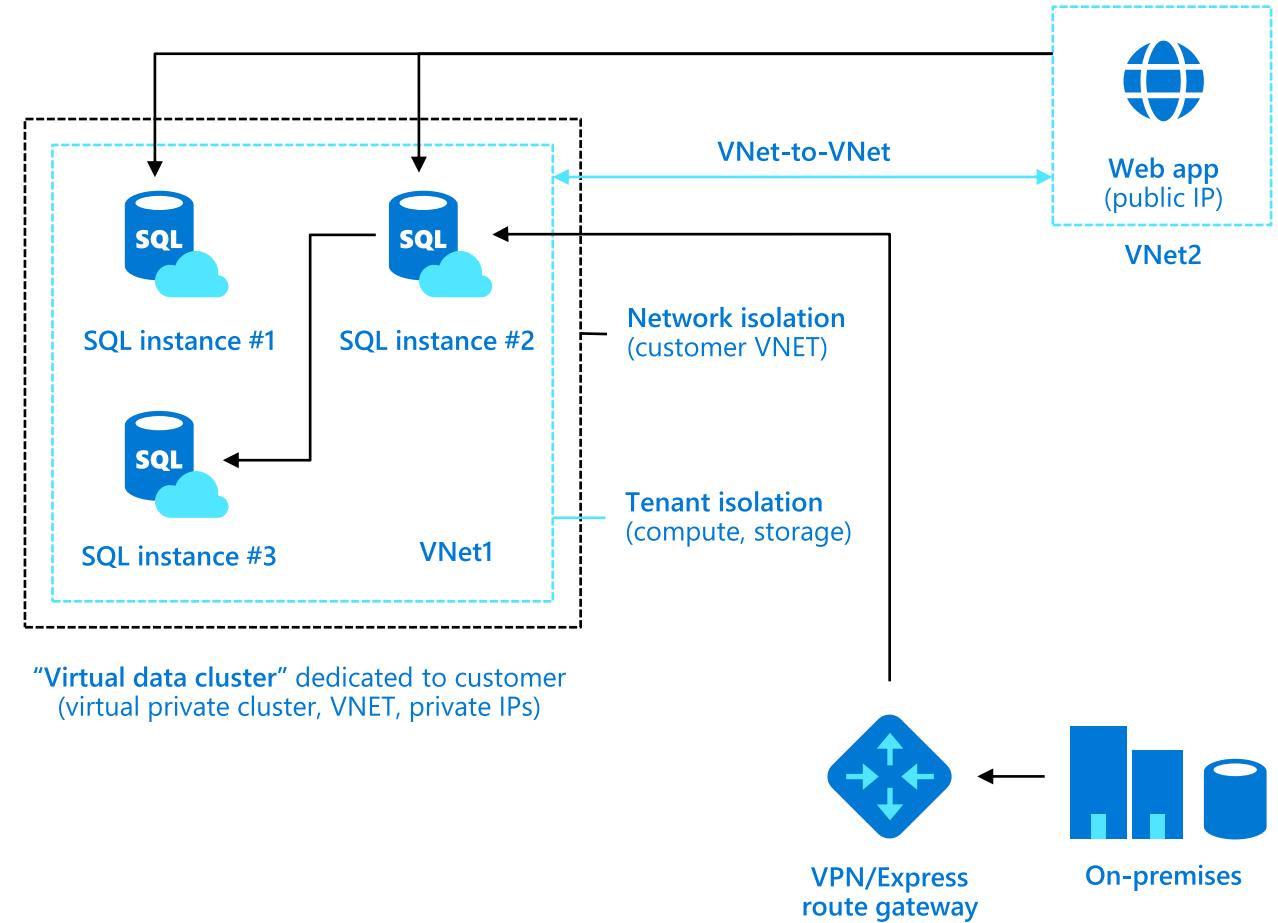
Promote secure communication over private IP addresses with native VNET integration

Enable your on-premise identities on cloud instances, through integration with Azure Active Directory and AD Connect

Combine the best of SQL Server with the benefits of a fully-managed service

Use familiar SQL Server features in SQL Database Managed Instance

VNET support in SQL Database Managed Instance



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

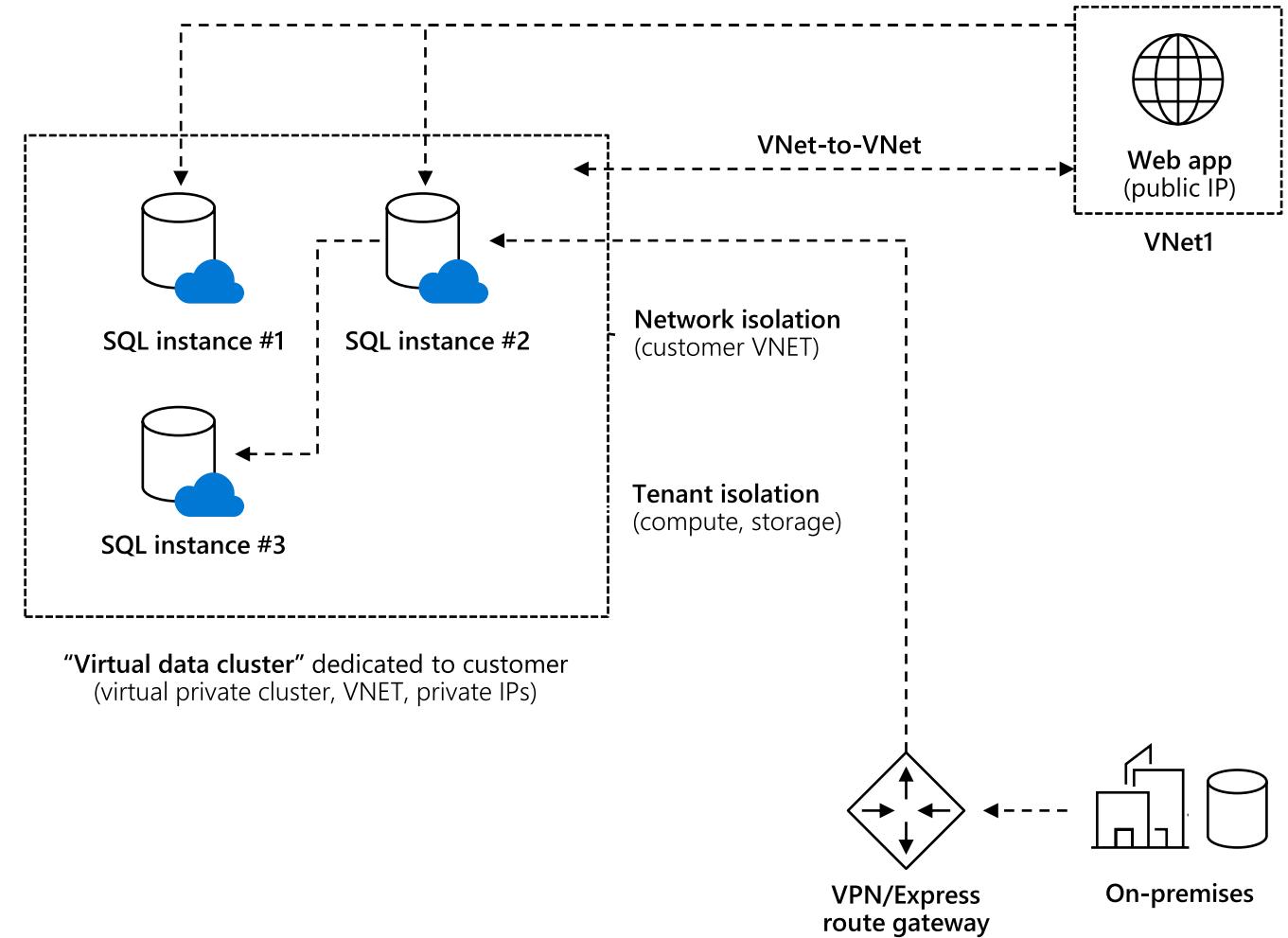
Easily migrate from SQL Server & modernize

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

Dedicated resources through customer isolation



Agenda

Intro to Azure SQL Database

Value prop, Platform benefits, TCO

Managed Instance overview

Managed Instance overview and architecture, Hands-on-lab

Security & Networking

Security overview, Networking considerations, demos

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Key capabilities, limitations, backup & restore

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Replication and Monitoring, demo

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Migration overview and options, Hands-on-Lab

Data migration tasks

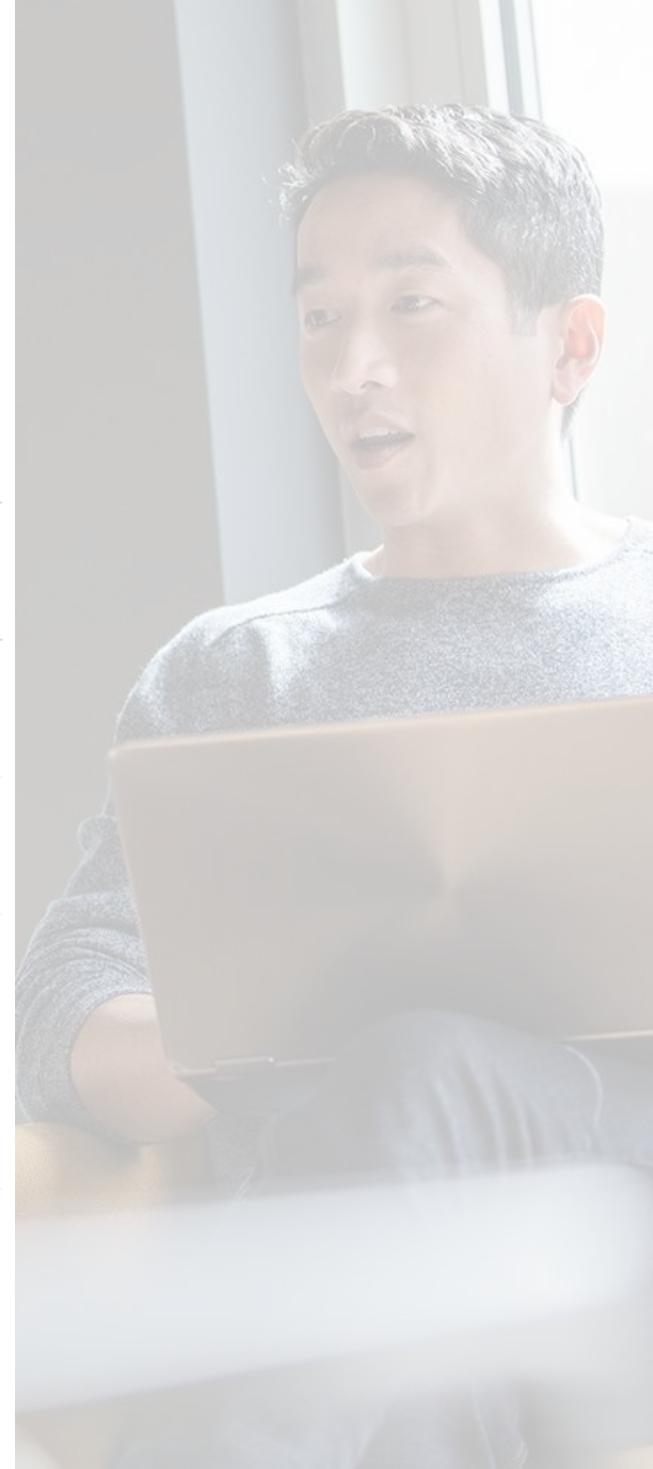
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Hyperscale

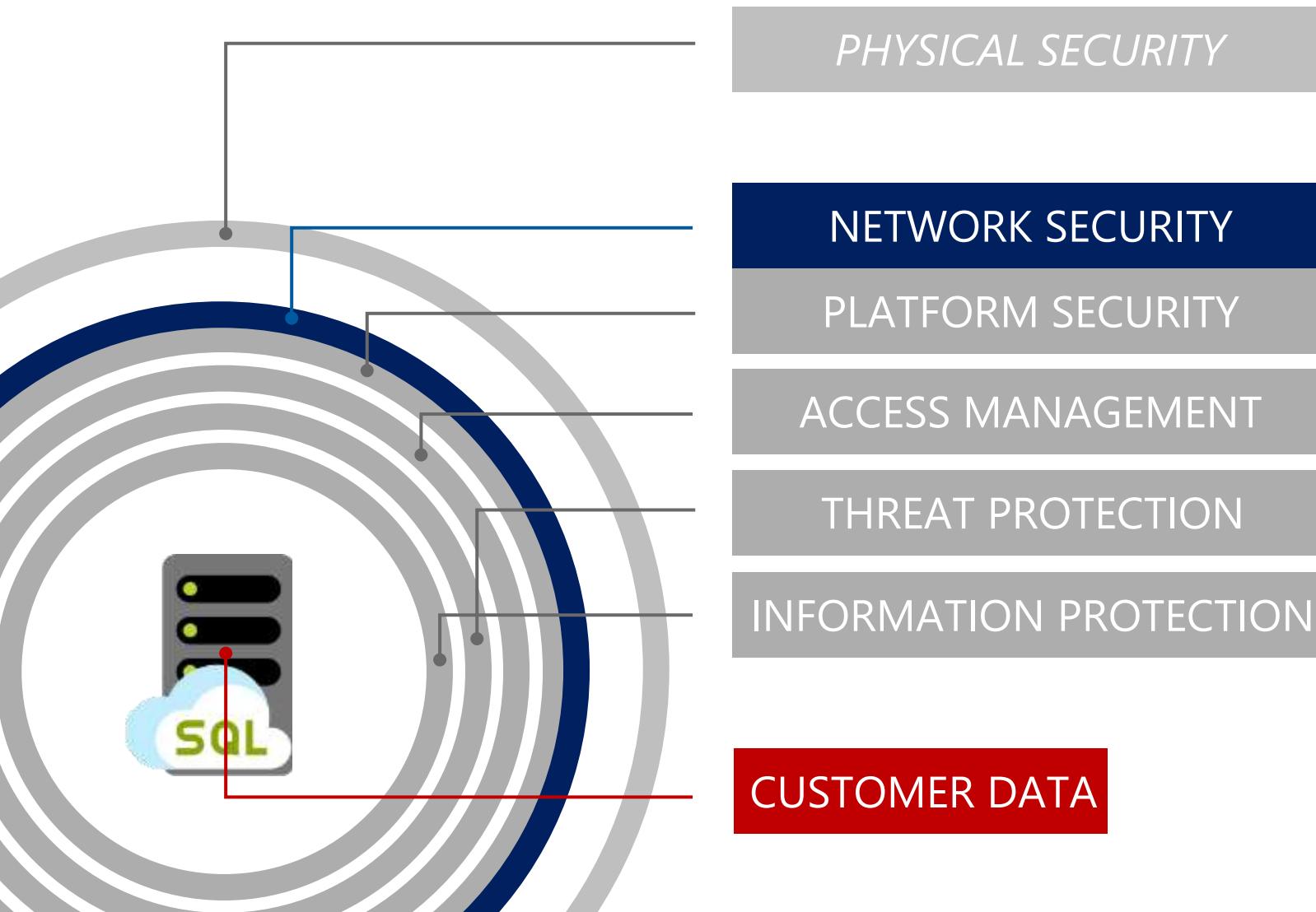
Working with large workloads, demo

Closing

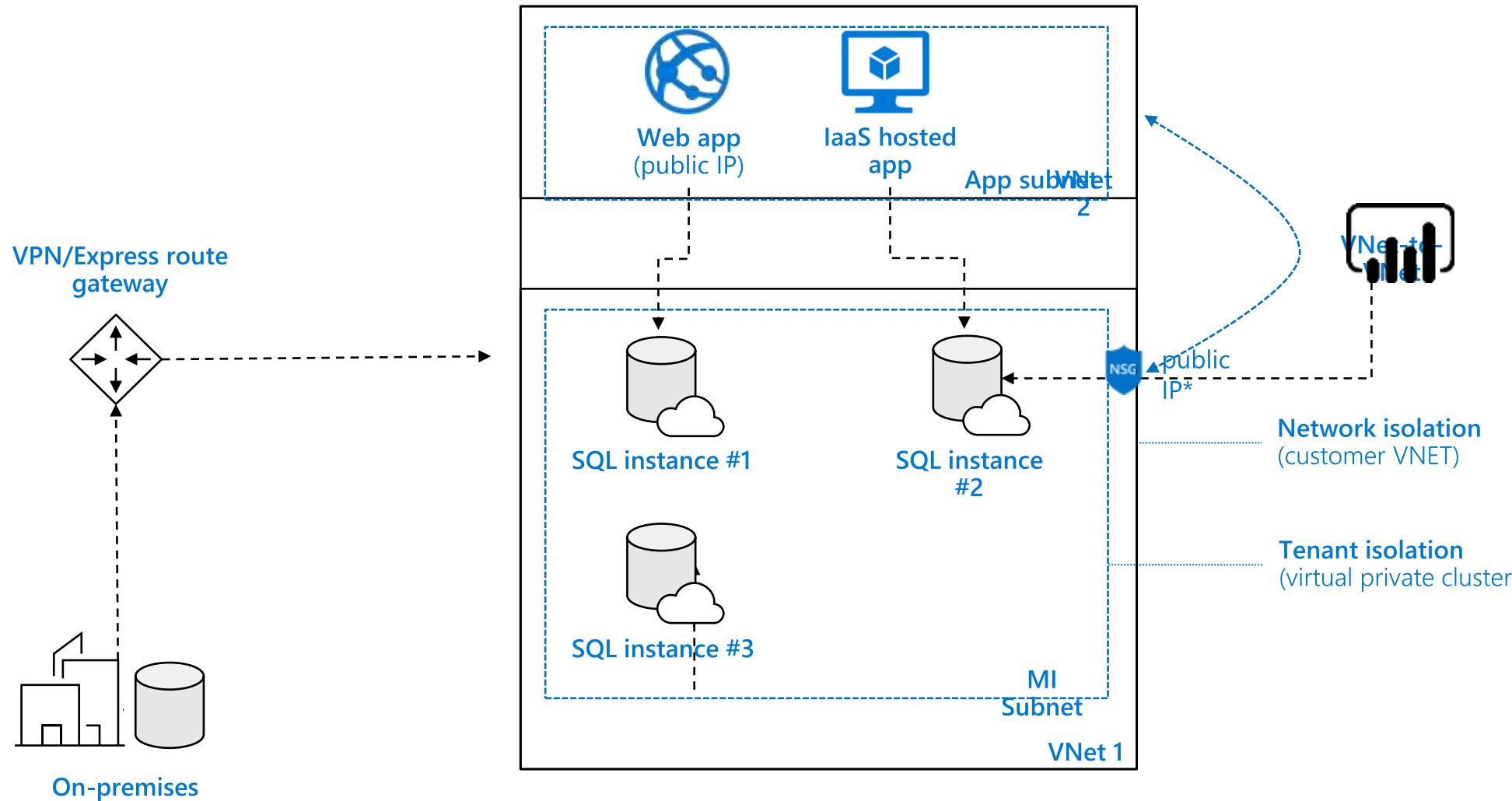
Q&A, technical resources, etc.



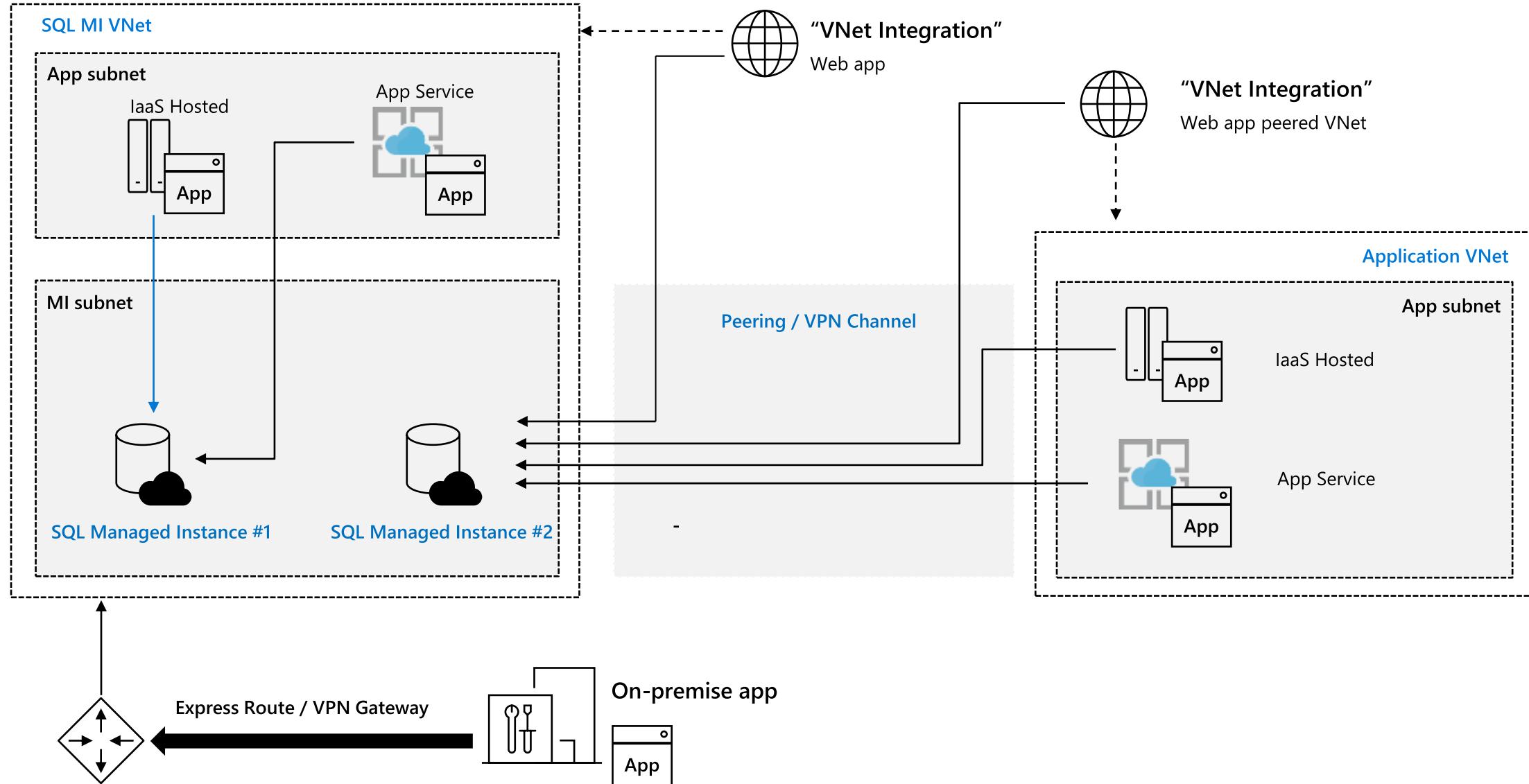
Securing the network



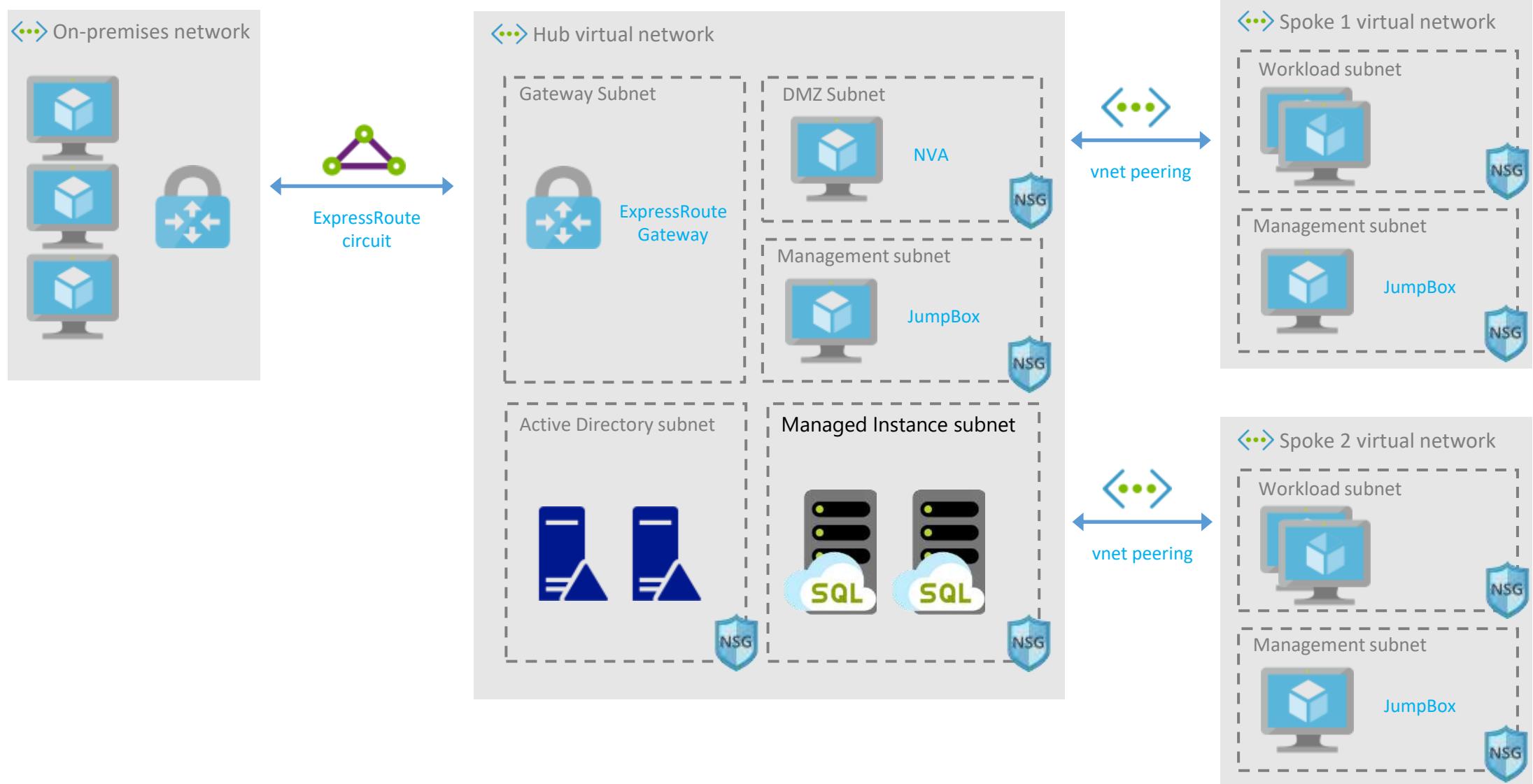
Isolation and connectivity of Managed Instance



Host your application in the cloud or keep on-premises



Hub & spoke architecture with MI



Virtual network guidance

A Managed Instance must be deployed in an Azure Virtual Network

Allows for connecting directly from an on-premises network

Allows for connecting linked servers or other on-premises data stores

Allows for connecting to additional Azure resources

Plan your deployment

Managed Instance requires a minimum of 16 IP addresses in a subnet and may use up to 256 IP addresses

If deploying multiple Managed Instances inside the subnet, you need to optimize the subnet size

The default values create a subnet that takes all the VNet address space, allowing for only Managed Instance inside the virtual network

Routes

Effective routes on the Managed Instance subnet are not supported

Routes can be user-defined (UDR) or Border Gateway Protocol (BGP) routes propagated to network interfaces through ExpressRoute or site-to-site VPN connections

For BGP routes, create a 0.0.0.0/0 Next Hop Internet route and apply it to the Managed Instance subnet

Network Security Groups (NSG)

NSGs on the Managed Instance subnet are not supported

Virtual network considerations

Be empty: The subnet must not contain any other cloud service associated to it, and it must not be Gateway subnet. You won't be able to create Managed Instance in subnet that contains resources other than managed instance or add other resources inside the subnet later.

Have specific route table: The subnet must have a User Route Table (UDR) with 0.0.0.0/0 Next Hop Internet as the only route assigned to it.

Optional custom DNS: If custom DNS is specified on the VNet, Azure's recursive resolvers IP address (such as 168.63.129.16) must be added to the list.

No Service endpoint: The subnet must not have a Service endpoint (Storage or Sql) associated to it. Make sure that Service Endpoints option is Disabled when creating VNet.

Sufficient IP addresses: The subnet must have minimum of 16 IP addresses. For more information. By design, a Managed Instance needs a minimum of 16 IP addresses in a subnet and may use up to 256 IP addresses. As a result, you can use subnet masks /28 to /24 when defining your subnet IP ranges.

Azure uses five IP addresses in the subnet for its own needs

Each General Purpose instance needs **two** addresses

Each Business Critical instance needs **four** addresses

Virtual network guidance

Considerations when creating a new Virtual Network for Managed Instance

- Calculate the subnet size
- Assess the needs for the rest of the Vnet
- Disable Service end points
- Create new ARM Virtual Network

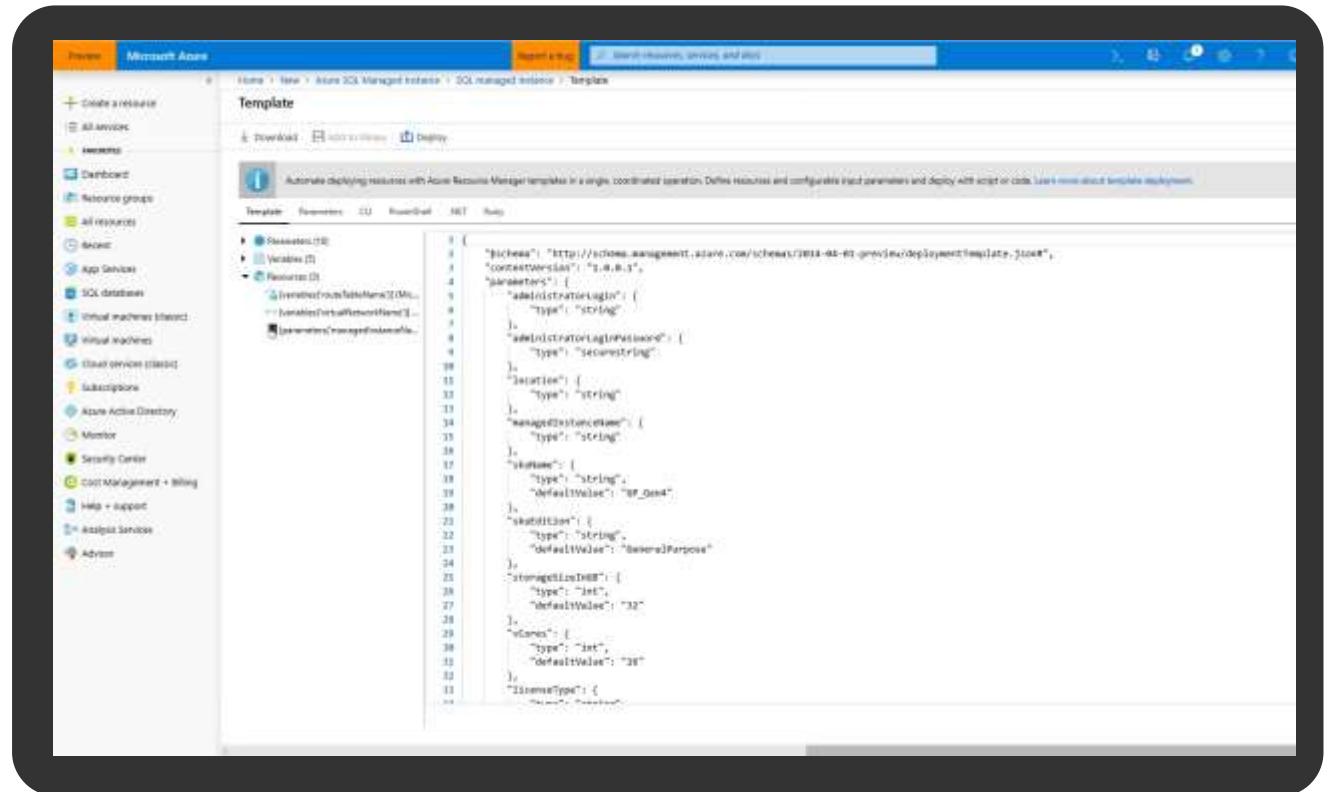
Name	Any valid name
Address space	Any valid address range, such as 10.14.0.0/24
Subscription	Your subscription
Resource Group	Any valid resource group (new or existing)
Location	Any valid location
Subnet name	Any valid subnet name, such as mi_subnet
Subnet address range	Any valid subnet address, such as 10.14.0.0/28. Use a subnet address space smaller than the address space itself to allow space to create other subnets in the same VNet, such as a subnet for hosting test / client apps or gateway subnets to connect from on-prem or other VNets.
Service endpoints	Disabled

Azure SQL Database Managed Instance

Start provisioning in azure portal

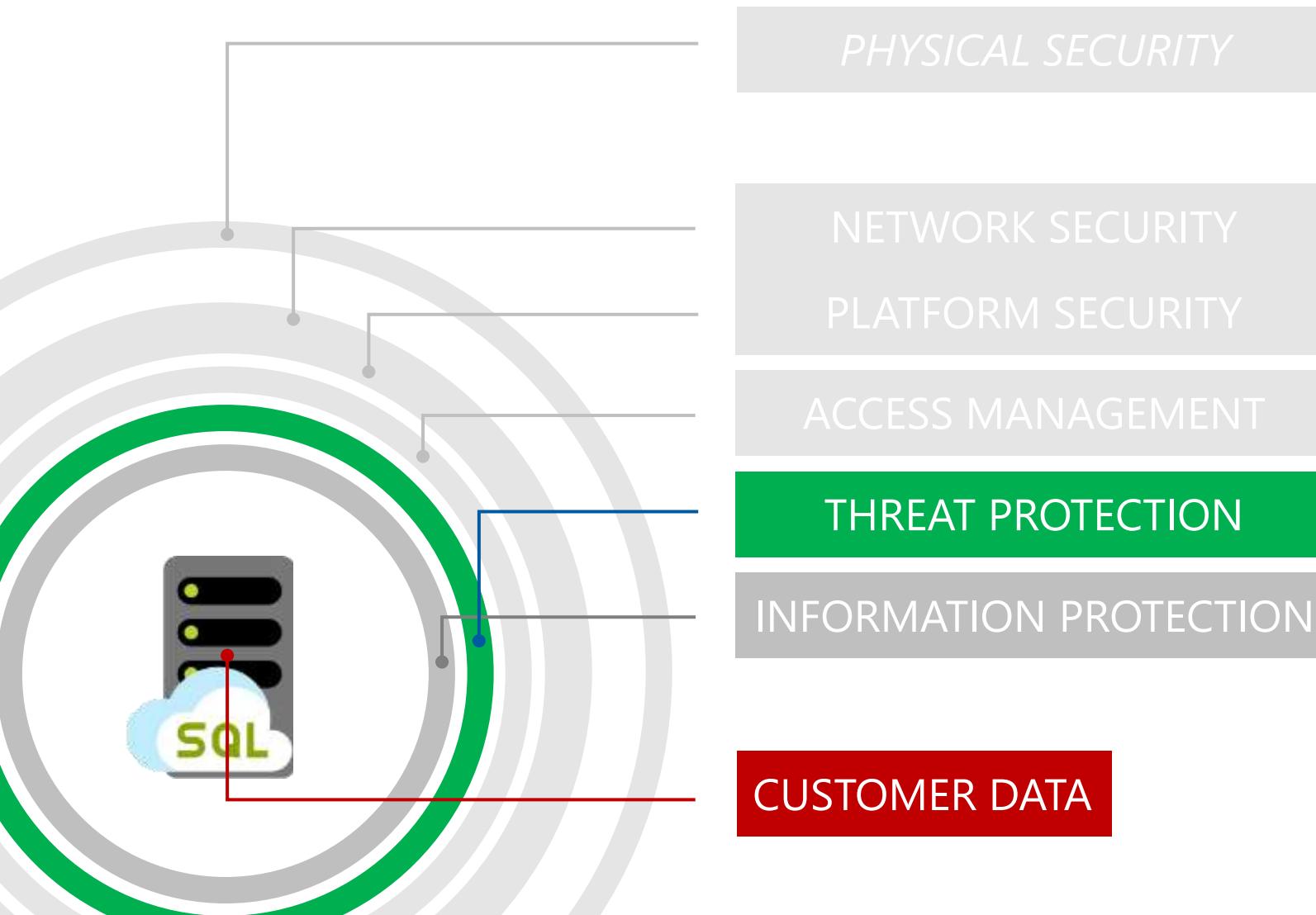
Download template to automate

QuickStart walkthrough on docs



<https://docs.microsoft.com/en-us/azure/sql-database/sql-database-managed-instance-get-started>

Monitoring and auditing



SQL Auditing

Integration with Log Analytics and Event Hubs for SQL DB

Singletons/pools (coming to M.I. soon)

Advanced Threat Protection

Vulnerability Assessment

Threat Monitoring (3 classes of threats)

Other Capabilities

Row-level security

Data Discovery & Classification

(very early prototype in preview for Azure SQL Database Singletons/Pools)

Data Masking (dynamic, static in private preview)

Threat Protection

SQL Auditing

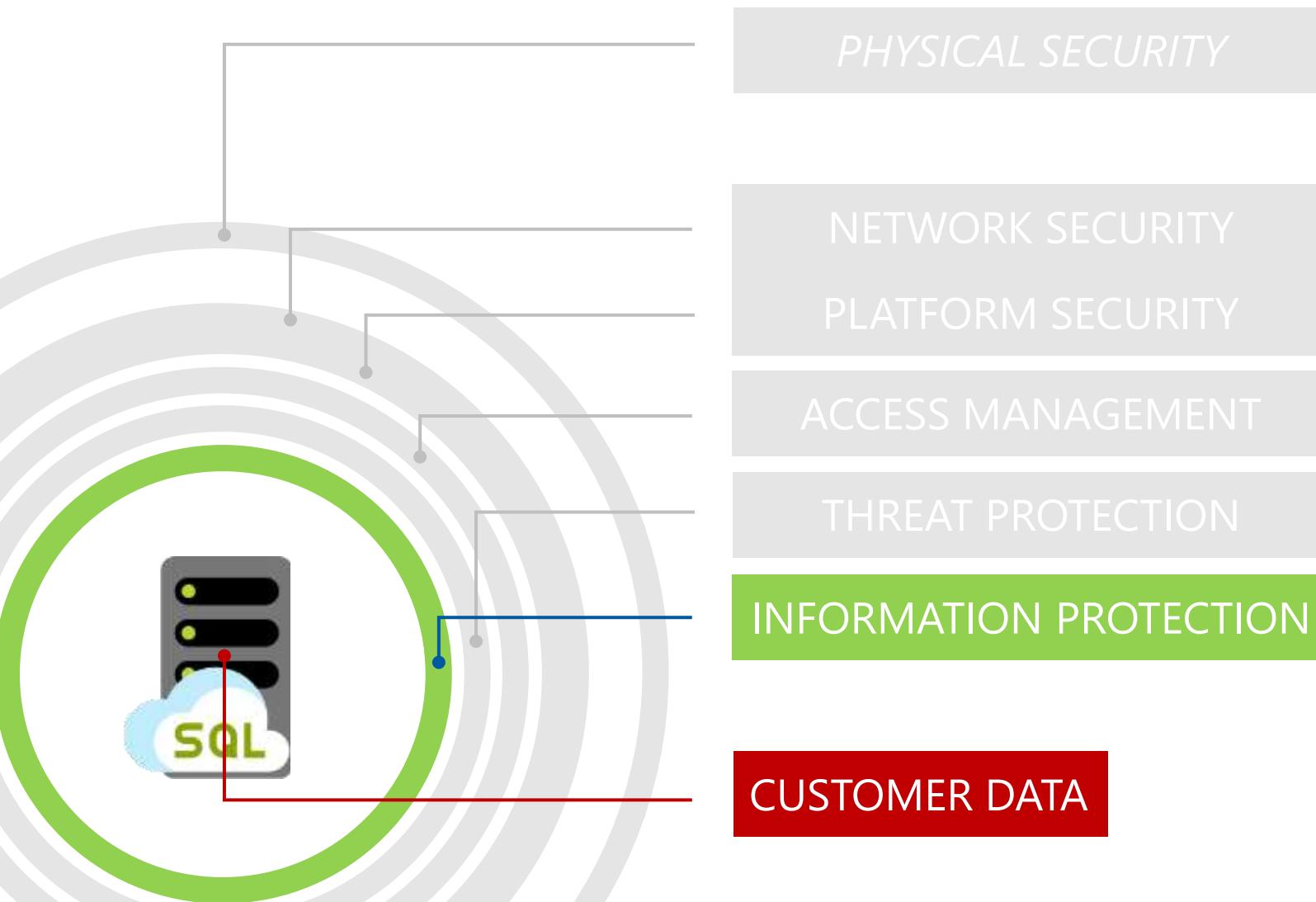
Integration with Log Analytics and Event Hubs for SQL DB singletons/pools (coming to M.I. soon)

Advanced Threat Protection

Vulnerability Assessment

Threat Monitoring (3 classes of threats)

Protecting the data



Encryption-in-flight

(aka. Transport Layer Security TLS)

Encryption-at-rest

(aka. Transparent Data Encryption TDE)
Service- or User-managed keys Backup
encryption

Encryption-in-use (Always Encrypted)*

Key management with
Azure Key Vault

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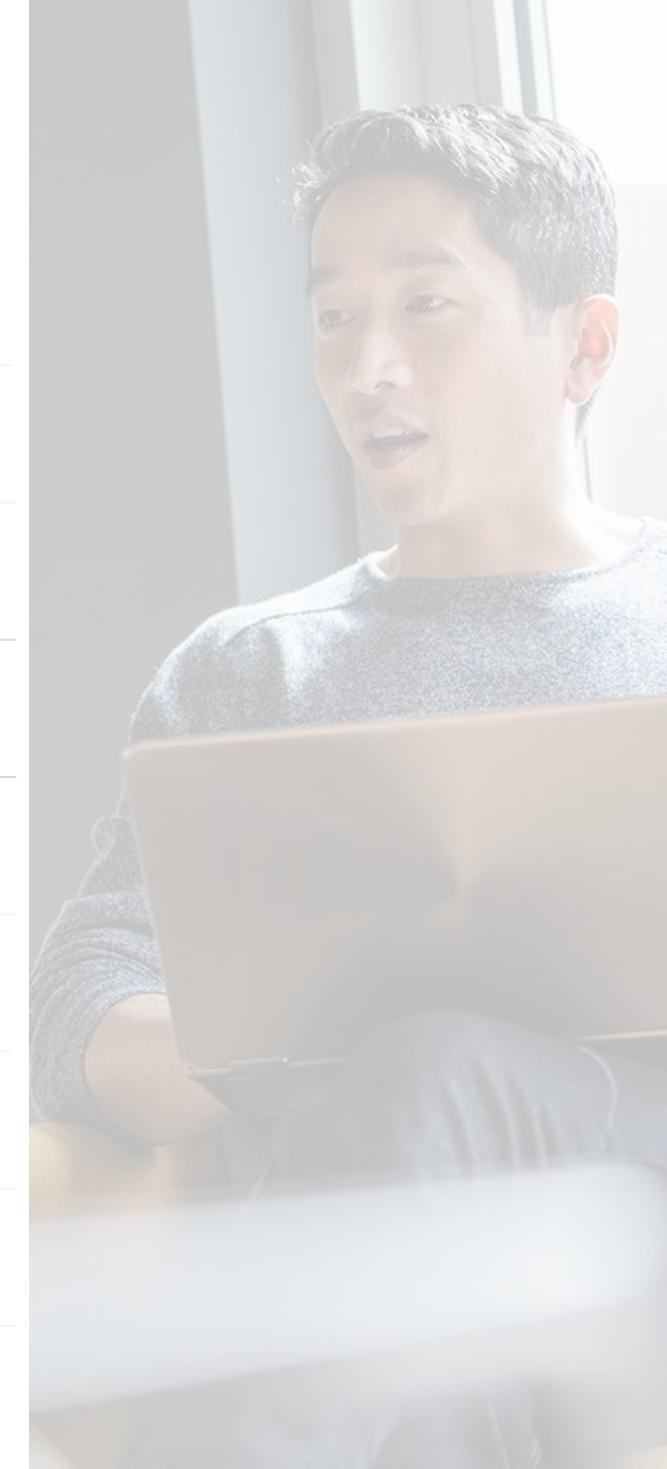
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Hyperscale

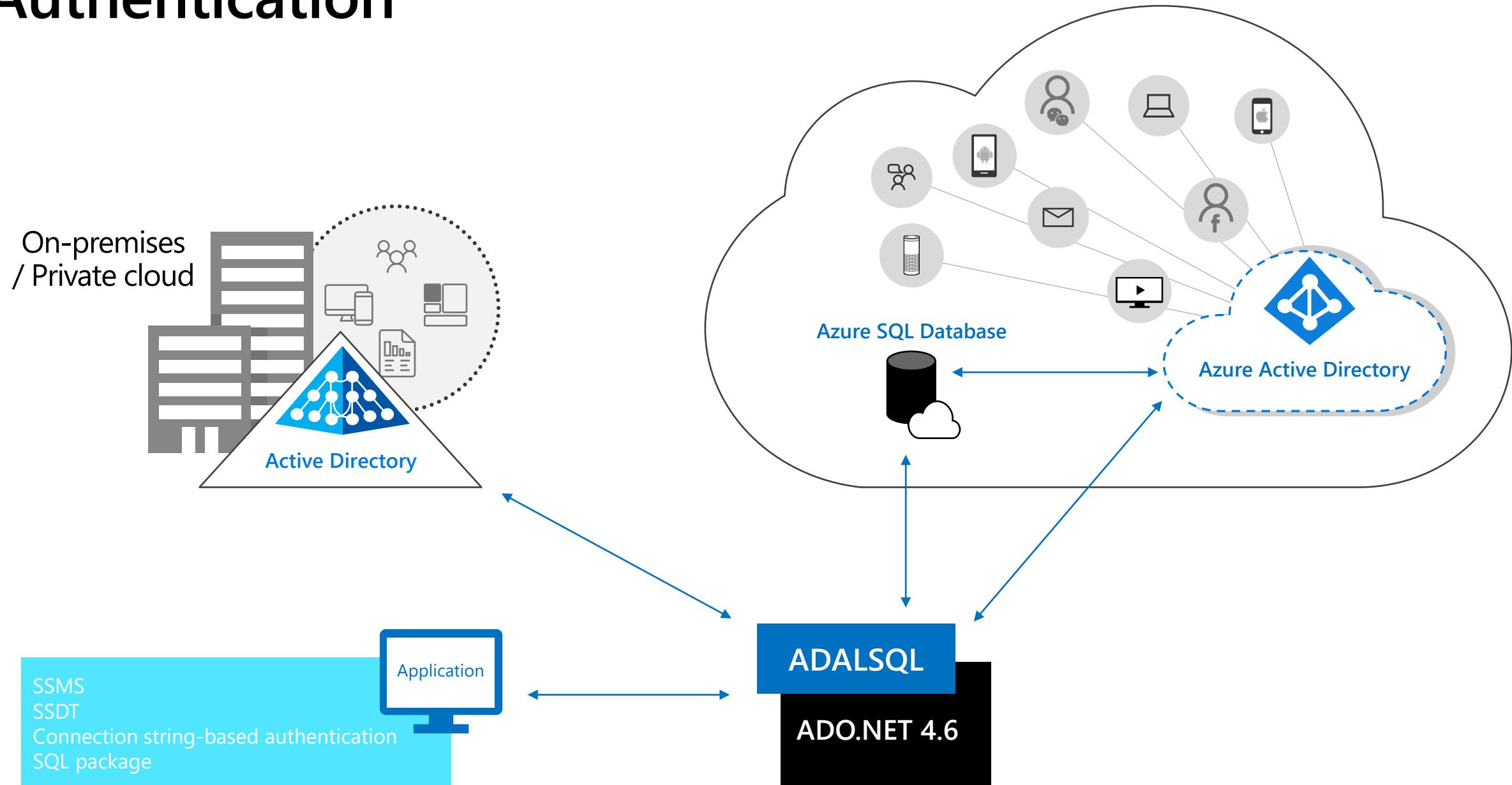
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Closing

Q&A, technical resources, etc.



Authentication



Azure AD

Provides an alternative to SQL Server authentication so database permissions can be managed via external (Azure AD) groups

Supports:

Token-based authentication for applications connecting to SQL Database

ADFS or native user/password authentication for a local Azure Active Directory without domain synchronization

Multi-Factor Authentication (MFA)

Windows logins are not supported

CREATE LOGIN... FROM WINDOWS is not permitted

SQL logins are fully supported when created using:

FROM CERTIFICATE

FROM ASYMMETRIC KEY,

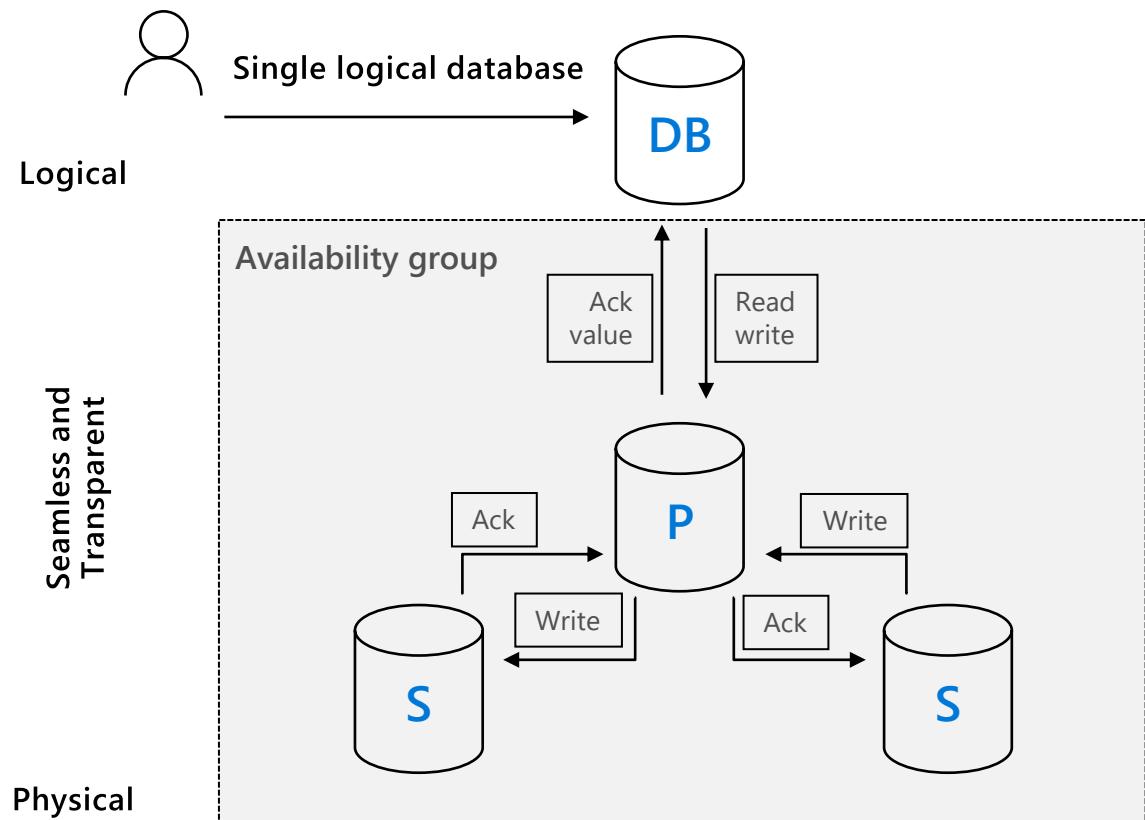
FROM SID

Azure AD user who creates the Managed Instance has unrestricted administrative privileges by default

This can be changed from an individual to a security group account

Azure AD non-admin database users can be created using CREATE USER... FROM EXTERNAL PROVIDER syntax

Built-in high availability



Reads are completed at the primary
Writes are replicated to secondaries

Surface area of Managed Instance

Always on the latest and greatest SQL engine version

Your code can be SQL deployment model aware if necessary

Note: current limitation being removed later this year

MI is always on latest and greatest SQL engine version

Certify your code for database compatibility level not for a version

Take advantage of new features (Temporal, JSON, Graph Database, etc.)

Use rich T-SQL surface area, check out [documentation page](#)

Your code can be SQL deployment model aware if necessary

`SERVERPROPERTY ('EngineEdition')` = 8 uniquely identifies MI

Current limitations (will be removed later this year)

Time is **UTC**. Use [AT TIME ZONE](#) to add local time zone experience

Instance collation is **fixed** (affects tempdb and system databases)

App compatibility: what's is missing?

Features with a better alternative in Azure

Always-On Availability Groups: local HA, active geo-replication

Windows Authentication: Azure Active Directory is the alternative.

Management Data Warehouse : OMS integration is the alternative.

Retired features

Database Mirroring: built-in HA / geo-replication

Extended stored procedures: customers should use CLR

Features considered post-GA

Filestream, Filetable

Cross-instance distributed transactions (MS DTC)

Stretch Database

PolyBase

Azure SQL LIMITATIONS – MAPPING TO OTHER AZURE SERVICES

Several common services are missing

SQL Server Agent

Azure Webjobs

Azure SQL Elastic Job (S0 tier and higher)

Azure Automation

Azure Functions

On-premise SQL or Azure VM SQL Server with SQL Server Agent

SSIS

Azure Data Factory

SSAS

Azure Analysis Services

SSRS

PowerBI

IaaS SQL VM with SSRS (Windows Srv)

MORE LIMITATIONS

- Azure SQL DB is a PaaS offering, you can't manage SQL Server instance
 - Cross-database queries
 - System views
 - Server roles
 - DB file management
 - Common SQL Server backup – migration complexity

Azure SQL Database Transact-SQL differences

- Server-level activities
- Features that relate to high availability which is managed through your Microsoft Azure account: backup, restore, AlwaysOn, database mirroring, log shipping, recovery modes
- Features that rely upon the log reader: Replication, Change Data Capture
- FILESTREAM
- Global temporary tables
- Hardware related server settings: memory, worker threads, CPU affinity, trace flags, etc. Use service levels instead
- Linked servers, OPENQUERY, OPENROWSET, OPENDATASOURCE, BULK INSERT, 3 and 4 part names
- .NET Framework CLR integration with SQL Server
- Resource governor
- Semantic search
- SQL Server Profiler
- Transact-SQL debugging
- Triggers: Server-scoped or logon triggers
- USE statement

Demo

“On-prem vs Azure SQL”

MI in the middle

CLR Considerations

Managed Instance cannot access file shares and Windows folders

Only CREATE ASSEMBLY FROM BINARY is supported

CREATE ASSEMBLY FROM FILE is not supported

ALTER ASSEMBLY can't reference files

SQL Server Agent

Built into Managed Instance

Azure SQL Database requires using on-premises SQL Server Agent, Azure Automation, Elastic Jobs, or PowerShell

Always running

Services cannot be stopped or restarted like they can with on-premises

Option to auto-restart SQL Server if it stops unexpectedly is disabled

Option to auto-restart SQL Server Agent if it stops unexpectedly is disabled

Forwarding SQL Server events is disabled

On-premises SQL Server Agent allows for forwarding events to another server but this is currently not an option for a Managed Instance

Connection

Alias local host server is predefined for a Managed Instance, whereas on-premises SQL Server Agent allows that to be configured if needed

Creating jobs

Creating jobs is as simple and easy as on-premises

Jobs can be created using the UI or T-SQL

Alert System

Functions the same as on-premises for sending email alerts

SQLCMD

Cannot be called within a SQL Server Agent job

Can be used to connect to a Managed Instance

Service broker within instances

Service broker is on by default for all user databases

Cross-instance service broker is not supported

CREATE ROUTE does not work with ADDRESS other than LOCAL
ALTER ROUTE does not work with ADDRESS other than LOCAL

Database mail

Fully supported in Managed Instance

Functions the same as on-premises to set up and use

Azure SQL Database does not have Database Mail support

Replication support

Supported

Snapshot replication. Same functionality as on-premises
Transactional replication

Unsupported

Peer-to-peer replication
Merge replication
Heterogeneous replication
Oracle publisher

For comparison, Azure SQL Database only supports being a transactional replication push subscriber

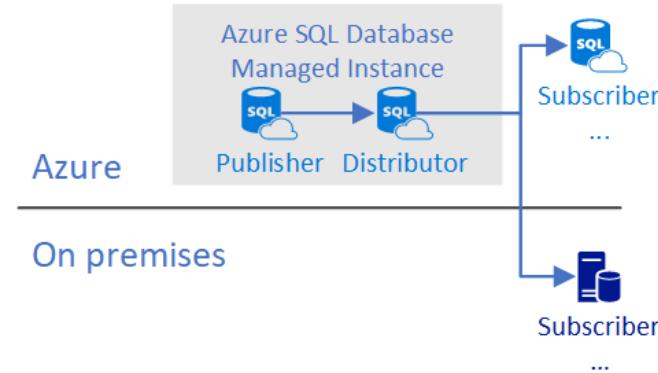
Some restrictions when used with a Managed Instance

Updatable subscriptions are not permitted
Publisher and distributor must be in the same location
If publisher and distributor are in a Managed Instance, Azure file share must be used to store data and schema from the publication
Connections to the Distributor must use SQL authentication

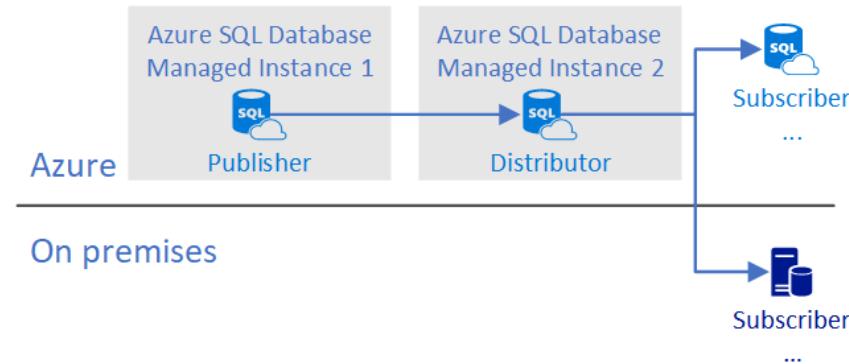
Additions to support Managed Instance

New fields have been added in replication-related tables in msdb
job_login, job_password, storage_connection_string
SSMS replication wizard supports using a Managed Instance

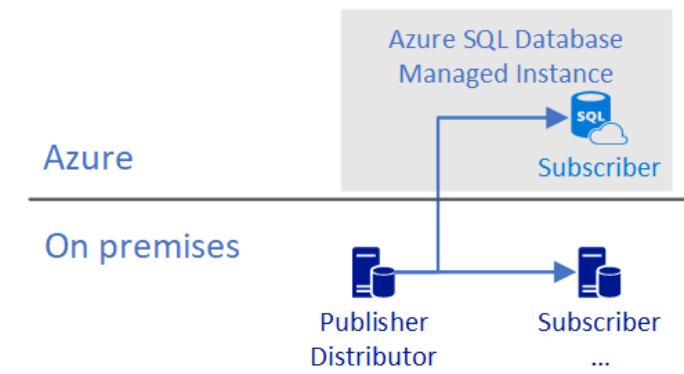
Publisher with Local Distributor on MI



Publisher with Remote Distributor on MI



Publisher and distributor on-premises with subscriber on managed instance



Database Compatibility Based Certification

Microsoft database compatibility level protection

Easy to use tools to help you access migration

Microsoft Database Compatibility Level Protection

Full Functional protection once assessment tool runs clean.

Maintaining backward compatibility is very important to SQL Server team.

Query Plan shape protection.

Overall process

Use Database Migration Assistant (DMA) and Database Experimentation Assistant (DEA) for assessment.

Migrate database and keep/set source Database Compatibility Level on target.

Perform minimal testing or as determined by your organization.

App compatibility: what's is missing?

Features with a better alternative in Azure

Always-On Availability Groups: local HA, active geo-replication

Windows Authentication: Azure Active Directory is the alternative.

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Retired features

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Stretch Database

PolyBase

User Database File Layout Considerations

Data file default initial size is 16MB with 16MB auto growth

These can and should be adjusted for your workload

File size limit is 8TB in General Purpose

Log file default initial size is 8MB with 16MB auto growth

This can and should be adjusted for your workload

Additional data files/filegroups can be added

Only using an ALTER DATABASE statement and the FILENAME clause is not permitted

Paths and File Names are chosen for you

Different from Azure SQL Database where additional files are not allowed

Multiple log files are not supported (and should not be needed)

A backup with multiple files/filegroups can be restored

Each user database has a FILESTREAM filegroup for In-Memory OLTP checkpoint files

Multiple log files are not supported (and should not be needed)

Tempdb Data File Considerations

Tempdb Tuning Options

Multiple tempdb data files are created automatically
Default data file and log file sizes are 16MB

These can and should be adjusted for your workload

Default auto-growth for data files is set to 256MB

This can be adjusted for your workload if needed

Default auto-growth for the log file is set to 64MB

This can be adjusted for your workload if needed

Additional tempdb data files can be created if needed

Files can only be created using an ALTER DATABASE statement and the FILENAME clause is not permitted

Well-known tempdb tuning 'fixes' are on by default

Data files auto-grow at the same time

Single-page allocations disabled

This default behavior was introduced in SQL Server 2016 for on-premises

Tempdb Resizing

Sometimes necessary to resize tempdb after excessive growth

E.g. from a runaway query with a large memory spill to tempdb

The SQL Server Service cannot be restarted manually to make tempdb resize back to the configured size

This is the usual way of dealing with the situation in on-premises

It is possible to shrink the database or shrink one or more files if needed

Be aware that just as with on-premises, tempdb shrinking may not be able to progress if it encounters certain data page types

This is usually solved on-premises by restarting the instance

A better option may be to restrict tempdb from growing out of control by specifying a maximum file size

Backup/restore

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

Agenda

Intro to Azure SQL Database

Value prop, Platform benefits, TCO

Managed Instance overview

Managed Instance overview and architecture, Hands-on-lab

Security & Networking

Security overview, Networking considerations, demos

Features and capabilities

Key capabilities, limitations, backup & restore

Replication & Monitoring

Replication and Monitoring, demo

Migration

Migration overview and options, Hands-on-Lab

Data migration tasks

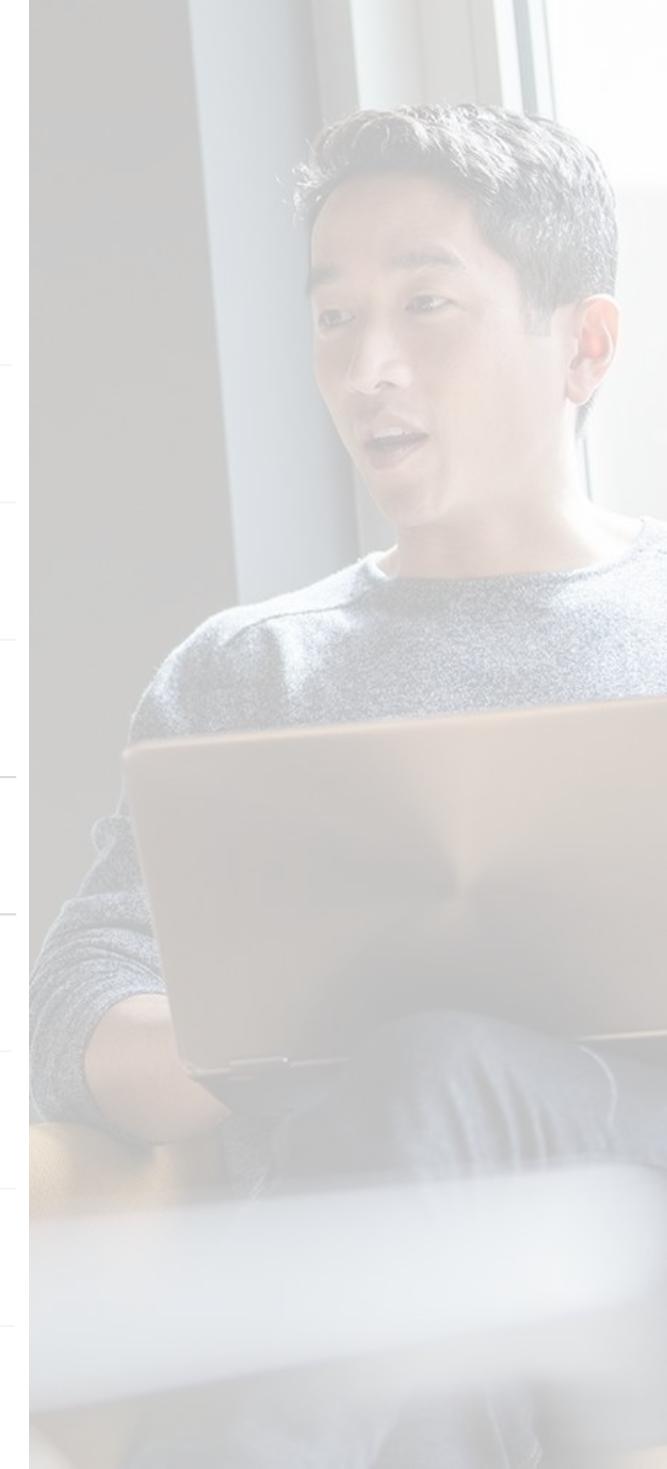
Microsoft ETL/ELT Services, Hands-on-Lab

Hyperscale

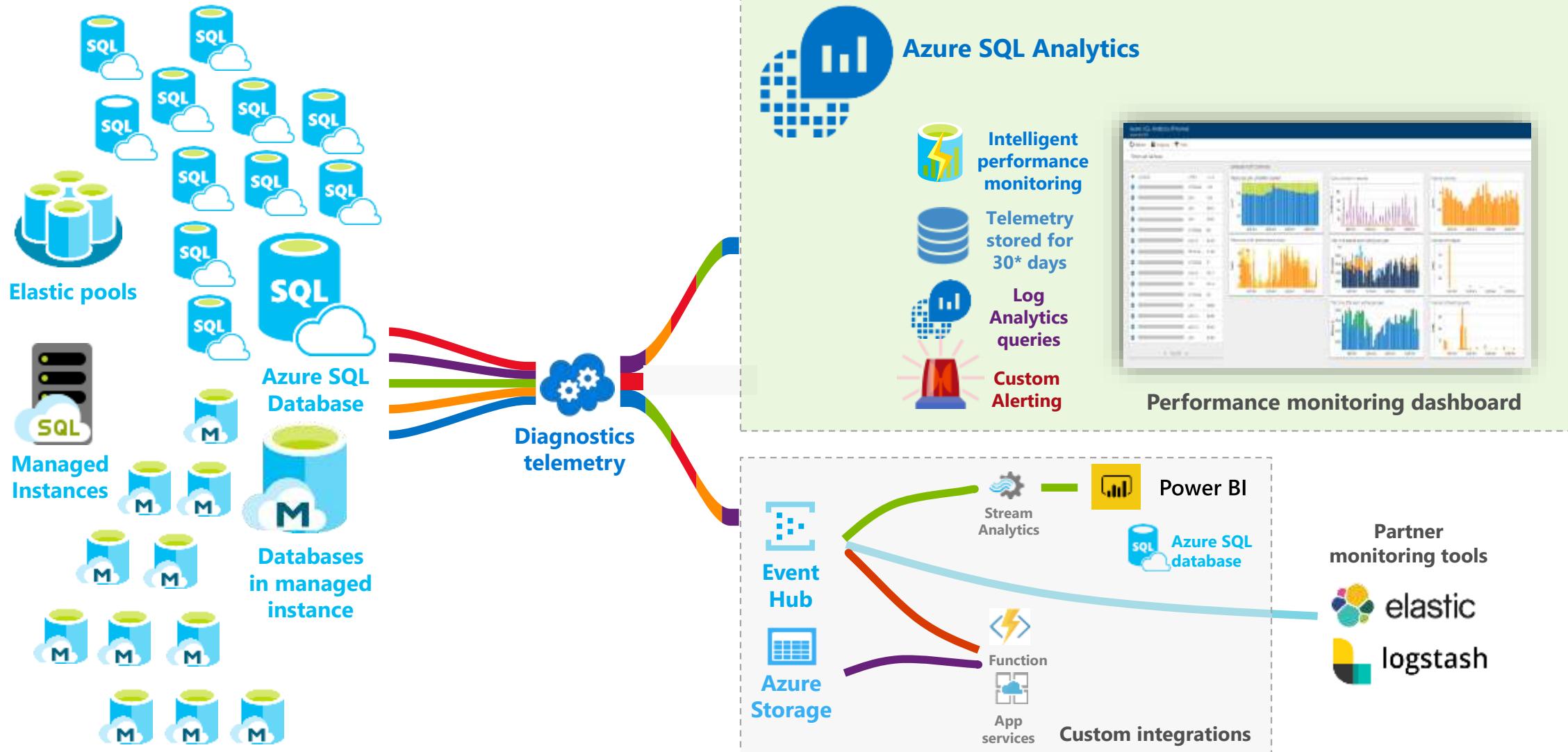
Working with large workloads, demo

Closing

Q&A, technical resources, etc.

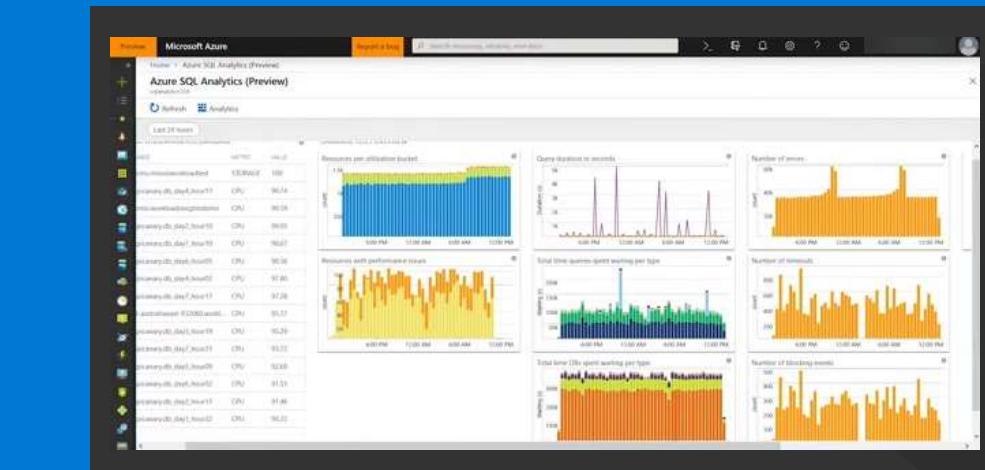


Monitoring with Azure SQL Analytics



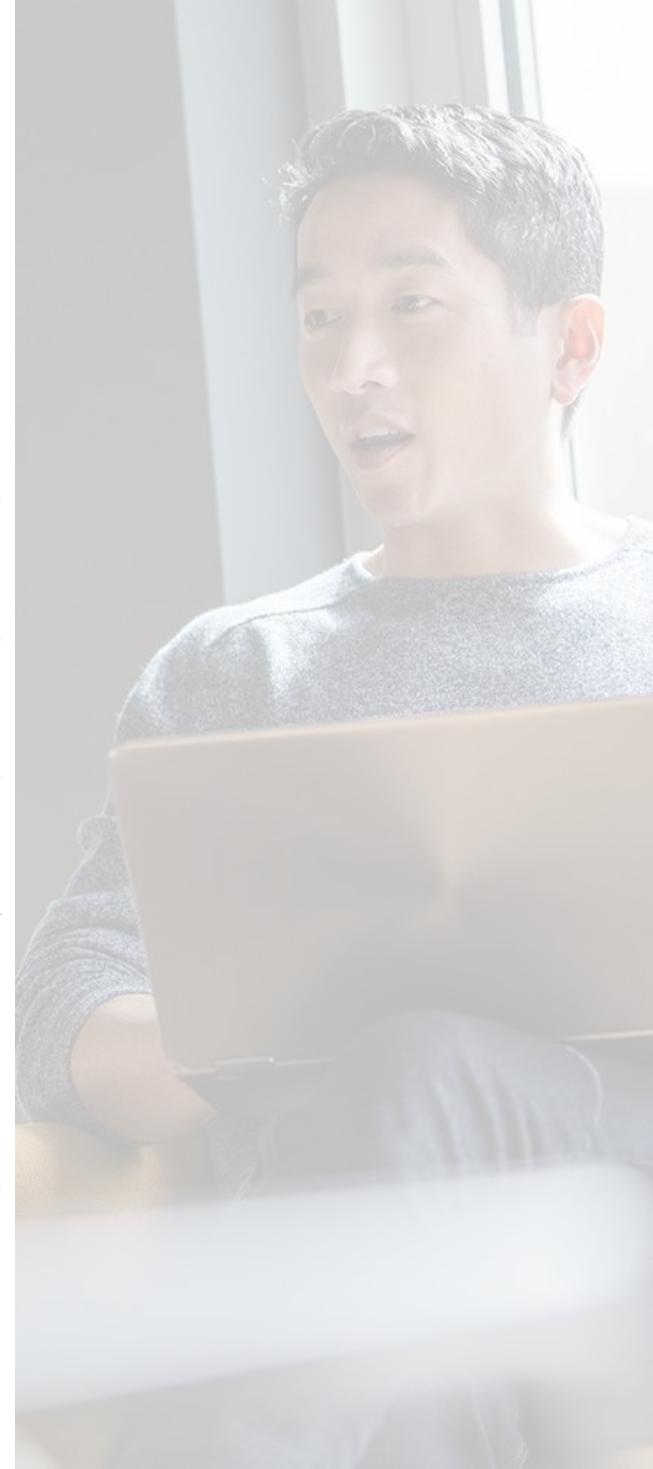
Demo

Azure SQL Analytics



Agenda

Intro to Azure SQL Database	Value prop, Platform benefits, TCO
Managed Instance overview	Managed Instance overview and architecture, Hands-on-lab
Security & Networking	Security overview, Networking considerations, demos
Features and capabilities	Key capabilities, limitations, backup & restore
Replication & Monitoring	Replication and Monitoring, demo
Migration	Migration overview and options, Hands-on-Lab
Data migration tasks	Microsoft ETL/ELT Services, Hands-on-Lab
Hyperscale	Working with large workloads, demo
Closing	Q&A, technical resources, etc.



Tools for your migration journey

Data Migration Assistant (DMA)

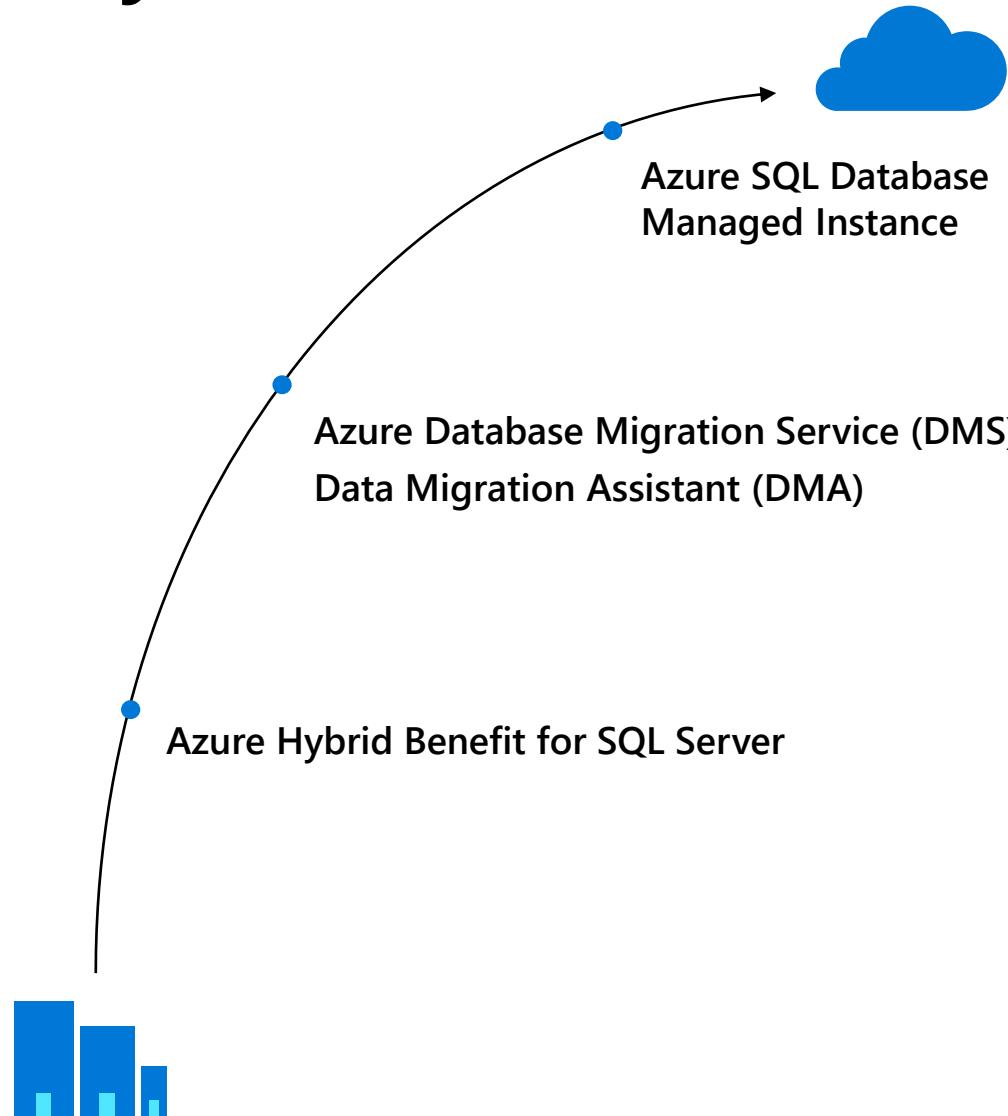
Enables upgrades to SQL Server and Azure SQL Database

Azure Hybrid Benefit for SQL Server

Maximizes current on-premises license investments to facilitate migration

Azure SQL Database Managed Instance

Facilitates lift and shift migration from on-premises SQL Server to PaaS



Cloud migration strategies



Rehost

Often referred to as "**lift and shift**" migration, this no-code option lets you migrate your existing applications to Azure quickly. Each *application is migrated as-is*, which provides the benefits of the cloud without the risks or costs of making code changes, and you can leverage SQL Server on Azure Virtual Machines, Microsoft's infrastructure as a service (IaaS) product, to achieve that.



Refactor

Often referred to as **repackage**, this cloud migration strategy involves *some change to the application design but no wholesale changes to the application code*. Your application can take advantage of infrastructure as a service (IaaS) and platform as a service (PaaS) products, such as Azure App Service, Azure SQL Managed Instance, and containers.



Rearchitect

Modify or extend your application's code base to scale and optimize it for the cloud. *Modernize your app into a resilient, highly scalable, independently deployable architecture* and use Azure SQL Database, Microsoft's platform as a service (PaaS) offering, to accelerate the process, scale applications with confidence, and manage your apps with ease.



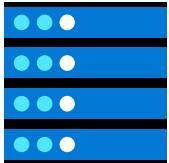
Rebuild

Rebuild an application from scratch using cloud-native technologies. Azure platform as a service (PaaS) provides a complete development and deployment environment in the cloud, without the expense and complexity of software licenses, the need for underlying application infrastructure, or middleware and other resources. With this cloud migration strategy, *you manage the applications and services you develop*, and Azure manages everything else.

For more information about cloud migration strategies, see [Start your cloud migration process](#).

Rehost with Azure Migrate to Azure VMs

Windows and
SQL Server
migration



1. Discover

Deploy [Azure Migrate Appliance](#) to on-premises environment or use CMDB info to import via CSV. Discover and analyze server performance

2. Assess

Group servers and perform assessments to determine Azure suitability, right-sizing information, dependency mapping, and cost planning.

3. Migrate

Start migrating servers to Azure with the combined appliance. Test migration and perform zero data loss cutover to Azure

Refactor to Azure SQL using Azure migration tools

Application Migration



Database Migration



1. Discover

Access the [App Service Migration](#) from Azure Migrate. Download the [Migration Assistant](#) to start .NET or PHP app migration

2. Assess

Scan the public endpoint to get a list of technologies used, which are then compared to other sites hosted on [App Service](#). This creates a unique assessment report for the site. Use [Data Access Migration Toolkit](#) to migrate application source code between databases

3. Migrate

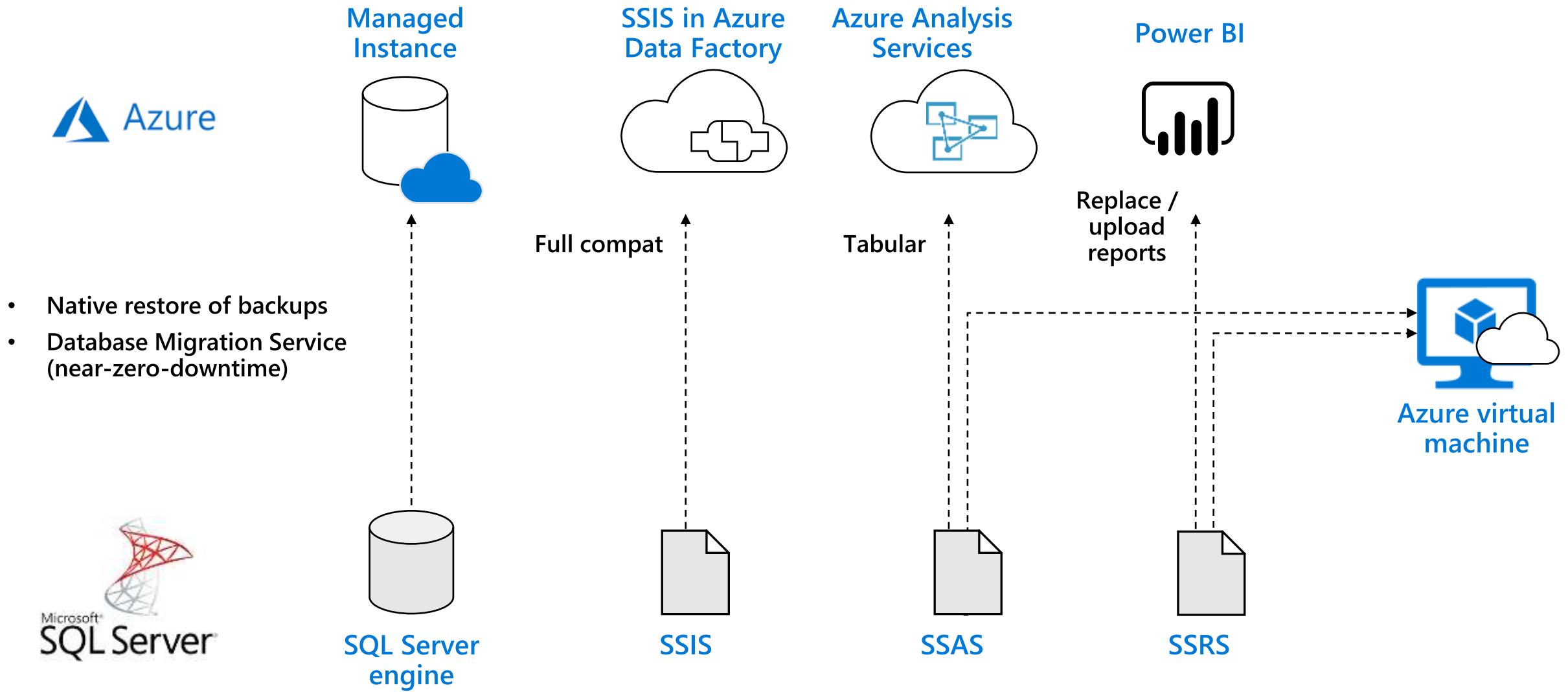
Migrate to [App Service](#) by either redeploying code via CI/CD pipeline, deploying a container, or using the [App Service Migration Assistant](#) tool

Create project in [Azure Migrate](#) as a central repository and download [Data Migration Assistant \(DMA\)](#) tool. Upload results to migrate project

Assess on-premises databases using the [DMA](#) tool to understand Azure SQL readiness. Optionally, validate your target database performance using the [Database Experimentation Assistant \(DEA\)](#)

Sync assessment summary from DMA to Azure Migrate. Use [Database Migration Service \(DMS\)](#) to move schema, data, & uncontained objects from source server to target server

Migration to Azure



Microsoft ETL/ELT Services

On-premises



Running SSIS on-premises

OS: Windows/Linux

SCALABILITY: Scale-Out feature

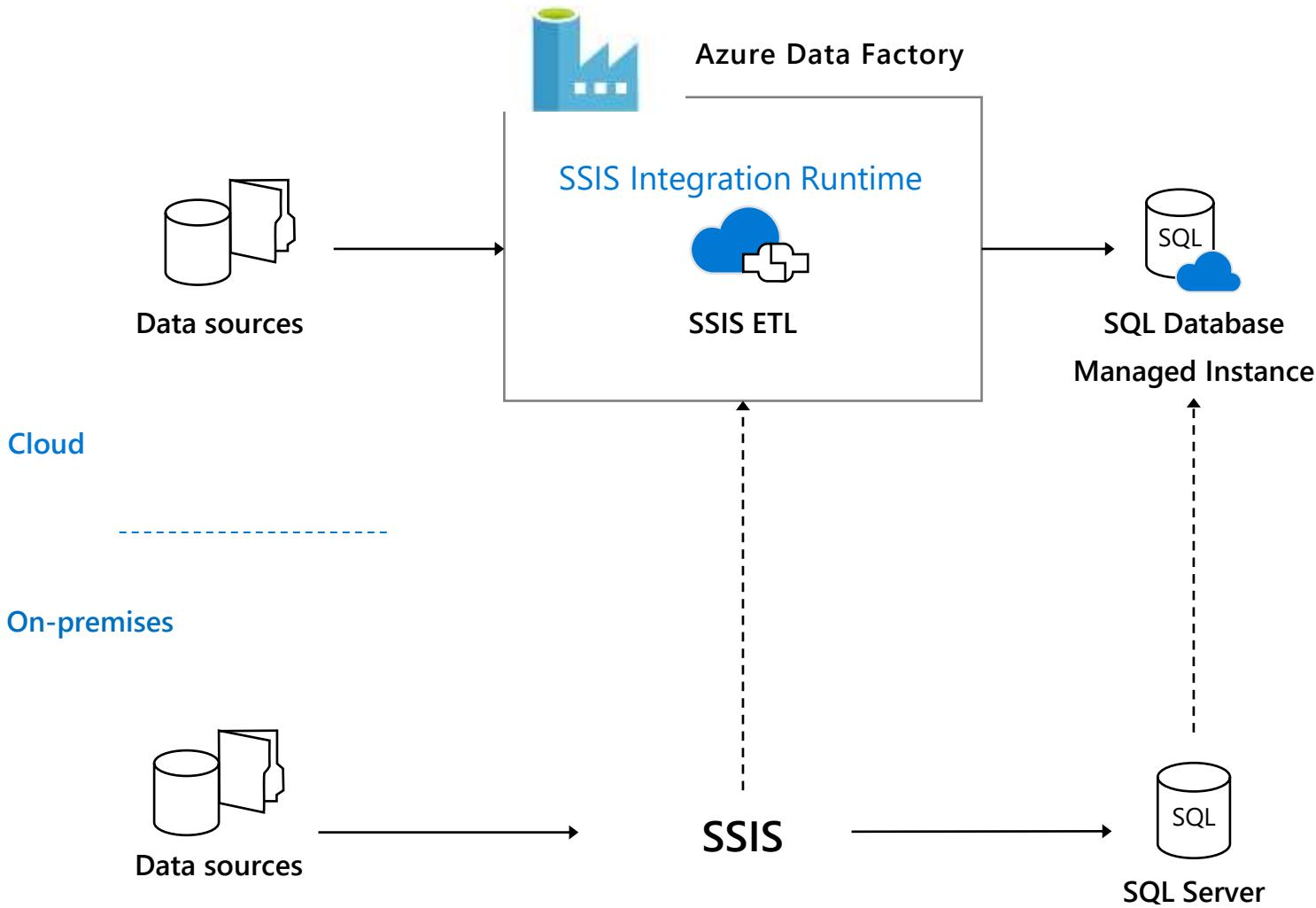
EDITION: Standard/Enterprise

TOOLS: SSDT/SSMS to design/deploy/manage/execute/monitor packages

EXTENSIBILITY: ISVs can build components/extensions on SSIS

PRICING: Bundled w/ on-prem SQL Server

Microsoft ETL/ELT Services



Running SSIS in the cloud

LIFT & SHIFT: Use **Azure SQL DB/Managed Instance** to host SSISDB

SCALABILITY: Use ADF to provision a **managed cluster of Azure VMs dedicated** to run your packages – **Azure-SSIS Integration Runtime (IR)**

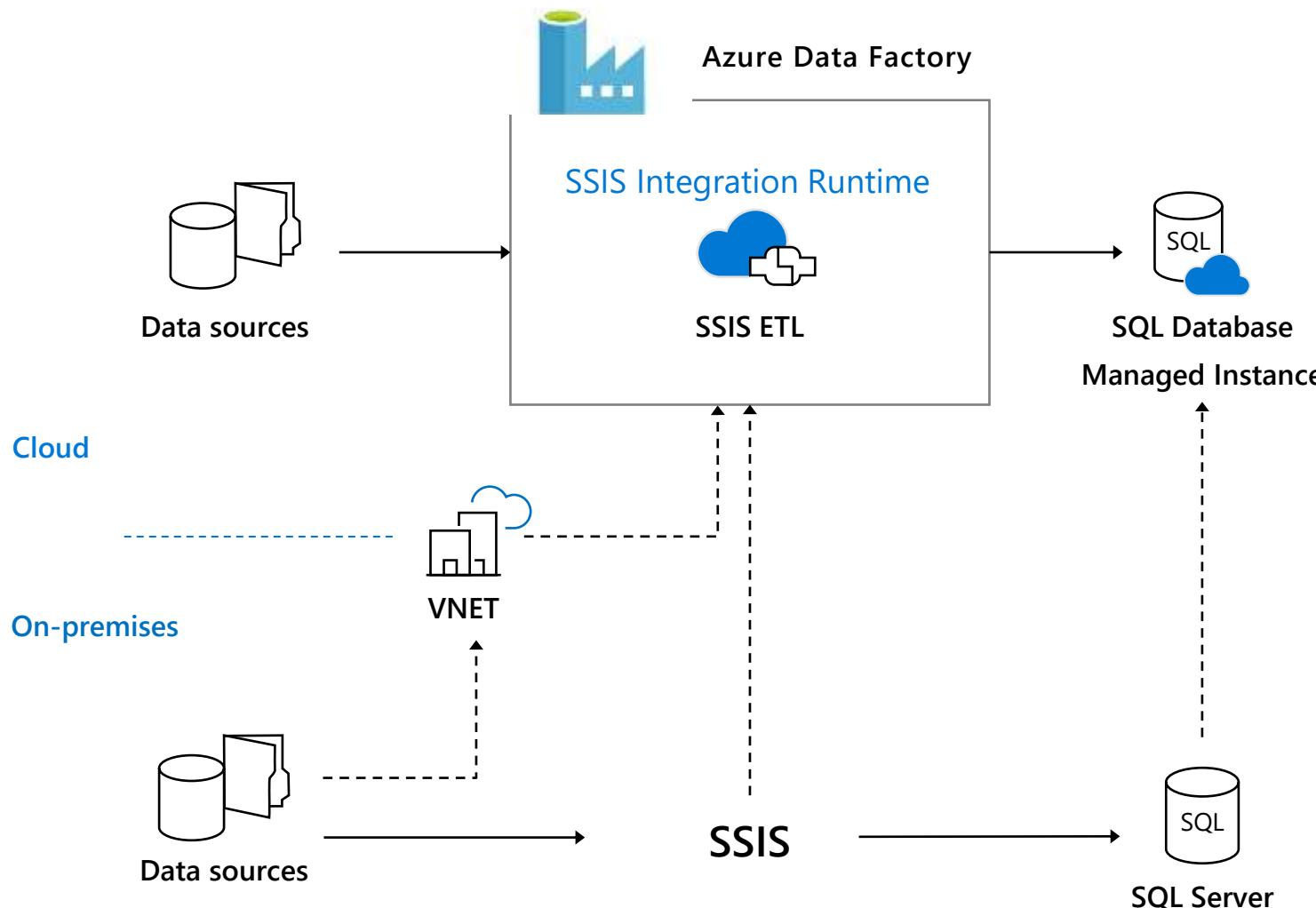
EDITION: Standard/Enterprise

TOOLS: **SSDT/SSMS + ADF app** to design/deploy/manage/execute/monitor packages (activities)

EXTENSIBILITY: ISVs can build components/extensions + SaaS on SSIS in ADF via **custom setup + 3rd party licensing**

PRICING: Pay per hour + **Azure Hybrid Benefit** to Bring Your Own License (BYOL)

Microsoft ETL/ELT Services



Running SSIS in the cloud

HYBRID: Join Azure-SSIS IR to a VNet that is connected to your on-prem network to enable on-prem data access

MODERNIZATION: Schedule **first-class SSIS activities** in ADF pipelines via SSMS and chain/group them w/ other activities via ADF app

COMPLEMENTARY: Splice/inject **built-in/custom/Open Source/3rd party SSIS tasks and transformations** in ADF pipelines

READINESS: General Availability (GA) w/ **24/7 live-site support**

Azure Database Migration Service

Database Migration Guide

**Step-by-step guidance for modernizing
your data assets**

- This guide gives step-by-step guidance on migrating any SQL Server 2005 version or newer to Azure
- Migrations are also supported for SQL Server on Virtual Machines, Amazon Web Services (AWS) EC2, Compute Engine (GCP), and AWS RDS
- The guide covers pre-migration, migration, and post-migration scenarios to help ensure an easy migration to Azure
- Migrate your current databases, applications, and SQL Server logins

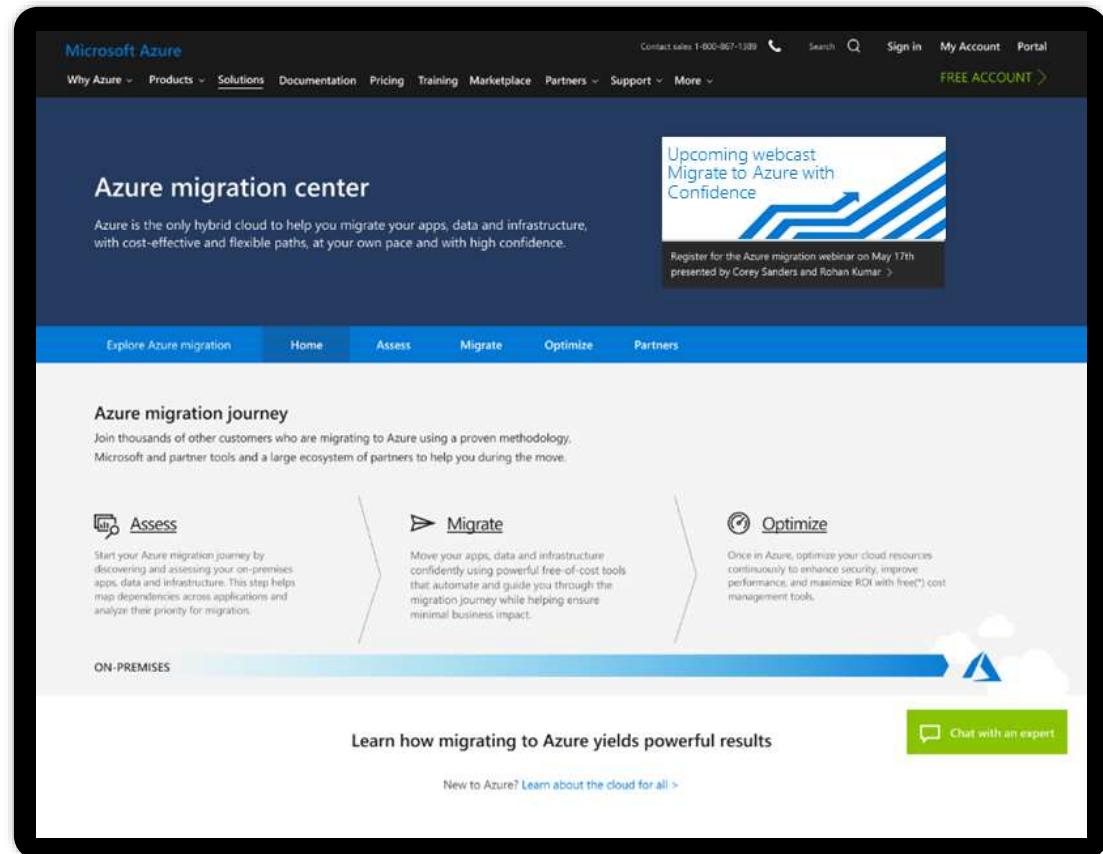
The screenshot shows the landing page for the Azure Database Migration Guide. The header reads "Azure Database Migration Guide" and "Step-by-step guidance for modernizing your data assets". A call-to-action button says "Select your source and target to get started". Below it, a link says "Need a recommendation?". The page lists supported source databases in a grid:

Microsoft SQL Server	ORACLE®	DB2
mongoDB	cassandra	MariaDB
Microsoft Azure Table Storage		

Your single destination for all thing's migration

Provides guidance, tools, and partners in context of your migration scenario

Azure migration center



The screenshot shows the Microsoft Azure migration center homepage. At the top, there's a navigation bar with links like 'Why Azure', 'Products', 'Solutions', 'Documentation', 'Pricing', 'Training', 'Marketplace', 'Partners', 'Support', and 'More'. On the right of the nav bar are links for 'Contact sales 1-800-867-1389', 'Search', 'Sign in', 'My Account', 'Portal', and a 'FREE ACCOUNT' button. A banner on the right promotes an 'Upcoming webcast Migrate to Azure with Confidence' on May 17th, presented by Corey Sanders and Rohan Kumar. Below the banner, a section titled 'Azure migration center' explains that Azure is the only hybrid cloud to help migrate apps, data, and infrastructure with cost-effective and flexible paths. A 'Explore Azure migration' button is visible. The main content area is titled 'Azure migration journey' and describes it as a proven methodology using Microsoft and partner tools and a large ecosystem of partners. It features three steps: 'Assess' (with a brief description), 'Migrate' (with a brief description), and 'Optimize' (with a brief description). A horizontal bar at the bottom indicates the process moves from 'ON-PREMISES' to 'Azure'. At the bottom, there's a call-to-action 'Learn how migrating to Azure yields powerful results' and a 'Chat with an expert' button.

<https://azure.microsoft.com/en-us/migration/>

Expedite migration with Azure Database Migration Service

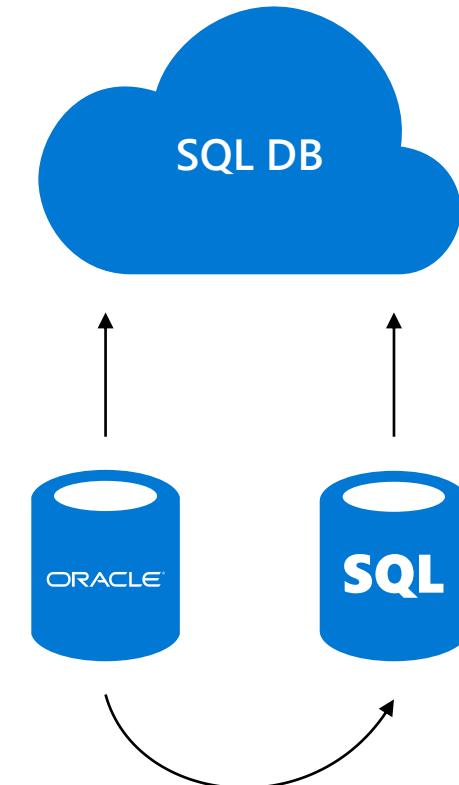
Fully managed Azure service platform for
seamless and frictionless data migration at scale

Database migrations with minimal downtime

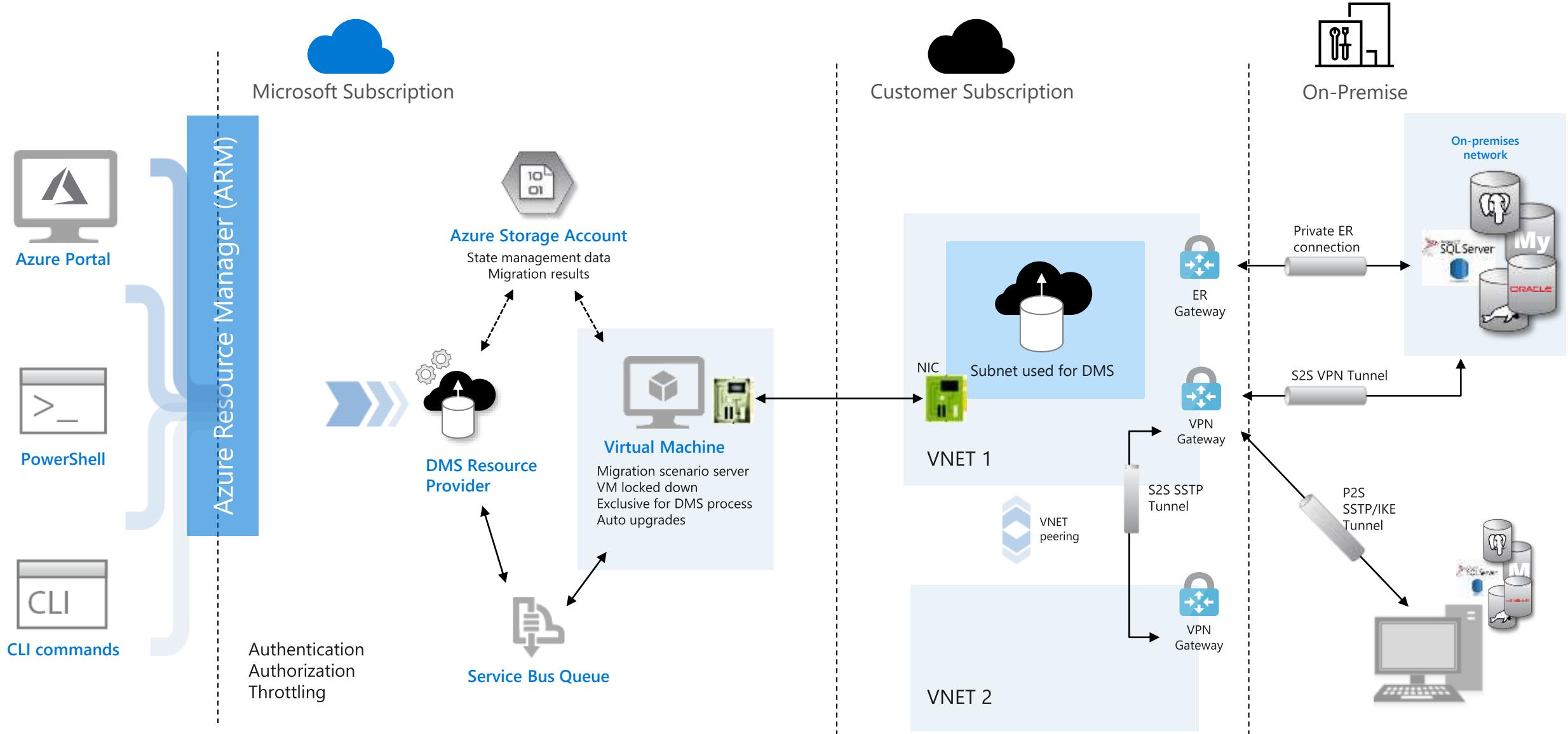
Migrate SQL Server & 3rd party databases to
Azure SQL Database

Built for scale and reliability

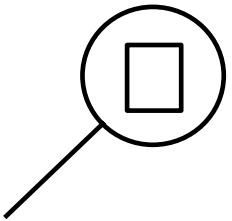
Azure Database Migration Service



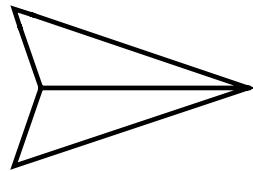
Azure Database Migration Service



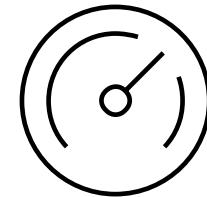
Azure Database migration journey



Assess



Migrate

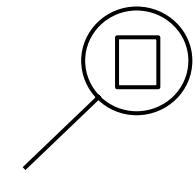


Optimize

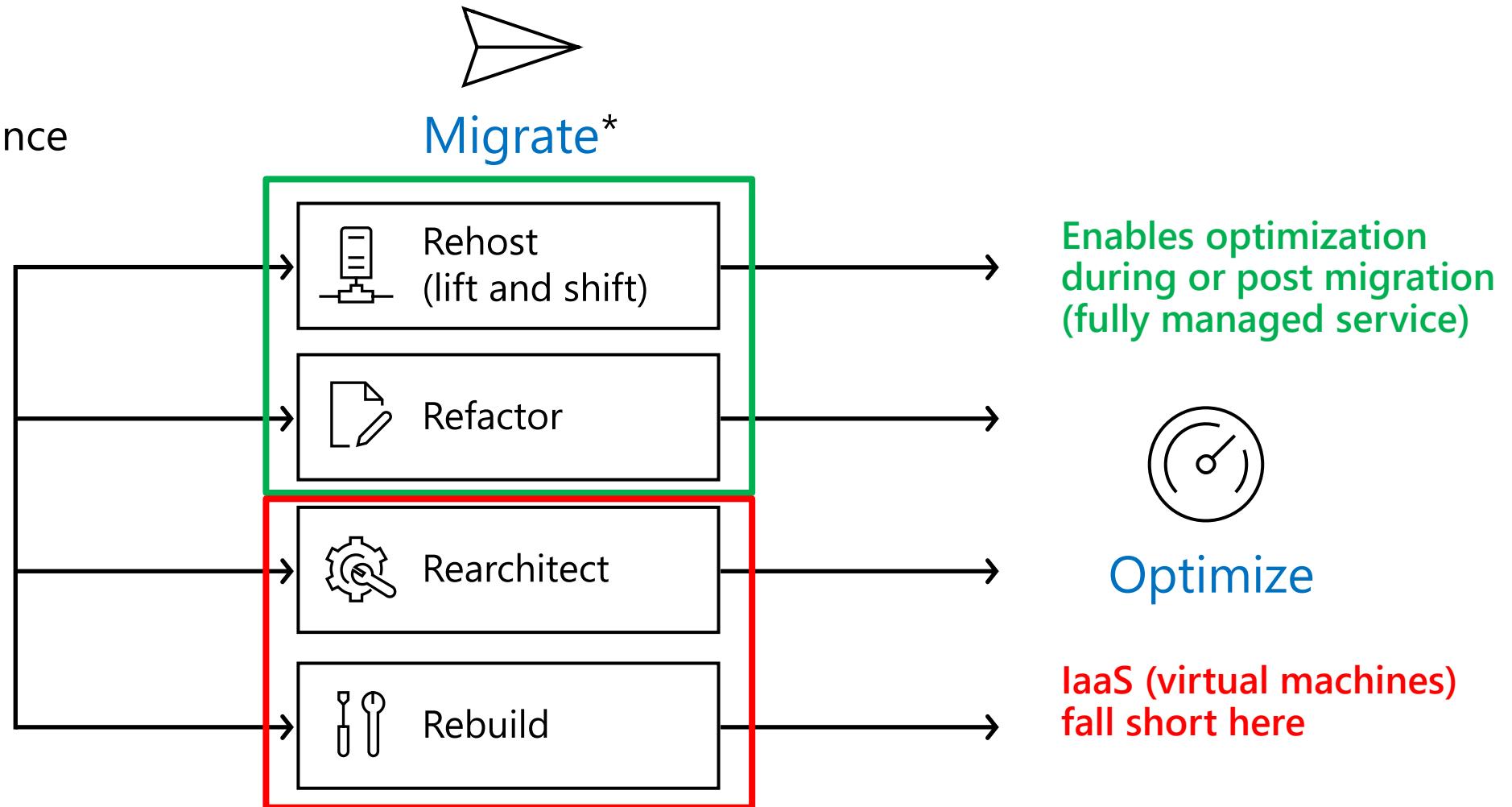
Azure Database migration journey



Managed Instance
Enables rehosting or light refactoring for most apps



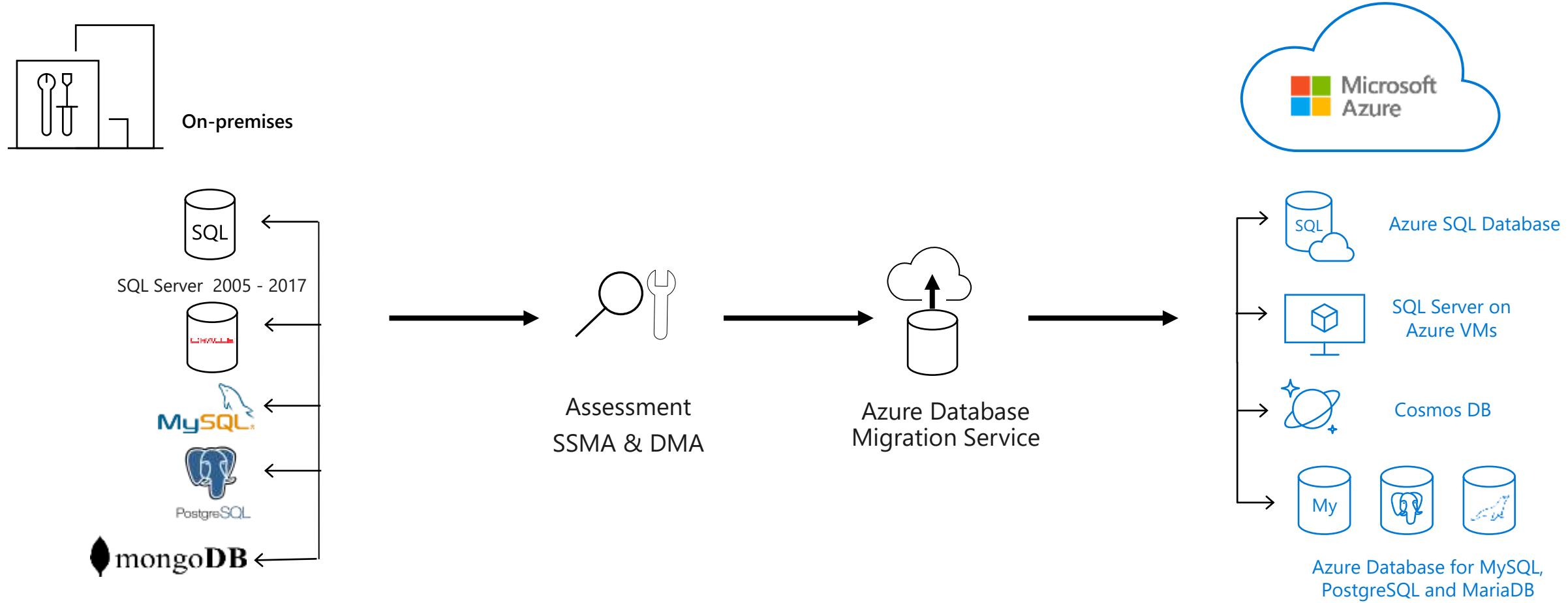
Assess
Eliminates the need to rearchitect or rebuild your apps



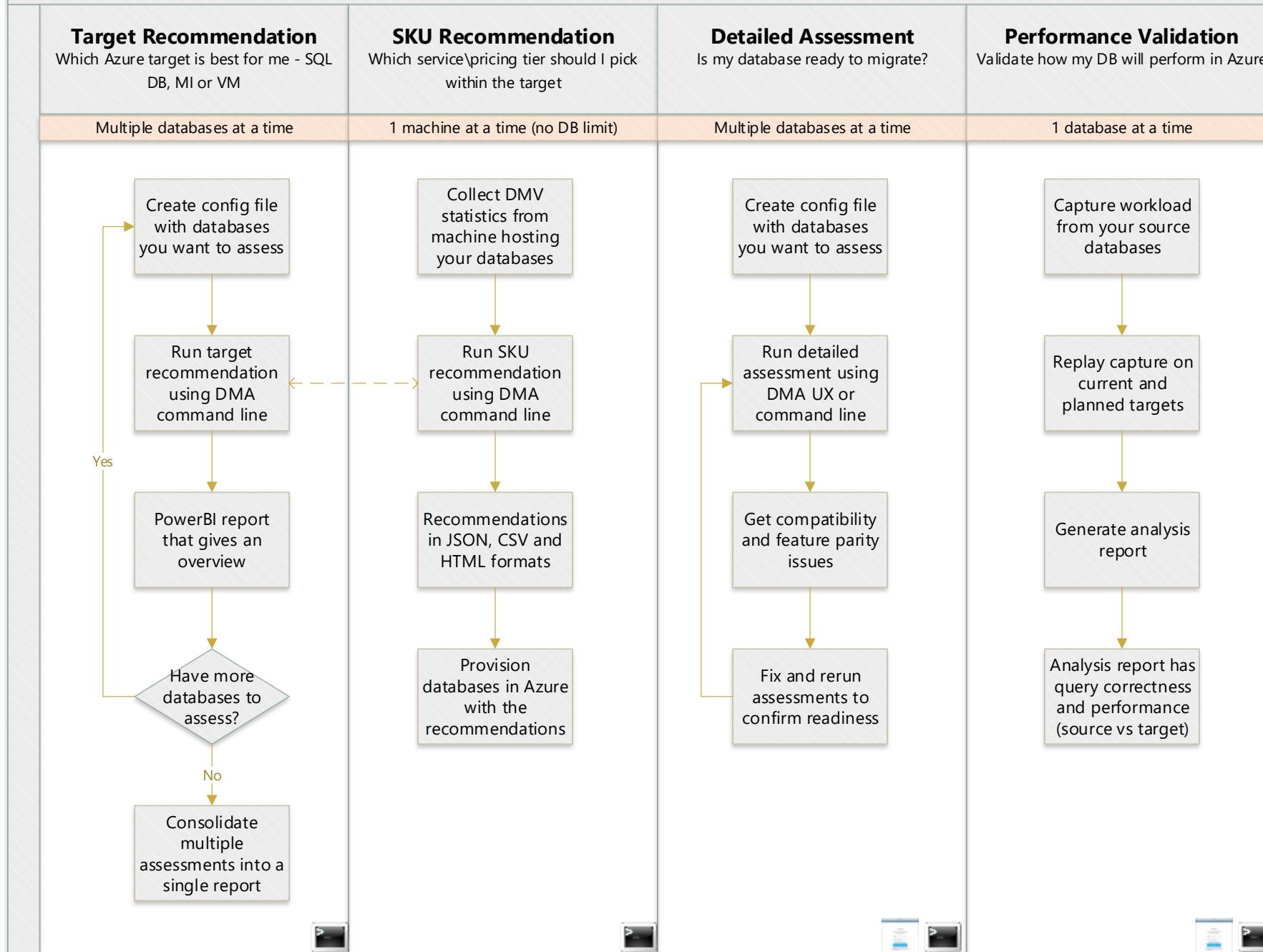
* These migration strategies are adopted from Gartner research. Gartner also calls out a 5th strategy called "Replace," which is all about SaaS. We won't focus on that here.

Migrating databases using Azure Database Migration Services

Seamless, end to end solution | Near-zero downtime | Resilient | Migrate at-scale from multiple sources



Assessment + Optimize



Target Recommendation

Create database config file

```
Untitled - Notepad
File Edit Format View Help
<?xml version="1.0" encoding="utf-8" ?>
<TargetRecommendationConfiguration>
  xmlns="http://microsoft.com/schemas/SqlServer/Advisor/TargetRecommendationConfiguration"
    <AssessmentName>your-assessment-name</AssessmentName>
    <AssessmentDatabases>
      <AssessmentDatabase>connection string 1</AssessmentDatabase>
      <AssessmentDatabase>connection string 2</AssessmentDatabase>
      ...
      <AssessmentDatabase>connection string n</AssessmentDatabase>
    </AssessmentDatabases>
    <AssessmentResultJson>path/to/json/output/file</AssessmentResultJson>
  </TargetRecommendationConfiguration>
```

Run target recommendation using DMA CLI

```
Administrator: Command Prompt
C:\Program Files\Microsoft Data Migration Assistant>DmaCmd.exe
/AssessmentName="string" /AssessmentDatabases="connectionString
1" \["connectionString2"\] \[/AssessmentTargetRecommendations="True"\] /AssessmentEvaluateRecommendations|/AssessmentEvaluateCompatibilityIssues
```

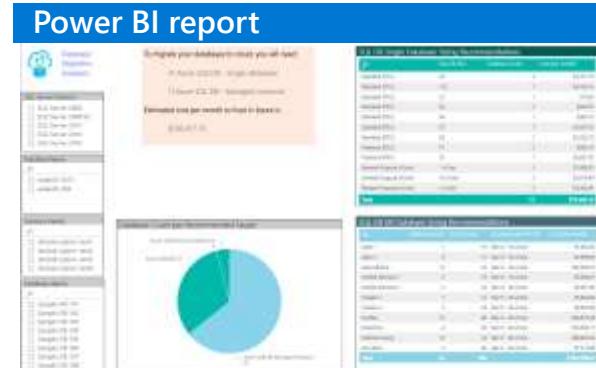
SKU Recommendation

Collect DMV statistics from your database

```
Windows PowerShell ISE
File Edit View Tools Debug Add-ons Help
PS C:\Program Files\Microsoft Data Migration Assistant> Dir *SKU*.ps1
Directory: C:\Program Files\Microsoft Data Migration Assistant
Mode LastWriteTime Length Name
-a---- 8/16/2018 10:34 AM 27437 SkuRecommendationDataCollectionScript.ps1
```

Run SKU recommendation using DMA CLI

```
Administrator: Command Prompt
C:\Program Files\Microsoft Data Migration Assistant>.\DmaCmd.exe
/Action=SkuRecommendation /SkuRecommendationInputFilePath
="C:\TestOut\out.csv" /SkuRecommendationTsvOutputResultsFilePath
="C:\TestOut\prices.tsv" /SkuRecommendationJsonOutputResultsFi
lePath="C:\TestOut\prices.json" /SkuRecommendationOutputResults
FilePath="C:\TestOut\prices.html" /SkuRecommendationPreventPric
eRefresh=true
```



Database Experimentation Assistant

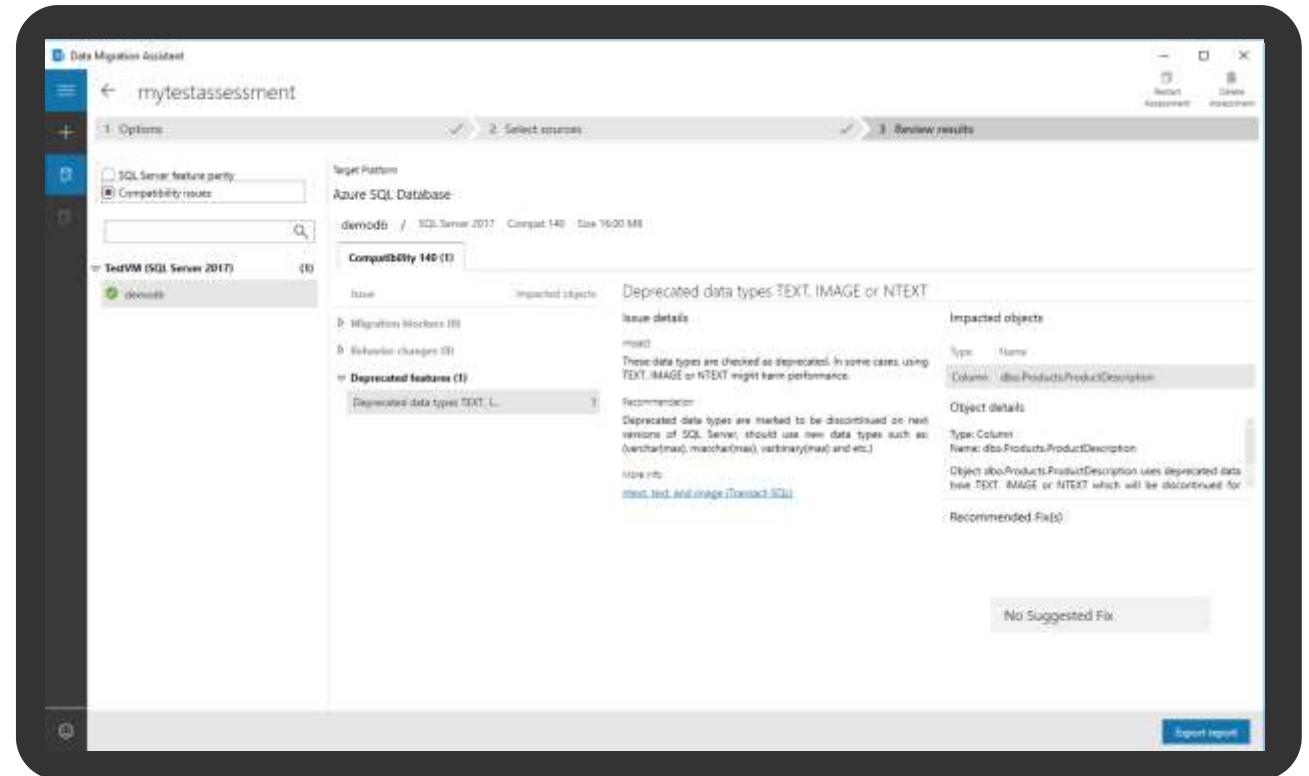


Data Migration Assistant

Assess on-premises SQL Server instance(s)
for migrating to Azure SQL database(s)

Discover issues that can affect an upgrade

Migrate an on-premises SQL Server instance
to a modern SQL Server instance



Demo

Data Migration Assistant



Lab

Migrate using Azure SQL Database Managed Instance

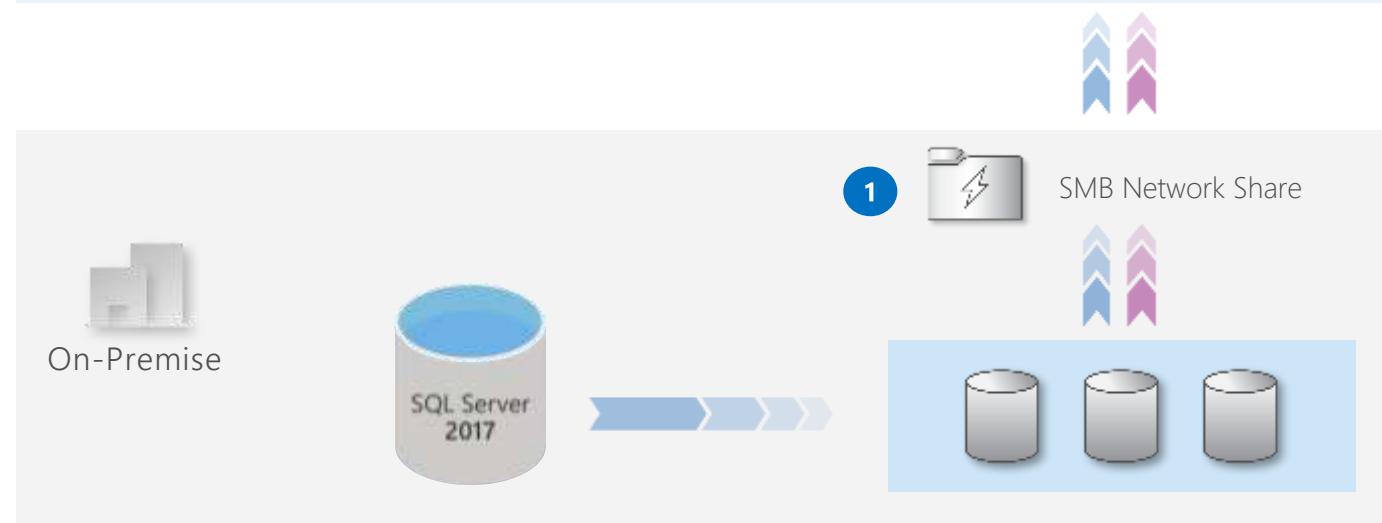
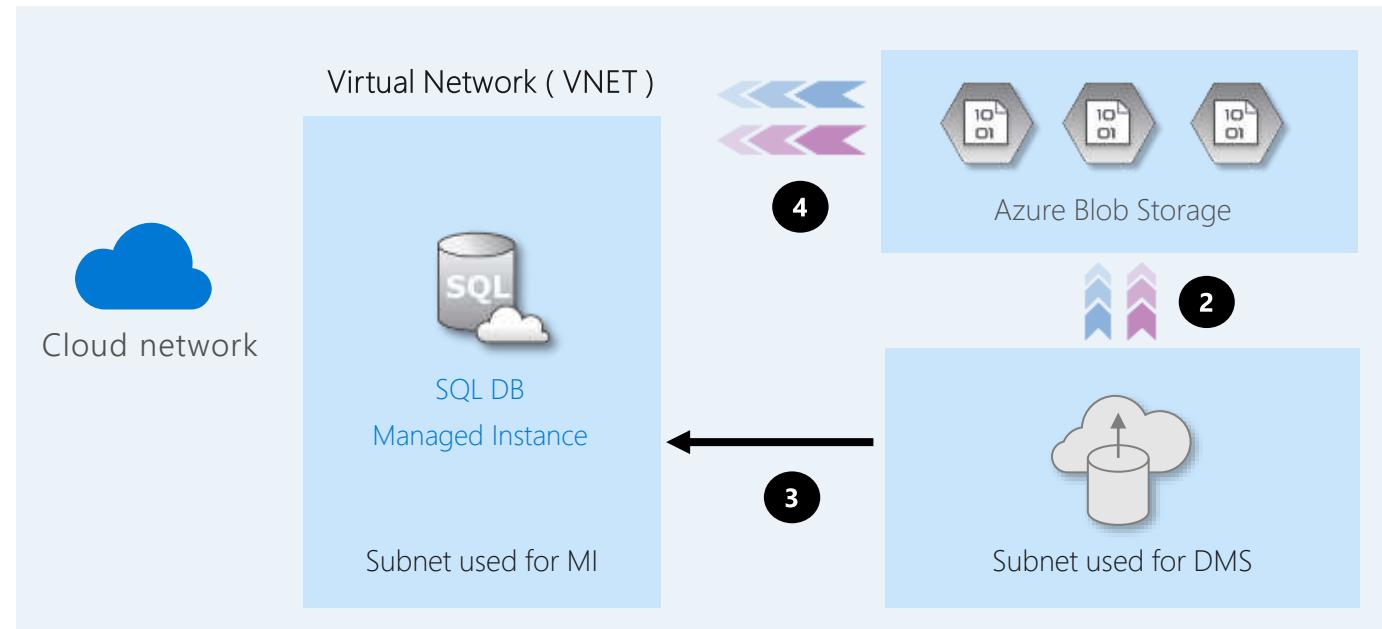
This lab demonstrates how to migrate a SQL database to an Azure SQL Database Managed Instance using the Azure Database Migration Service.

Lab

Migrate using Azure SQL Database Managed Instance

<http://tinyurl.com/????????>

SQL -> SQL Database MI online migration workflow



Legend

- Full Database backup files (blue arrow)
- Transaction log backup files (purple arrow)
- Site to site connectivity (VPN or ExpressRoute) (green arrow)

- 1 Provide existing backups in network share
- 2 DMS upload backup files to Azure storage
- 3 DMS initiate the migration to Azure SQL MI
- 4 Full backup restored and Transaction log backups continuously applied until cutover

Provide Tail-Log backup, initiate cutover in DMS and change the application connection strings

Resources

Azure Database Migration Service

<https://azure.microsoft.com/services/database-migration/>

Preview signup: <https://aka.ms/dms-preview>

Feedback alias: dmsfeedback@microsoft.com

Channel 9 Video: [Oracle migrations](#); [Azure SQL Database migrations](#)

Video: [Online migrations to Azure SQL Database using Azure DMS](#)

Video: [Migrate MySQL applications to Azure with minimal downtime using the Azure Database Migration Service](#)

Migration Guide

datamigration.microsoft.com

SQL Server Migration Assistant: <https://docs.microsoft.com/sql/ssma/sql-server-migration-assistant>

Database Migration Assistant: <https://blogs.msdn.microsoft.com/datamigration/dma/>

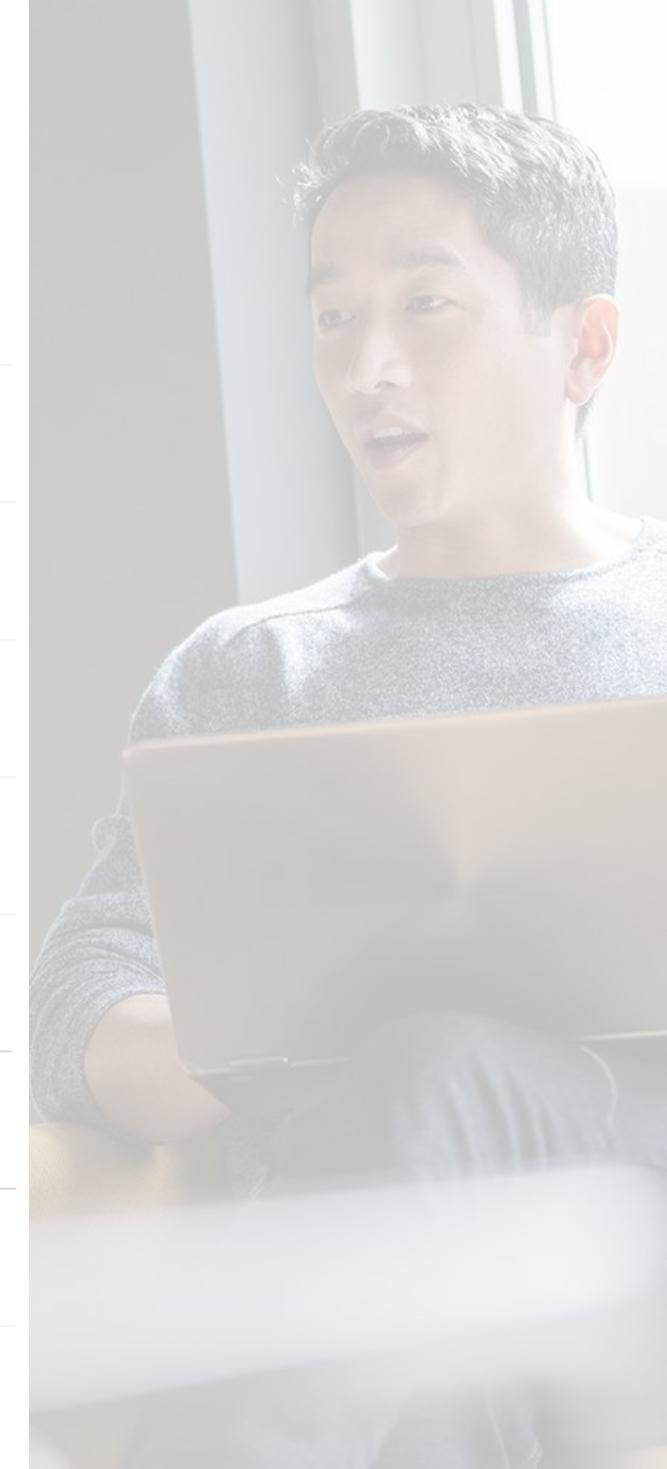
Database Experimentation Assistant: [Download](#)

Find a partner: <http://migration/Pages/SearchPartners.aspx>

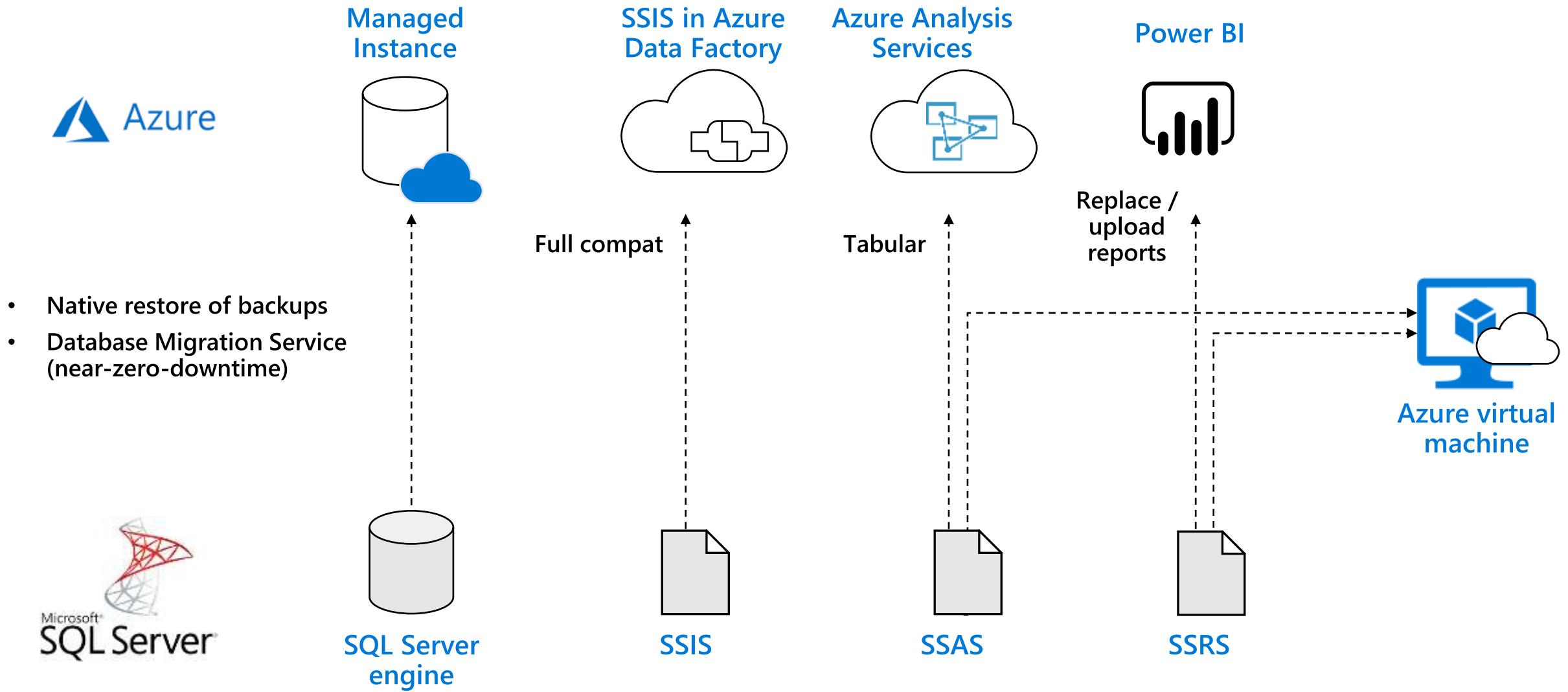
Data Migration Team Blog: blogs.msdn.microsoft.com/datamigration/

Agenda

Intro to Azure SQL Database	Value prop, Platform benefits, TCO
Managed Instance overview	Managed Instance overview and architecture, Hands-on-lab
Security & Networking	Security overview, Networking considerations, demos
Features and capabilities	Key capabilities, limitations, backup & restore
Replication & Monitoring	Replication and Monitoring, demo
Migration	Migration overview and options, Hands-on-Lab
Data migration tasks	Microsoft ETL/ELT Services , Hands-on-Lab
Hyperscale	Working with large workloads, demo
Closing	Q&A, technical resources, etc.



Migration to Azure



Microsoft ETL/ELT Services

Running SSIS on-premises

OS: Windows/Linux

SCALABILITY: Scale-Out feature

EDITION: Standard/Enterprise

TOOLS: SSDT/SSMS to design/deploy/manage/execute/monitor packages

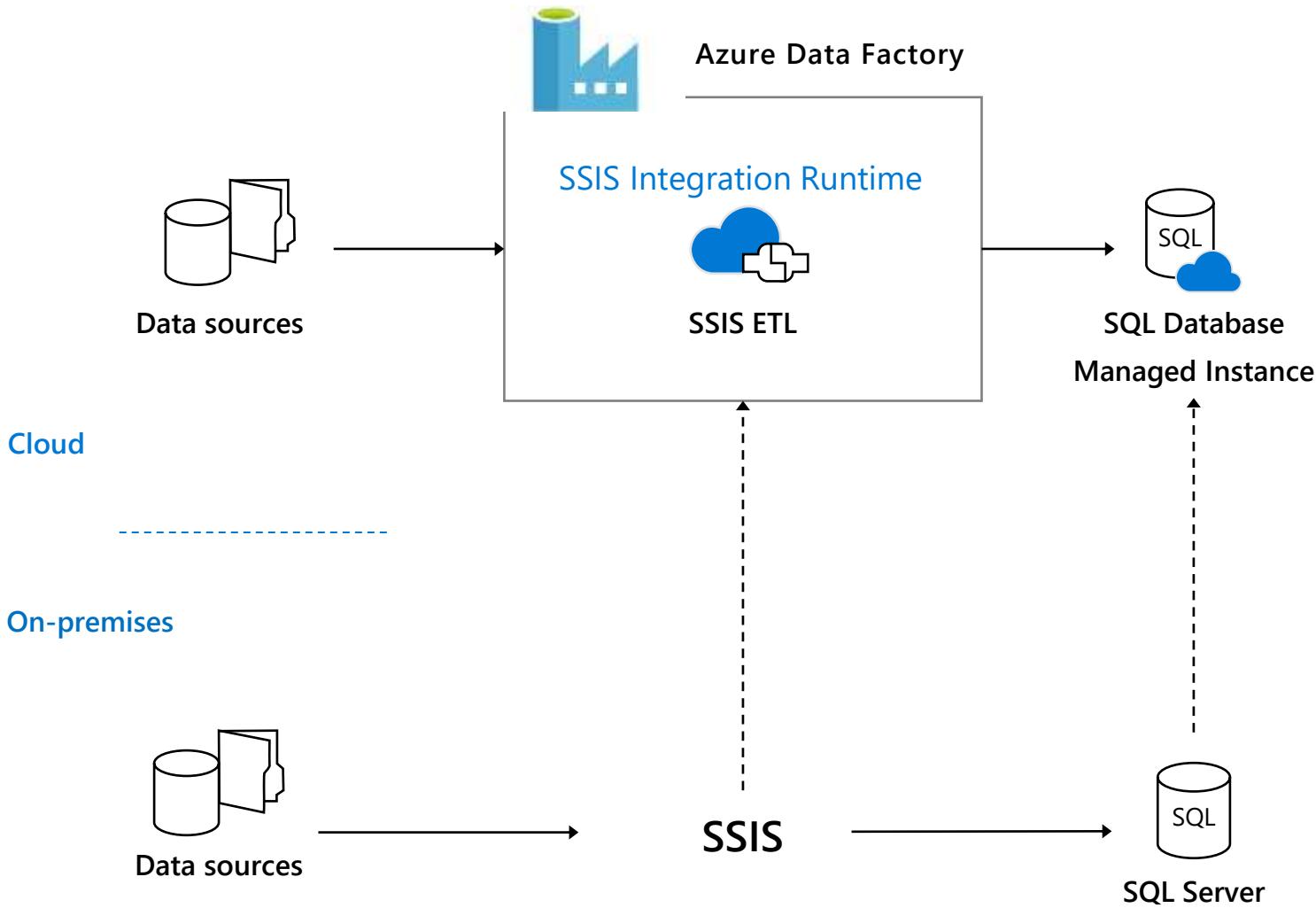
EXTENSIBILITY: ISVs can build components/extensions on SSIS

PRICING: Bundled w/ on-prem SQL Server

On-premises



Microsoft ETL/ELT Services



Running SSIS in the cloud

LIFT & SHIFT: Use **Azure SQL DB/Managed Instance** to host SSISDB

SCALABILITY: Use ADF to provision a **managed cluster of Azure VMs dedicated** to run your packages – **Azure-SSIS Integration Runtime (IR)**

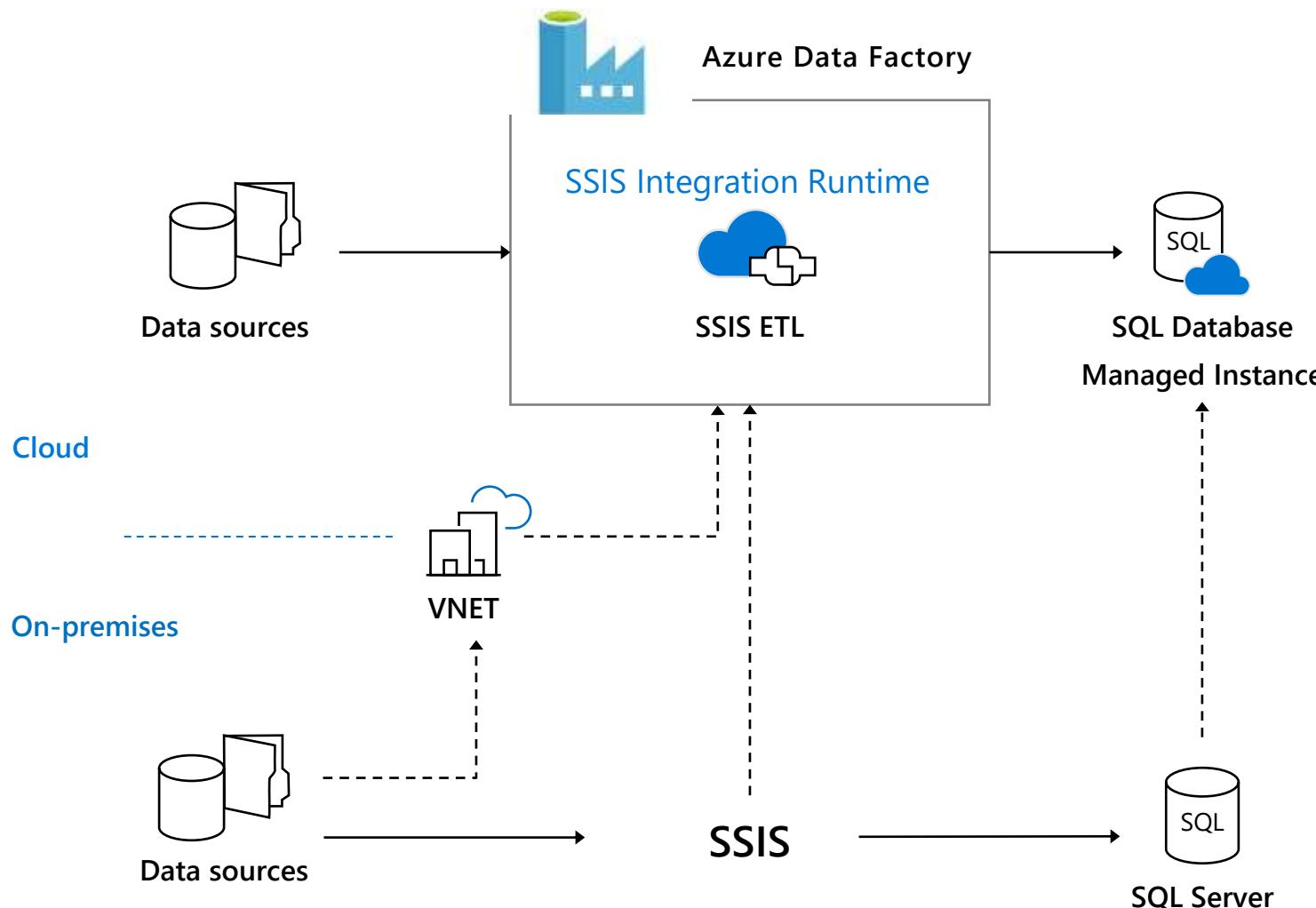
EDITION: Standard/Enterprise

TOOLS: **SSDT/SSMS + ADF app** to design/deploy/manage/execute/monitor packages (activities)

EXTENSIBILITY: ISVs can build components/extensions + SaaS on SSIS in ADF via **custom setup + 3rd party licensing**

PRICING: Pay per hour + **Azure Hybrid Benefit** to Bring Your Own License (BYOL)

Microsoft ETL/ELT Services



Running SSIS in the cloud

HYBRID: Join Azure-SSIS IR to a VNet that is connected to your on-prem network to enable on-prem data access

MODERNIZATION: Schedule **first-class SSIS activities** in ADF pipelines via SSMS and chain/group them w/ other activities via ADF app

COMPLEMENTARY: Splice/inject **built-in/custom/Open Source/3rd party SSIS tasks and transformations** in ADF pipelines

READINESS: General Availability (GA) w/ **24/7 live-site support**

SSIS IR Enterprise Edition

Enterprise Edition of Azure-SSIS IR allows you to use advanced/premium features

- Change Data Capture (CDC) components

- Oracle/Teradata/SAP BW connectors

- SQL Server Analysis Services (SSAS)/Azure Analysis Services (AAS) connectors/transformations

- Fuzzy Grouping/Lookup transformations

- Term Extraction/Lookup transformations

Some of these features will also require you to install additional components, essentially customizing your Azure-SSIS IR (via Custom Setup Interface)

SSIS IR Custom setup interface

Custom setup allows you to add your own setup steps during the provisioning/reconfiguration of your Azure-SSIS IR to:

Alter the default operating configuration/environment (e.g. to start additional Windows services or persist access credentials for file shares)

Install additional components (e.g. APIs/assemblies/drivers/extensions)

Instructions

Prepare a script (main.cmd) + associated files and upload them into a blob container in your Azure Storage account

Provide Shared Access Signature (SAS) Uniform Resource Identifier (URI) of your container when you provision/reconfigure your Azure-SSIS IR

Each node of your Azure-SSIS IR will then download the script + files from your container and execute your custom setup with an elevated privilege

Upon completion, each node will upload the standard output of execution and other logs into your container

We support the installation of free/paid/(un)licensed components

3rd party licensing

To support the installation of paid/licensed components from our ISV partners, we face challenges from the nature of Azure-SSIS IR as the nodes are **volatile** in the sense that they can be allocated/released at any time

We regularly reimage the nodes to release security patches/new features

Customers can start/stop their Azure-SSIS IR to manage its running cost

Customers can scale up/down through various node sizes

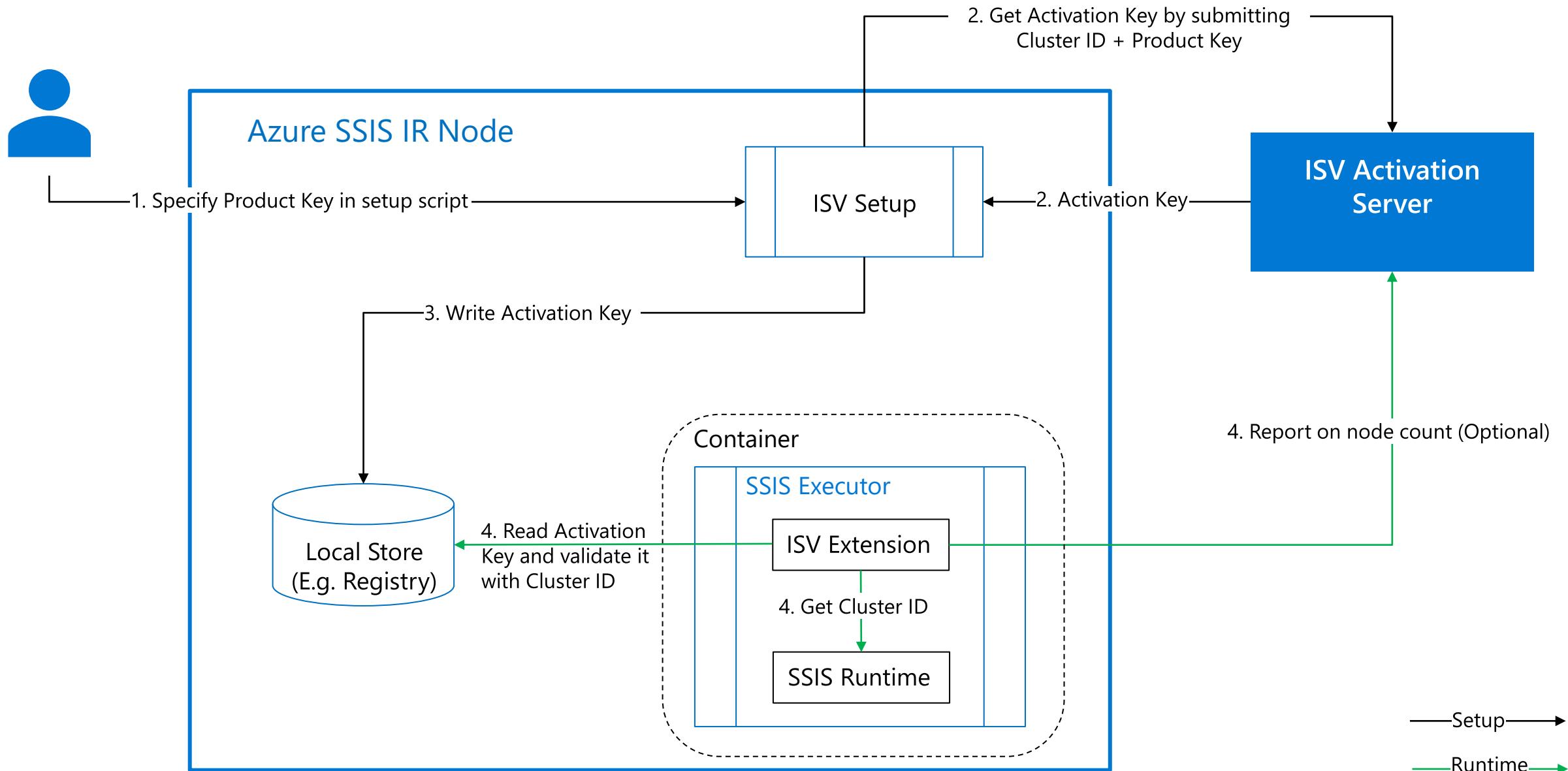
Customers can scale in/out the number of nodes between 1 to 10 (or more by a special request)

Binding a component installation to any particular node by collecting machine-specific info that is traditionally used for on-prem installations, e.g. MAC address, CPU ID, etc. **isn't viable anymore**

We provide new **unique and persistent** Windows environment + SSIS system variables for ISVs to bind/validate their component licenses on Azure-SSIS IR:

Cluster ID and Cluster Node Count

3rd Party Extensibility – How to



ISV Partners



SentryOne®



KingswaySoft



cdata



SSIS Team Blog: <https://blogs.msdn.microsoft.com/ssis/>

<https://blogs.msdn.microsoft.com/ssis/2018/04/27/enterprise-edition-custom-setup-and-3rd-party-extensibility-for-ssis-in-adf/>

Business Intelligence Services

Not installed side-by-side with Managed Instance

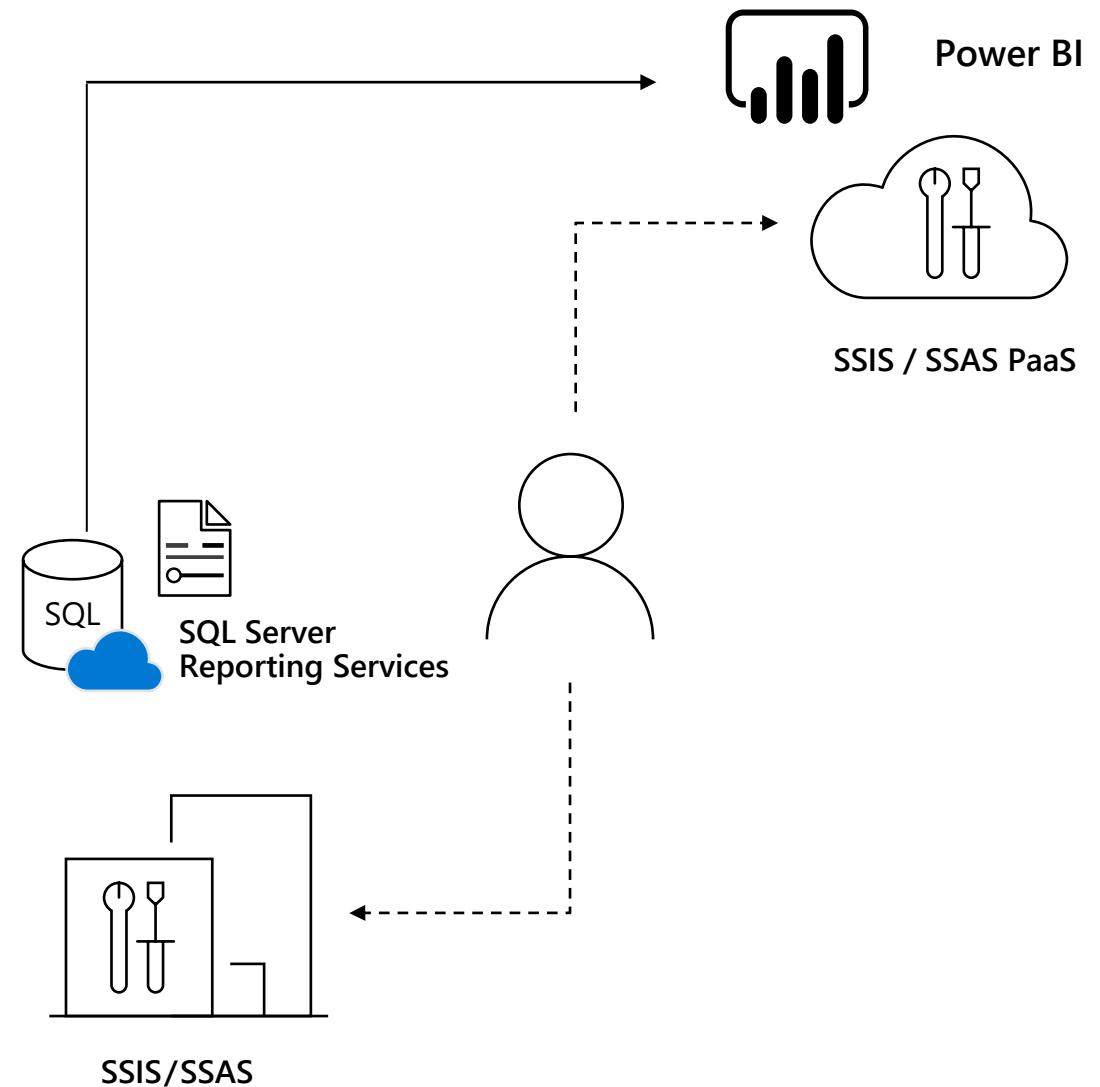
Migrate your SSIS packages to new SSIS on Azure Data Factory (PaaS service)

Migrate your OLAP models to Azure Analysis Services

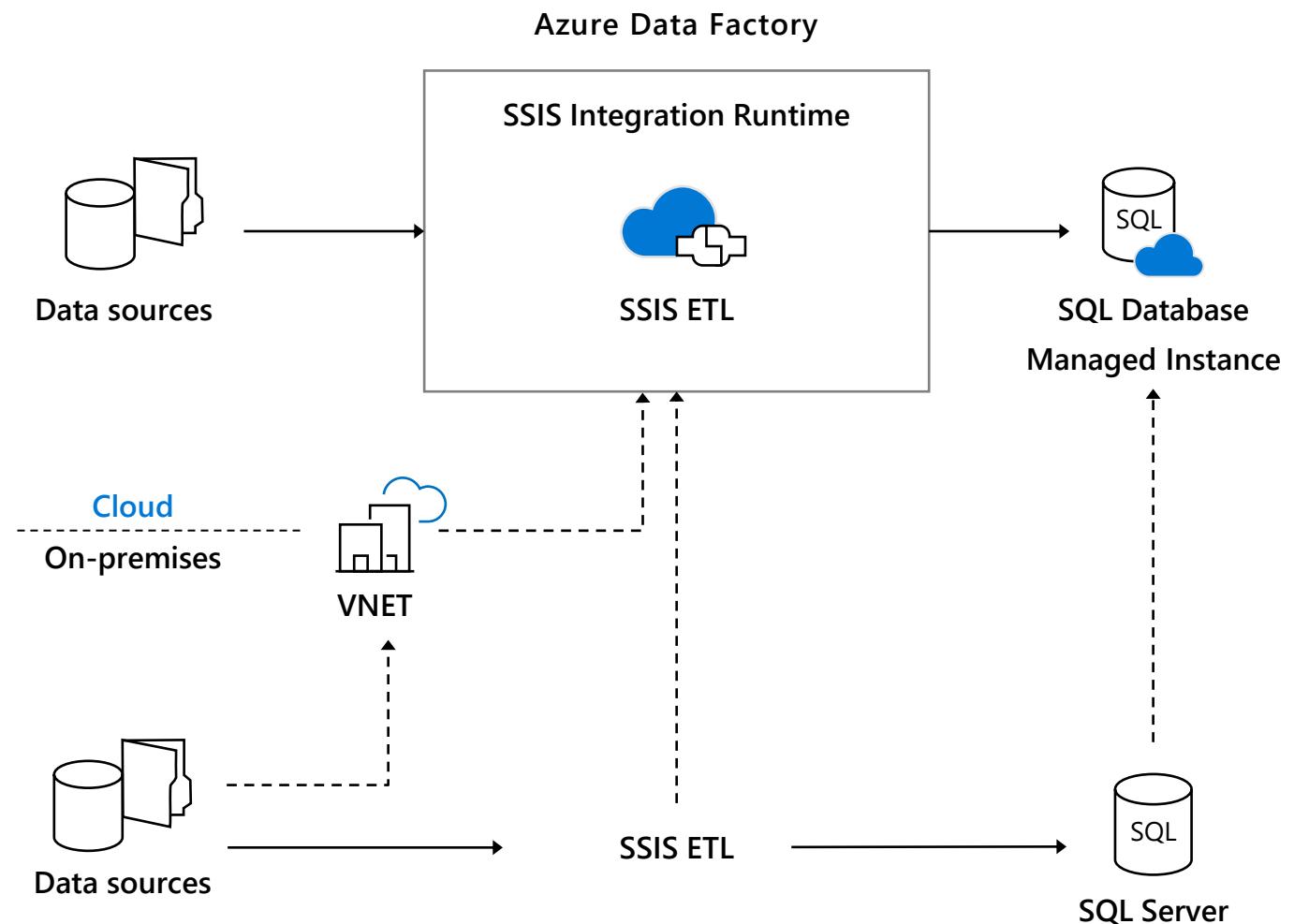
... or run these services in Azure virtual machines

For SSRS: run in a virtual machine, or switch to Power BI

Recommendation:
Move BI solutions to PaaS model

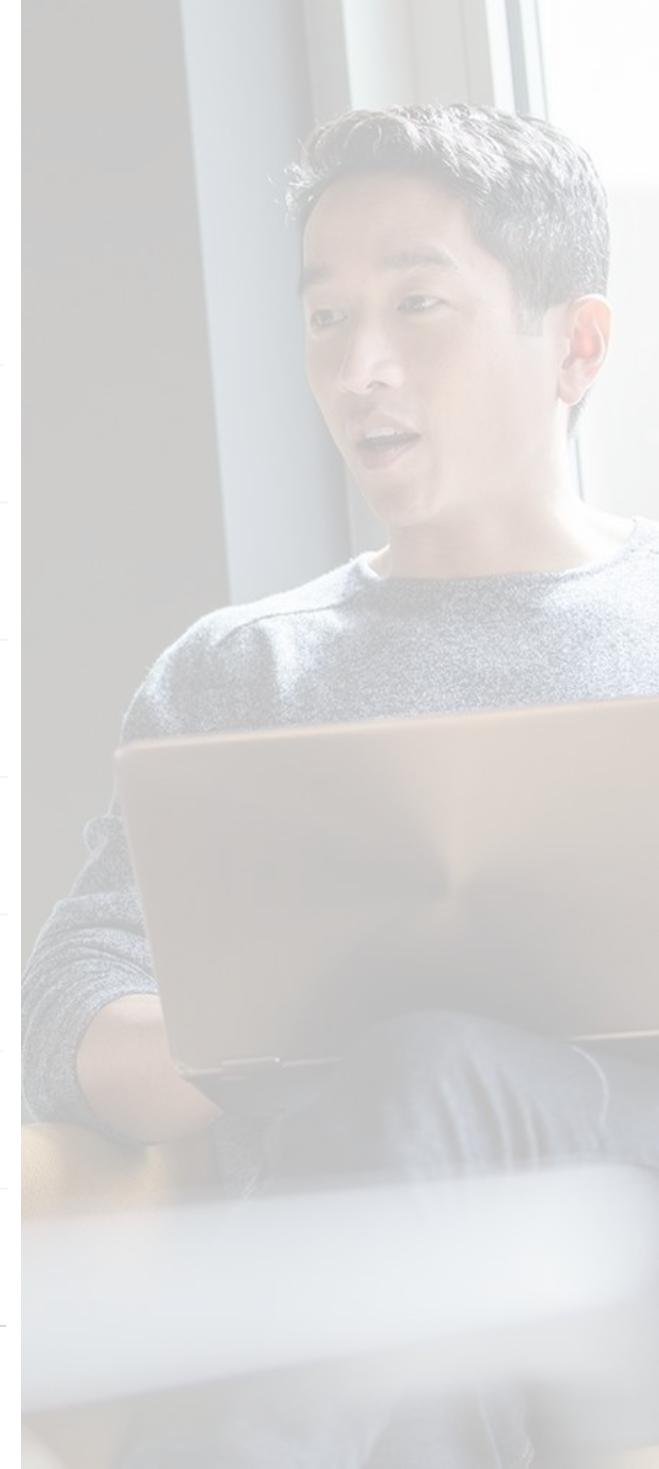


Lift your SQL server integration services (SSIS) packages to azure



Agenda

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Hyperscale	Working with large workloads, demo
Closing	Q&A, technical resources, etc.



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	SQL MI management through ARM templates & PowerShell (official docs and blogs)
Create SQL MI using ARM templates	
Change size of SQL MI using PowerShell	
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 in 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 <code>sp_readmierrorlog</code>
CAT Blog: Real time performance monitoring for Azure SQL DB Managed Instance	Configuring and using 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

Learn more about Azure SQL Database in the [Azure blog](#)

Read about the [Database Migration Service announcement](#)

Download the [Migration Cookbook](#)

Resources for Azure SQL Database Managed Instance

Vanity Name	Description	Confidentiality
sqlmidocs	Online documentation for Azure SQL Database Managed Instance	Customer Ready
sqlmimigrate	Online documentation for Migrating SQL Server to Azure SQL Database Managed Instance	Customer Ready
sqlmiqs	5 minute quick starts for Azure SQL Database	Customer Ready



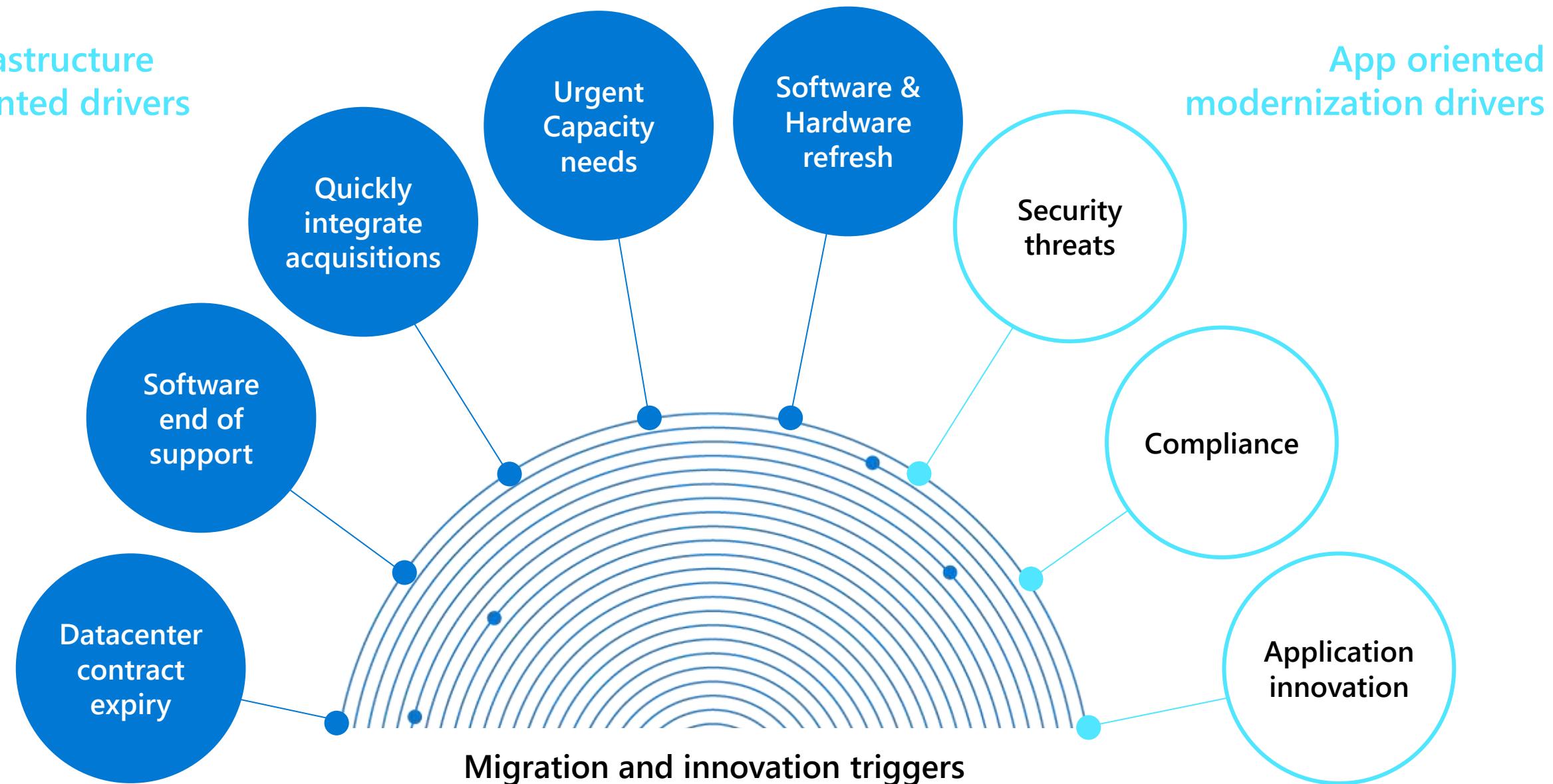


Azure SQL Database Migration

Szabolcs Baranyi

What's driving migrations to Azure?

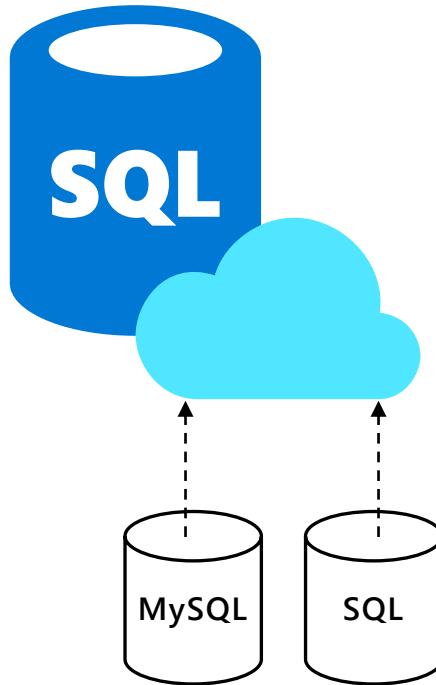
Infrastructure oriented drivers



Migration and innovation triggers

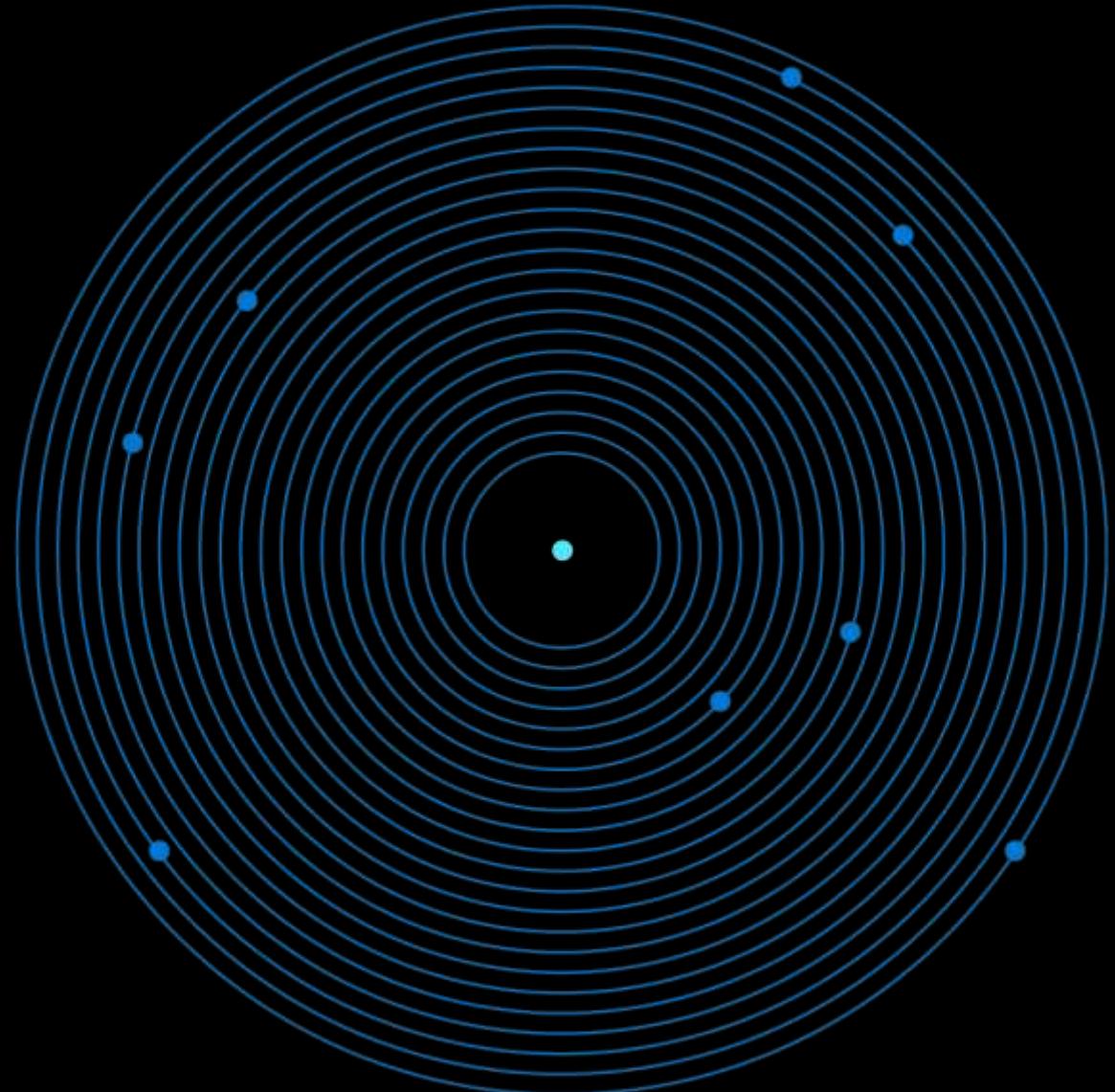
Accelerating your journey to the cloud

Azure Database Migration Service



- SQL Server** → Azure SQL Database single, elastic pools and Managed Instance
- MySQL** → Azure Database for MySQL
- PostgreSQL** → Azure Database for PostgreSQL
- Oracle** → Azure SQL Database & Managed Instance
- More...** → Azure Databases

Migrating your SQL Server to Azure



Azure managed databases offer more value



Azure SQL
Database



Azure SQL
Managed Instance



Azure Database
for PostgreSQL



Azure Database
for MySQL



Azure Database
for MariaDB



Azure Cache
for Redis



Azure
Cosmos DB

Managed, intelligent SQL
in the cloud

Enterprise-ready, fully managed
and scalable open-source databases

In-memory data
store to power fast,
scalable
applications

Globally distributed,
multi-model
dataset service for
any scale

Azure SQL

A unified SQL portfolio built on the industry-leading SQL Server engine



SQL Server on Azure VM

Best for lift and shift and/or workloads requiring OS-level access

IaaS - Rehost

[Learn More](#)



Azure SQL Managed Instance

Best for modernizing existing apps



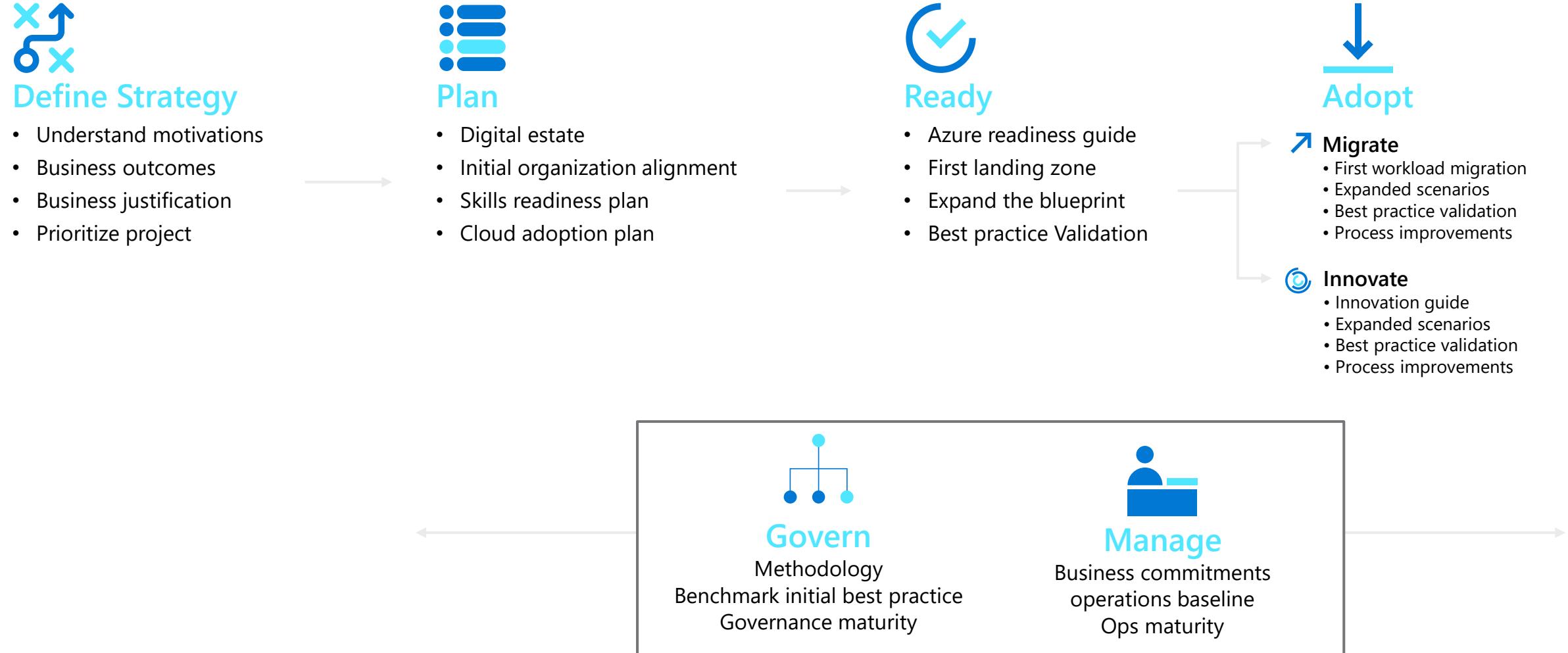
Azure SQL Database

Best for building new apps in the cloud

PaaS - Refactor

Azure is the cloud that knows SQL Server best

The cloud adoption journey



Proven guidance from Microsoft to accelerate the cloud adoption journey: <http://aka.ms/cloudadoptionframework>

Cloud migration strategies



Rehost

Often referred to as "**lift and shift**" migration, this no-code option lets you migrate your existing applications to Azure quickly. Each *application is migrated as-is*, which provides the benefits of the cloud without the risks or costs of making code changes, and you can leverage SQL Server on Azure Virtual Machines, Microsoft's infrastructure as a service (IaaS) product, to achieve that.



Refactor

Often referred to as **repackage**, this cloud migration strategy involves *some change to the application design but no wholesale changes to the application code*. Your application can take advantage of infrastructure as a service (IaaS) and platform as a service (PaaS) products, such as Azure App Service, Azure SQL Managed Instance, and containers.



Rearchitect

Modify or extend your application's code base to scale and optimize it for the cloud. *Modernize your app into a resilient, highly scalable, independently deployable architecture* and use Azure SQL Database, Microsoft's platform as a service (PaaS) offering, to accelerate the process, scale applications with confidence, and manage your apps with ease.



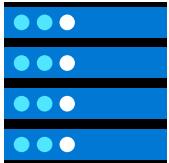
Rebuild

Rebuild an application from scratch using cloud-native technologies. Azure platform as a service (PaaS) provides a complete development and deployment environment in the cloud, without the expense and complexity of software licenses, the need for underlying application infrastructure, or middleware and other resources. With this cloud migration strategy, *you manage the applications and services you develop*, and Azure manages everything else.

For more information about cloud migration strategies, see [Start your cloud migration process](#).

Rehost with Azure Migrate to Azure VMs

Windows and
SQL Server
migration



1. Discover

Deploy [Azure Migrate Appliance](#) to on-premises environment or use CMDB info to import via CSV. Discover and analyze server performance

2. Assess

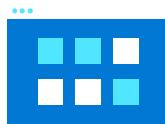
Group servers and perform assessments to determine Azure suitability, right-sizing information, dependency mapping, and cost planning.

3. Migrate

Start migrating servers to Azure with the combined appliance. Test migration and perform zero data loss cutover to Azure

Refactor to Azure SQL using Azure migration tools

Application Migration



Database Migration



1. Discover

Access the [App Service Migration](#) from Azure Migrate. Download the [Migration Assistant](#) to start .NET or PHP app migration

2. Assess

Scan the public endpoint to get a list of technologies used, which are then compared to other sites hosted on [App Service](#). This creates a unique assessment report for the site. Use [Data Access Migration Toolkit](#) to migrate application source code between databases

3. Migrate

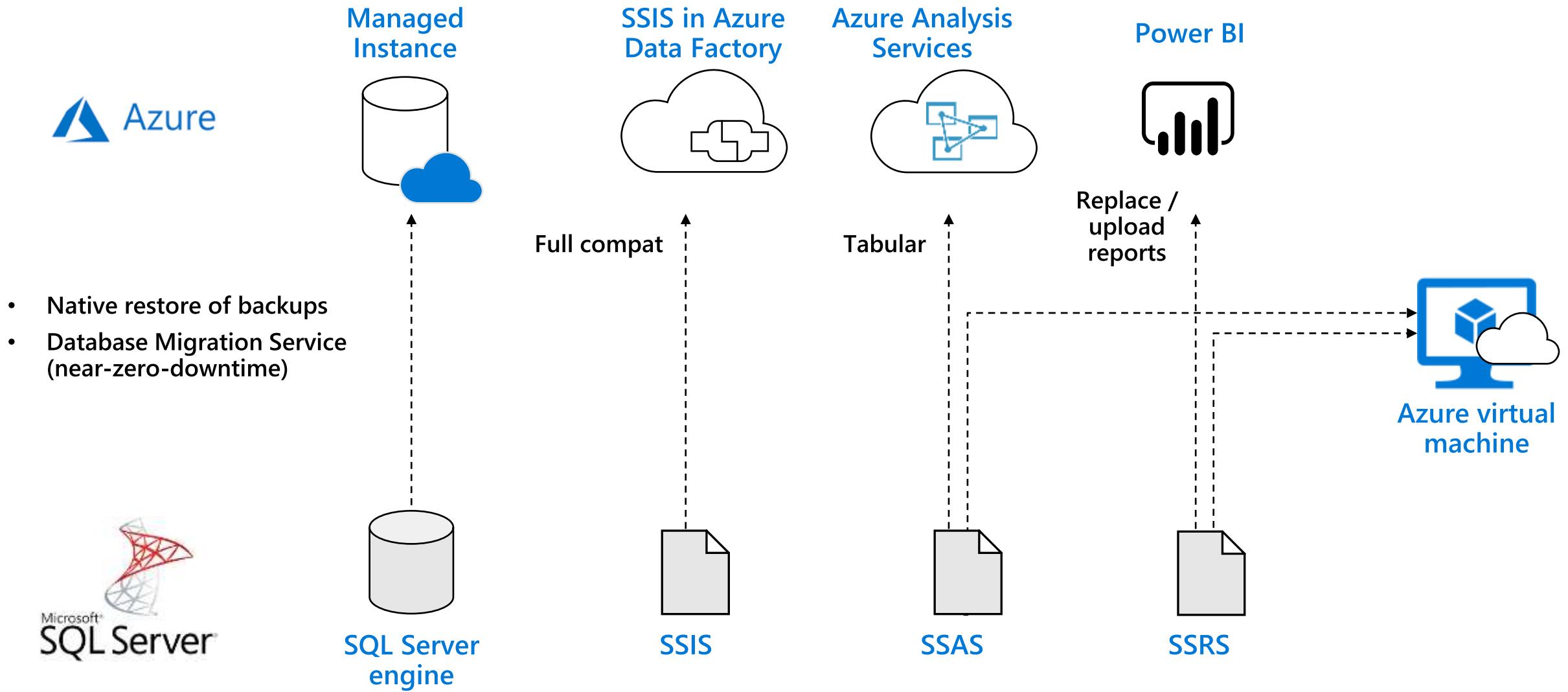
Migrate to [App Service](#) by either redeploying code via CI/CD pipeline, deploying a container, or using the [App Service Migration Assistant](#) tool

Create project in [Azure Migrate](#) as a central repository and download [Data Migration Assistant \(DMA\)](#) tool. Upload results to migrate project

Assess on-premises databases using the [DMA](#) tool to understand Azure SQL readiness. Optionally, validate your target database performance using the [Database Experimentation Assistant \(DEA\)](#)

Sync assessment summary from DMA to Azure Migrate. Use [Database Migration Service \(DMS\)](#) to move schema, data, & uncontained objects from source server to target server

Migration to Azure



Microsoft ETL/ELT Services

Running SSIS on-premises

OS: Windows/Linux

SCALABILITY: Scale-Out feature

EDITION: Standard/Enterprise

TOOLS: SSDT/SSMS to design/deploy/manage/execute/monitor packages

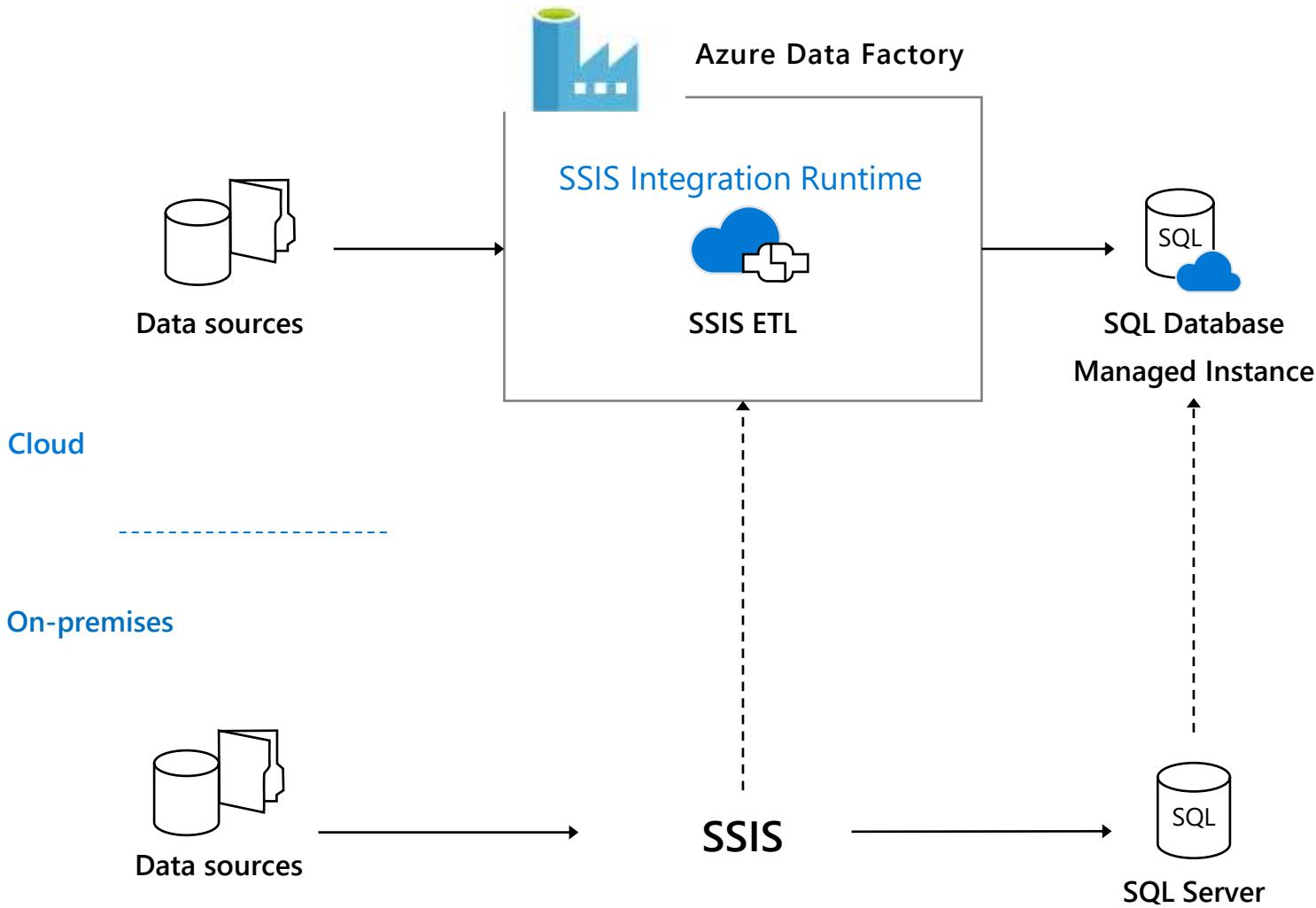
EXTENSIBILITY: ISVs can build components/extensions on SSIS

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On-premises



Microsoft ETL/ELT Services



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LIFT & SHIFT: Use **Azure SQL DB/Managed Instance** to host SSISDB

SCALABILITY: Use ADF to provision a **managed cluster of Azure VMs dedicated** to run your packages – **Azure-SSIS Integration Runtime (IR)**

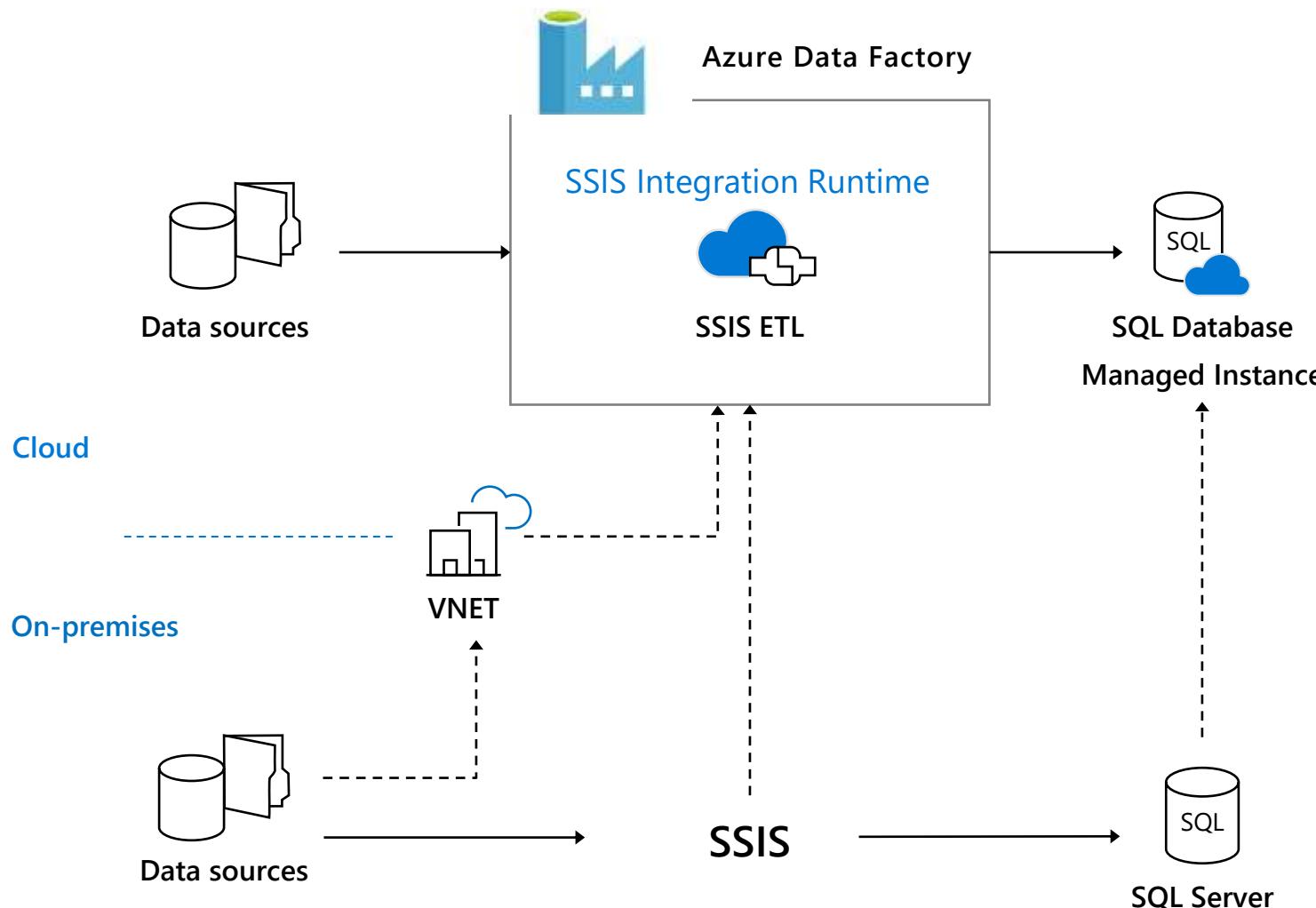
EDITION: Standard/Enterprise

TOOLS: **SSDT/SSMS + ADF app** to design/deploy/manage/execute/monitor packages (activities)

EXTENSIBILITY: ISVs can build components/extensions + SaaS on SSIS in ADF via **custom setup + 3rd party licensing**

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Microsoft ETL/ELT Services



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COMPLEMENTARY: Splice/inject **built-in/custom/Open Source/3rd party SSIS tasks and transformations** in ADF pipelines

READINESS: General Availability (GA) w/ **24/7 live-site support**

Azure Database Migration Service

Database Migration Guide

**Step-by-step guidance for modernizing
your data assets**

- This guide gives step-by-step guidance on migrating any SQL Server 2005 version or newer to Azure
- Migrations are also supported for SQL Server on Virtual Machines, Amazon Web Services (AWS) EC2, Compute Engine (GCP), and AWS RDS
- The guide covers pre-migration, migration, and post-migration scenarios to help ensure an easy migration to Azure
- Migrate your current databases, applications, and SQL Server logins

The screenshot shows the landing page for the Azure Database Migration Guide. The header reads "Azure Database Migration Guide" and "Step-by-step guidance for modernizing your data assets". Below the header, there is a section titled "Select your source and target" with a link "Need a recommendation?". The page displays logos for various databases categorized into three rows: Microsoft SQL Server, ORACLE, DB2; mongoDB, cassandra; and Microsoft Azure Table Storage.

Azure Database Migration Guide

Step-by-step guidance for modernizing your data assets

Select your source and target

[Need a recommendation?](#)

Microsoft SQL Server

ORACLE

DB2

mongoDB

cassandra

Microsoft Azure Table Storage

Azure Migration Program (AMP)

Available to all Azure customers, scaled through specialized migration partners



Best practice guidance



Offers and incentives



Technical skill building



Infrastructure and
data foundations



Migration planning
and execution



Digital
resources



Migration
Tools



Azure
trainers



FastTrack for
Azure engineers

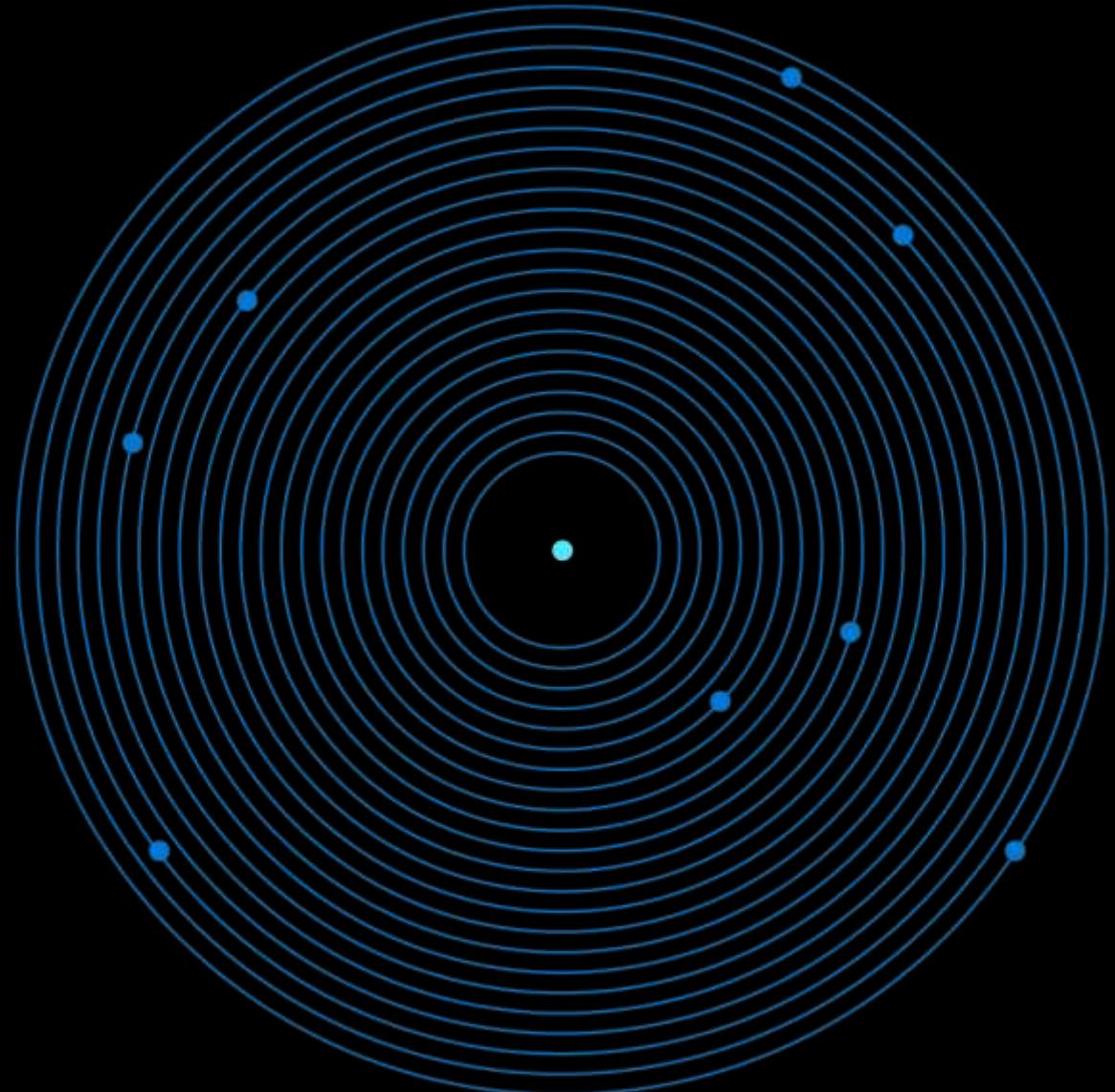


Specialized
partners

Reduce cost and risk | Accelerate migration velocity | Deliver customer success

Learn more | Azure.com/AMP

Migration Tooling on Azure



Azure Migrate: A Central Hub for Datacenter Migration

Assess and Migrate SQL Server

Assess your on-premises databases and receive a full report including the best-fit Azure SQL platform for your current environment

Multiple Scenarios

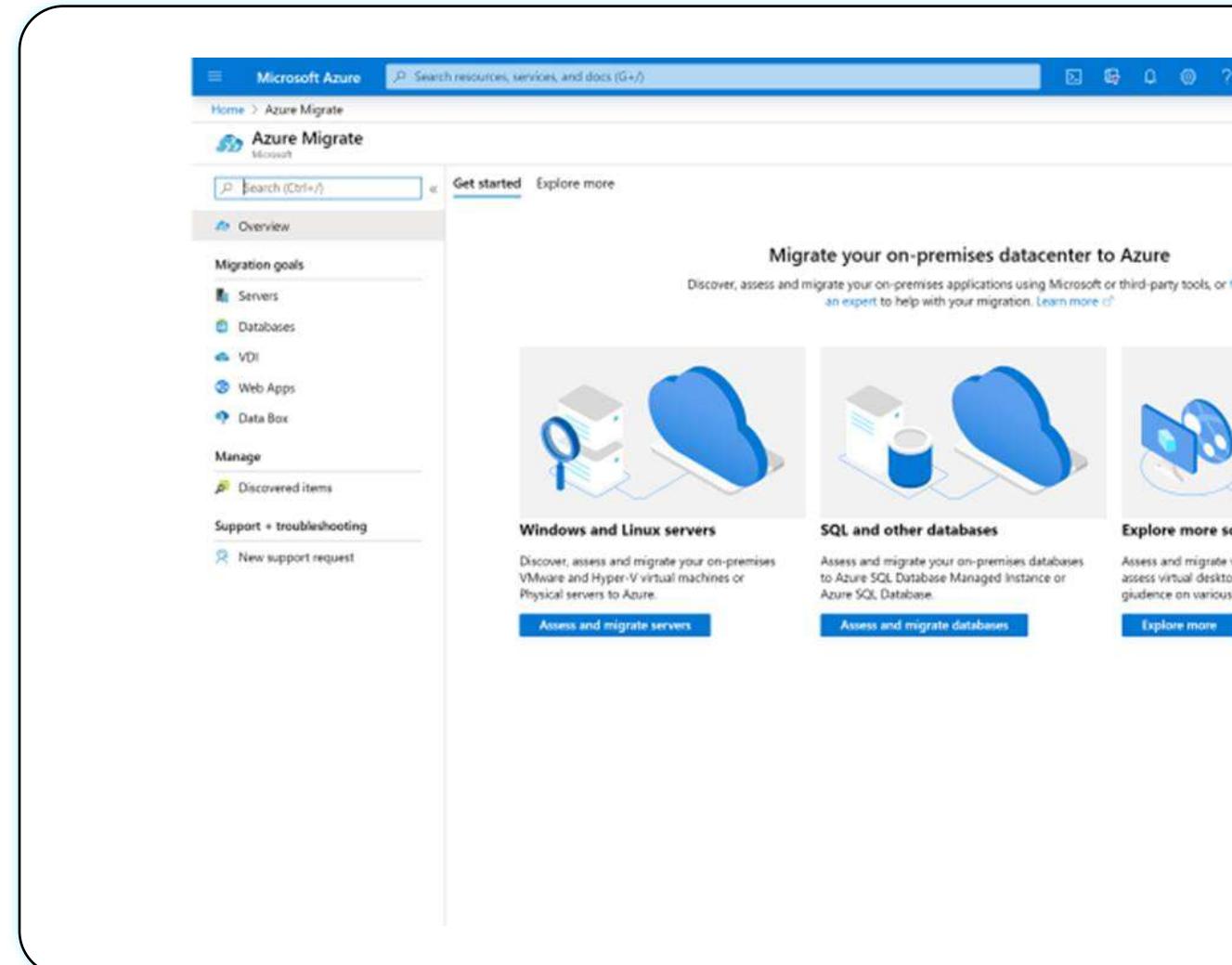
Migrate Windows and Linux Servers, Databases, Data, Web Applications and Virtual Desktops

Diverse Capabilities

Comprehensive discovery, assessment, and migration capabilities powered by Azure and third-party tools

Centralized Visibility

Centralized migration repository delivering end-to-end tracking and insights



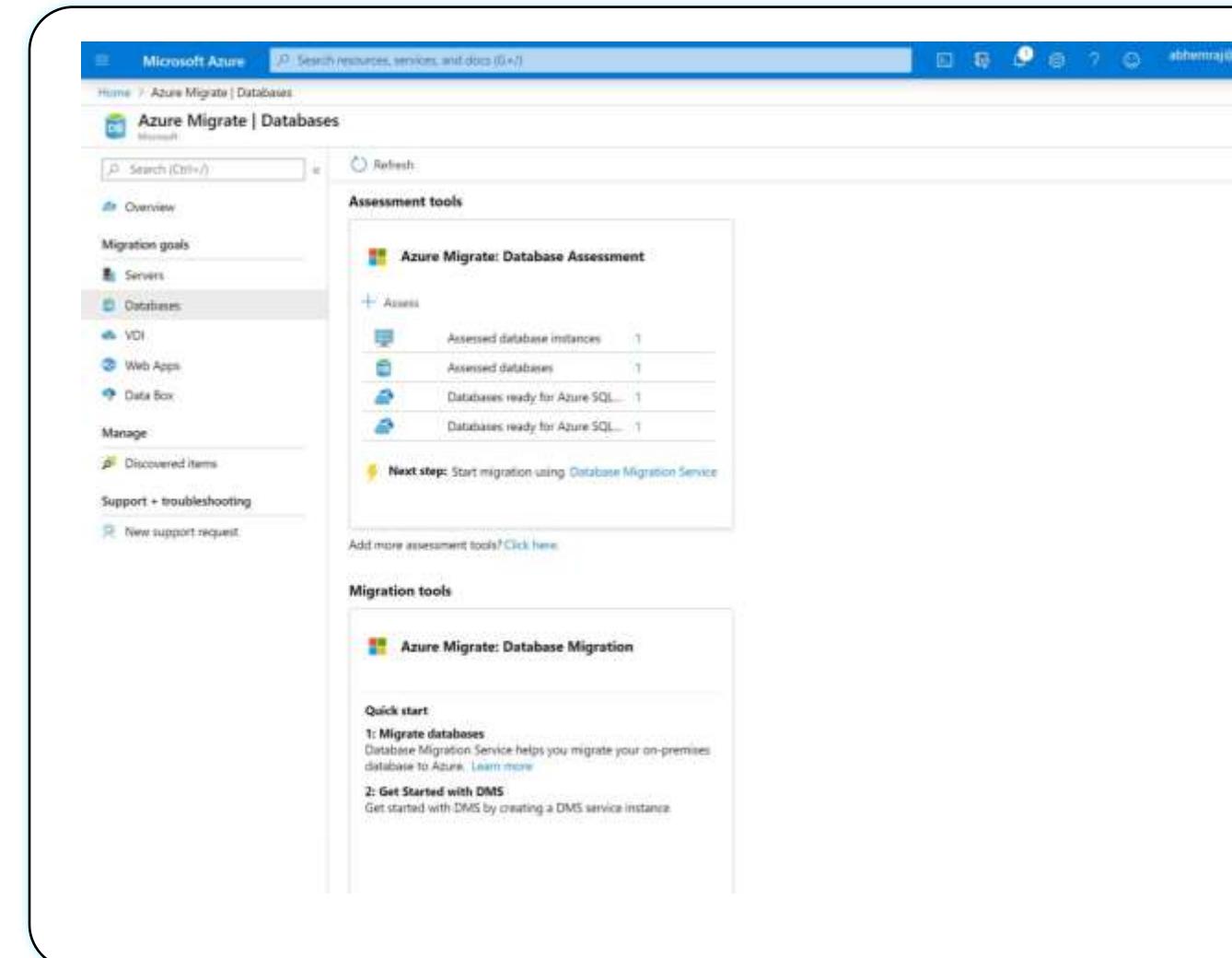
Database Assessment with Azure Migrate and DMA

Launch the Data Migration Assistant (DMA) from the Azure Migrate tool

Assess your on-premises database readiness

DMA report includes SKU recommendations based on collected performance data

Based on recommended SKU, receive an estimated monthly cost of migrating your on-premises environment to Azure

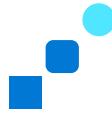


Learn more about the [Data Migration Assistant](#)

Azure Database Migration Service



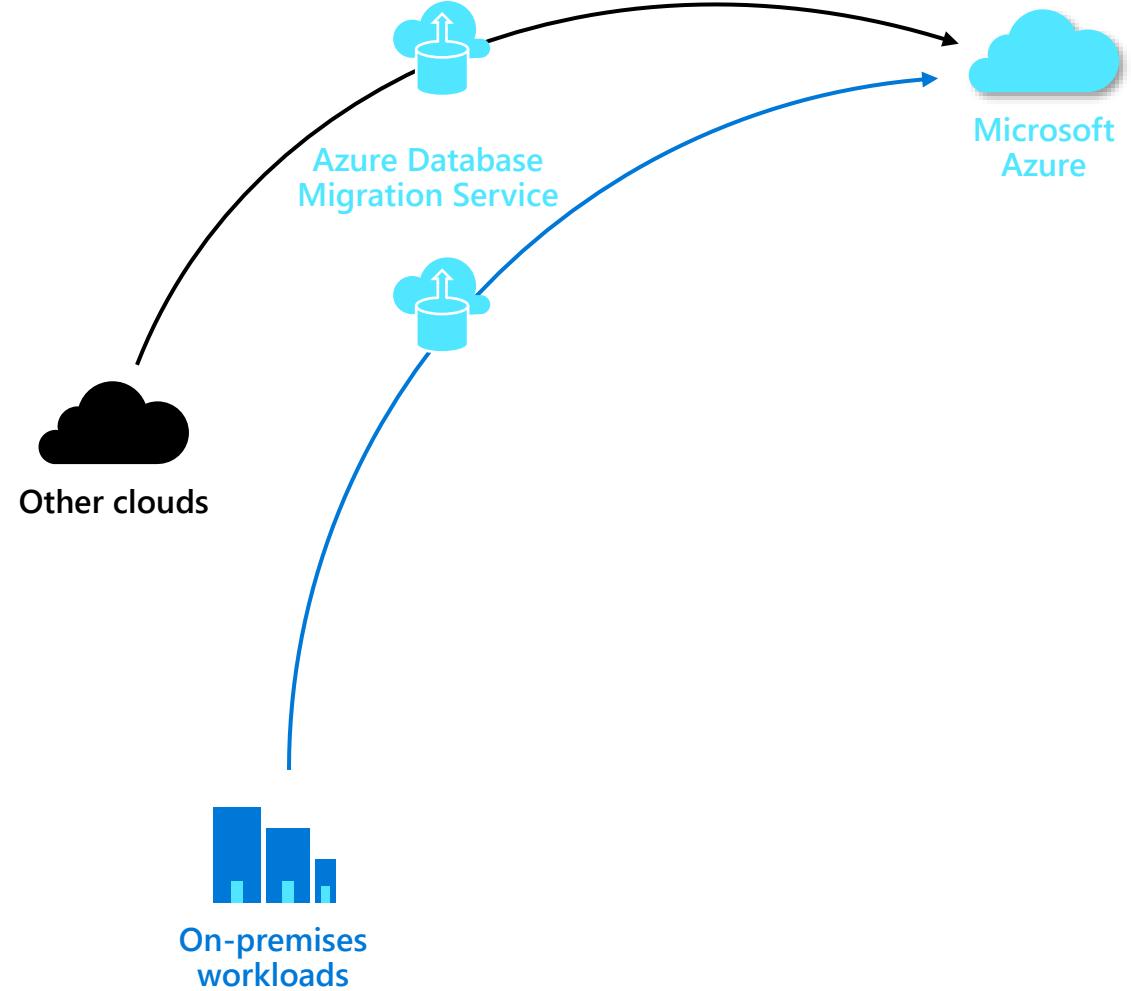
A comprehensive service, including a detailed guide, designed for seamlessly migrating your databases to Azure



Highly resilient and self-healing migration experience, with near-zero downtime



Completely automate your database migration project and find the migration scenario that best fits your needs



Azure Database Migration Service

Migration Scenarios

Choose the migration scenario
that best fits your needs, either
online or offline

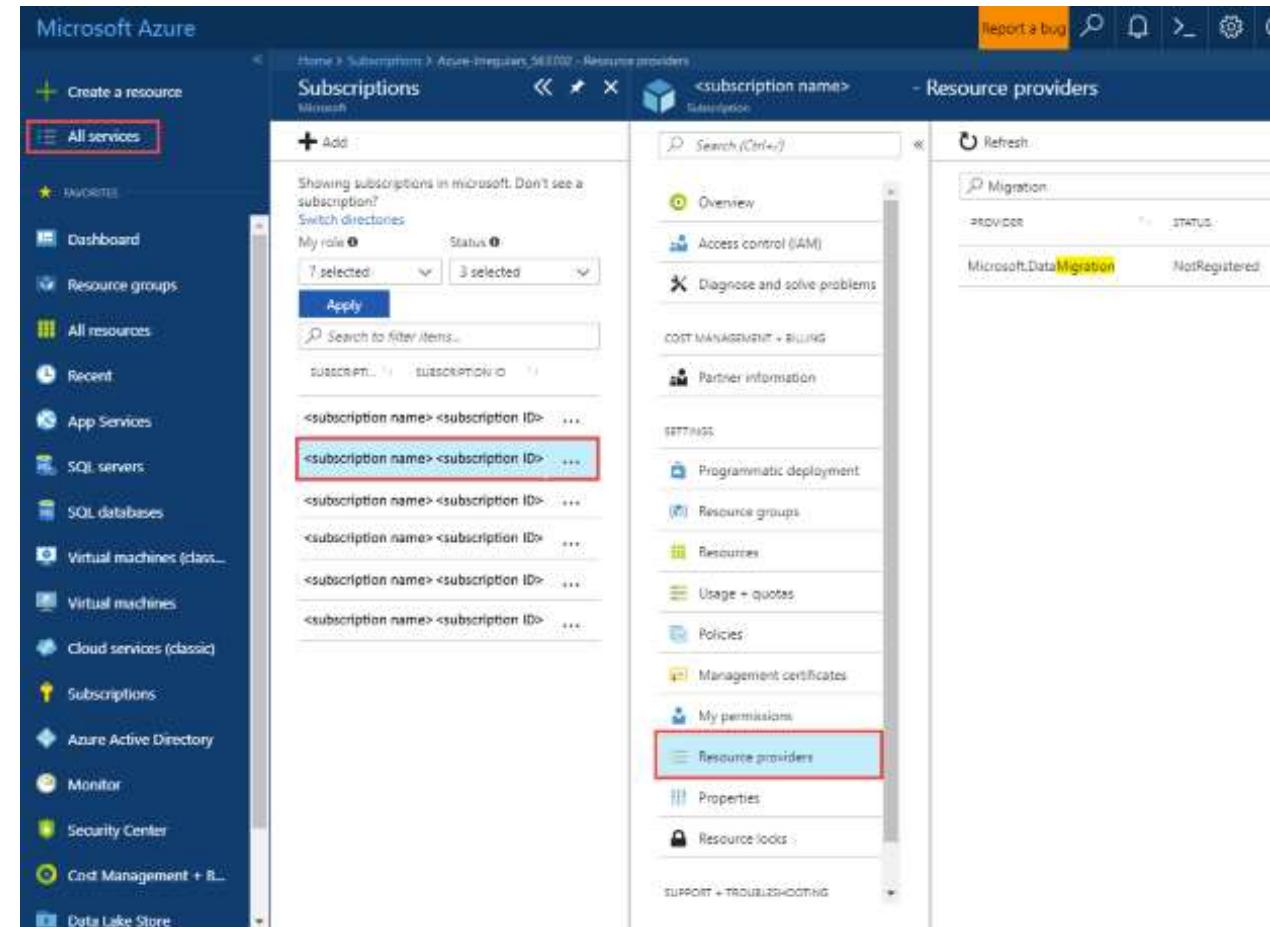
Opt for an offline migration if the application can handle downtime

Choose to do an online migration to limit downtime required to
move to a cloud environment

Currently, migrations to Azure SQL Database, Azure SQL Managed
Instance, and SQL Server on Azure VMs are supported from different
sources for online and offline migrations

Enjoy free migrations for all Standard offline migrations of 1, 2, or 4
vCores

Migrate business critical applications with the Premium tier in either
an online or offline manner free for 6 months from DMS creation
date



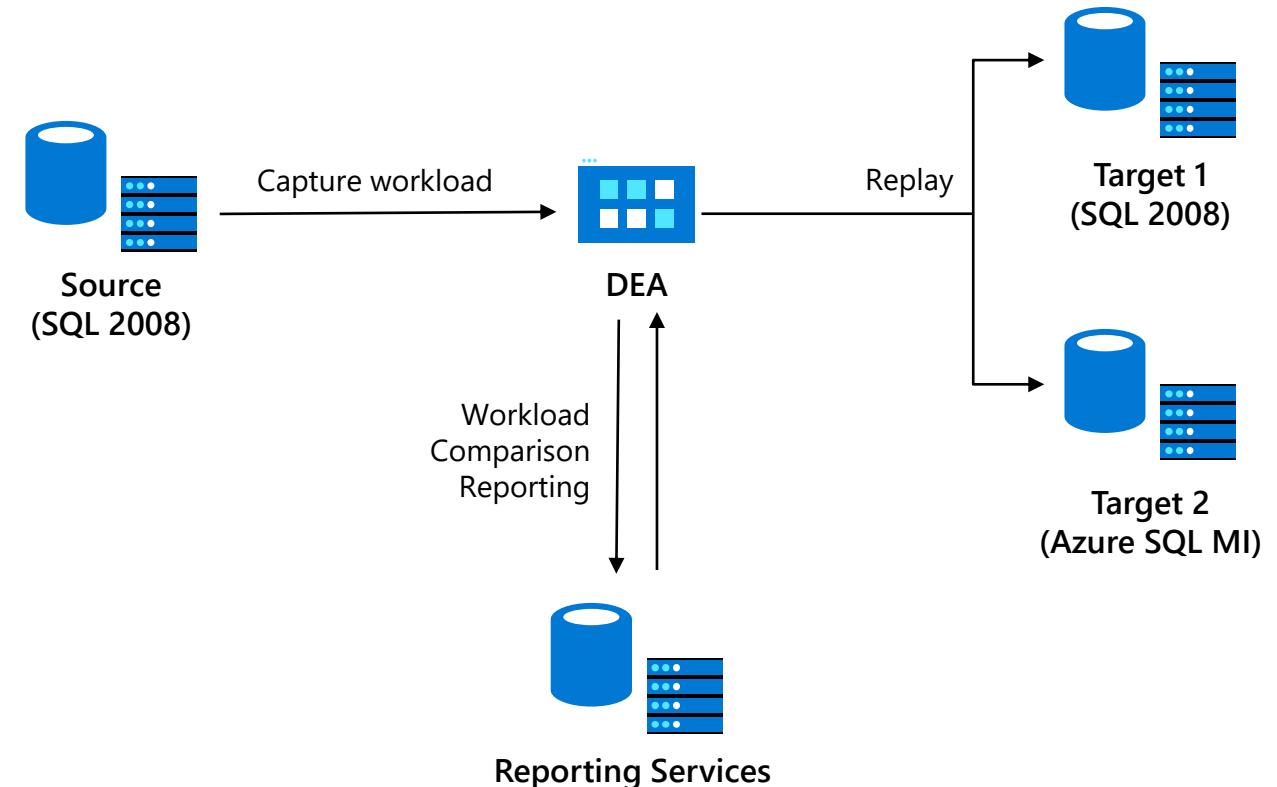
Database Experimentation Assistant

An experimentation solution for SQL Server upgrades

Evaluate the performance of an upgraded environment by conducting experiments across two SQL Server versions using production workloads

Build confidence about upgrading your SQL Server by obtaining metrics including queries with compatibility issues and degraded queries or query plans

Compatible with SQL Server 2005 and newer



Learn more about the [Database Experimentation Assistant](#)

Start your migration journey today



Assess

Calculate savings with the [Azure TCO calculator](#)



Migrate

Use the [Azure Database Migration Service](#) and [Data Migration Assistant](#) to migrate your on-premises database to Azure



Optimize

Take advantage of offers such as [Azure Hybrid Benefit](#) and [Azure Reserved Virtual Machine Instances](#)



Secure and manage

Get industry-leading security with [Azure Security Center](#), and protect your data in the cloud with [Azure Backup](#)

Additional Resources

Main resources

[Azure migration center](#)

[Azure Database Migration Guide](#)

[Find a partner](#)

[Azure Database Migration Service \(DMS\)](#)

[Azure DMS documentation](#)

Demos

[Migrating and modernizing your data estate to Azure with Data Migration Services](#)

[Database migration roadmap with Microsoft](#)

Blog

[Data Migration Team Blog](#)

Web pages

[Azure SQL family webpage](#)

3rd party studies

[GigaOM price-performance study](#)

[Forrester Consulting Total Economic Impact™ study](#)

Resources - infographics

[Azure SQL family](#)

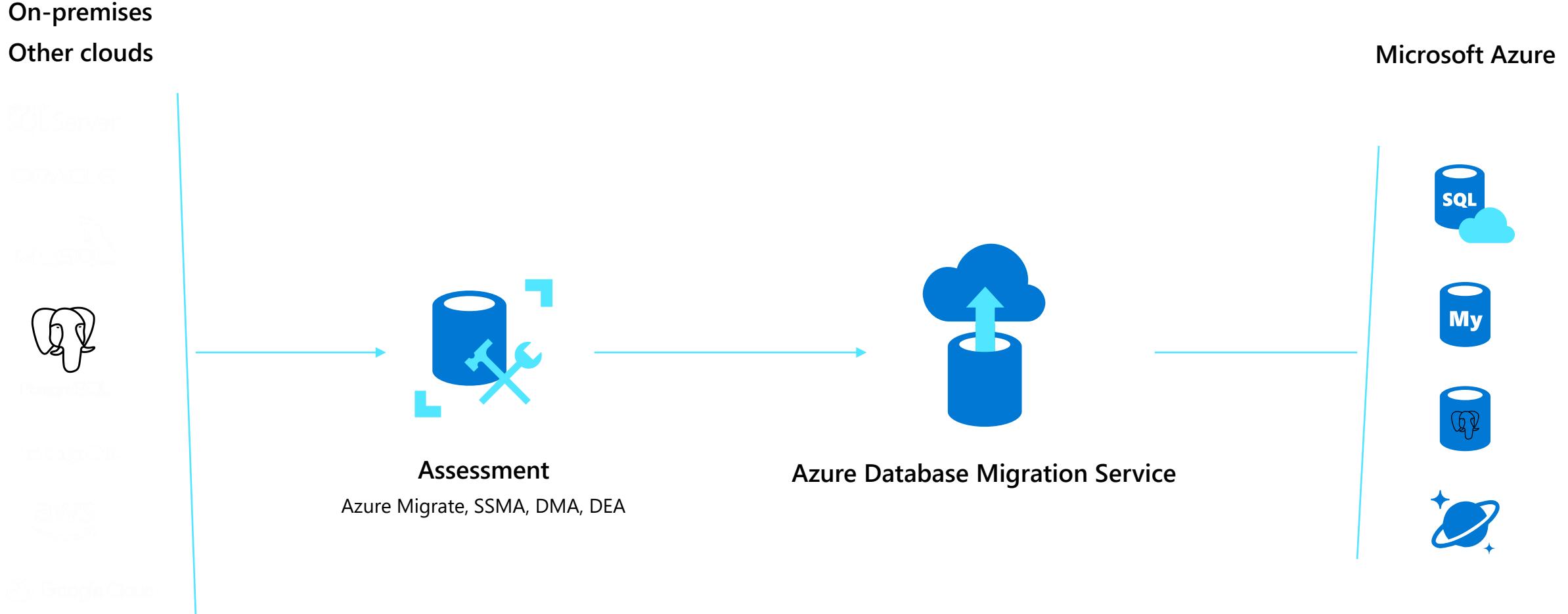
[Forrester Consulting Total Economic Impact™ study](#)

[Azure SQL Database serverless](#)

[Web App Migration Datasheet](#)

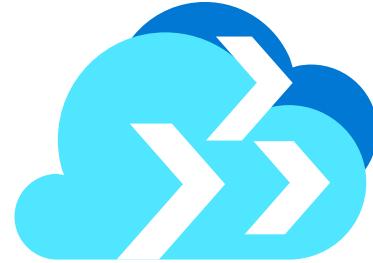
[SQL Server Cloud Pathways](#)

Tools and services for your migration journey

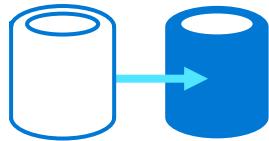


Azure Database Migration Service

Accelerate your transition to Azure



Homogeneous
sources



Heterogeneous
sources



Orchestration



Scale migration



Near-zero
downtime

A seamless, end-to-end solution for moving on-premises databases to Azure

SQL Server Migration Assistant

- A tool designed to automate database migration to SQL Server from non-SQL Server environments including Access, DB2, MySQL, Oracle, and SAP ASE
- Migrate to SQL Server versions 2012-2019, SQL Server 2017 and 2019 on Windows and Linux, Azure SQL Database, and Azure SQL Data Warehouse
- An automated process including migration assessment analysis, schema and SQL statement conversion, data migration, and migration testing to reduce risk and cost of project

Azure Database Migration Guide

Step-by-step guidance for database source and target migration

	 Azure SQL Database	 SQL Server upgrade	 Azure SQL DB Managed Instance	 SQL Server on Azure VMs	 SQL Data Warehouse	 SQL Server	 Azure SQL Database for PostgreSQL	 Azure Database for MySQL	 Azure Cosmos DB
Microsoft® SQL Server®	✓	✓	✓	✓	✓				
ORACLE®	✓		✓		✓	✓	✓		
DB2	✓		✓			✓			
MySQL						✓		✓	
PostgreSQL							✓		
mongoDB									✓
cassandra									✓
Access	✓		✓						
SAP ASE						✓			
Microsoft Azure Table Storage									✓

Start your migration journey today

Define strategy	Plan	Ready	Adopt	Govern	Manage
<p>Understand reasons and motivations for cloud adoption</p> <p>Identify and prioritize desired business outcomes by using this template</p> <p>Define your business case and create a financial model to project impact</p>	<p>Take inventory of your digital estate and evaluate them to determine the ideal cloud destination.</p> <p>Create a cloud adoption plan by prioritizing workloads based on business impact and complexity</p>	<p>Create and implement a readiness plan, ensuring that your ecosystem is prepared for the changes</p> <p>Prepare your cloud environment by setting up a cloud landing zone for your workloads, use the cloud adoption framework blueprint for help with quick set up</p>	<p>Migrate your existing on-premises workloads to the cloud based on an incremental process</p> <p>Innovate by modernizing your digital estate to drive innovation</p>	<p>Benchmark and improve your governance with the governance benchmark tool</p> <p>Establish governance practices based on cloud governance disciplines</p> <p>Identify business risks and mitigate them with governance and compliance policies</p>	<p>Classify your workloads by criticality and business value with the methodology for management, using these results to establish well-managed cloud environments</p>

Tools for your migration journey

Data Migration Assistant (DMA)

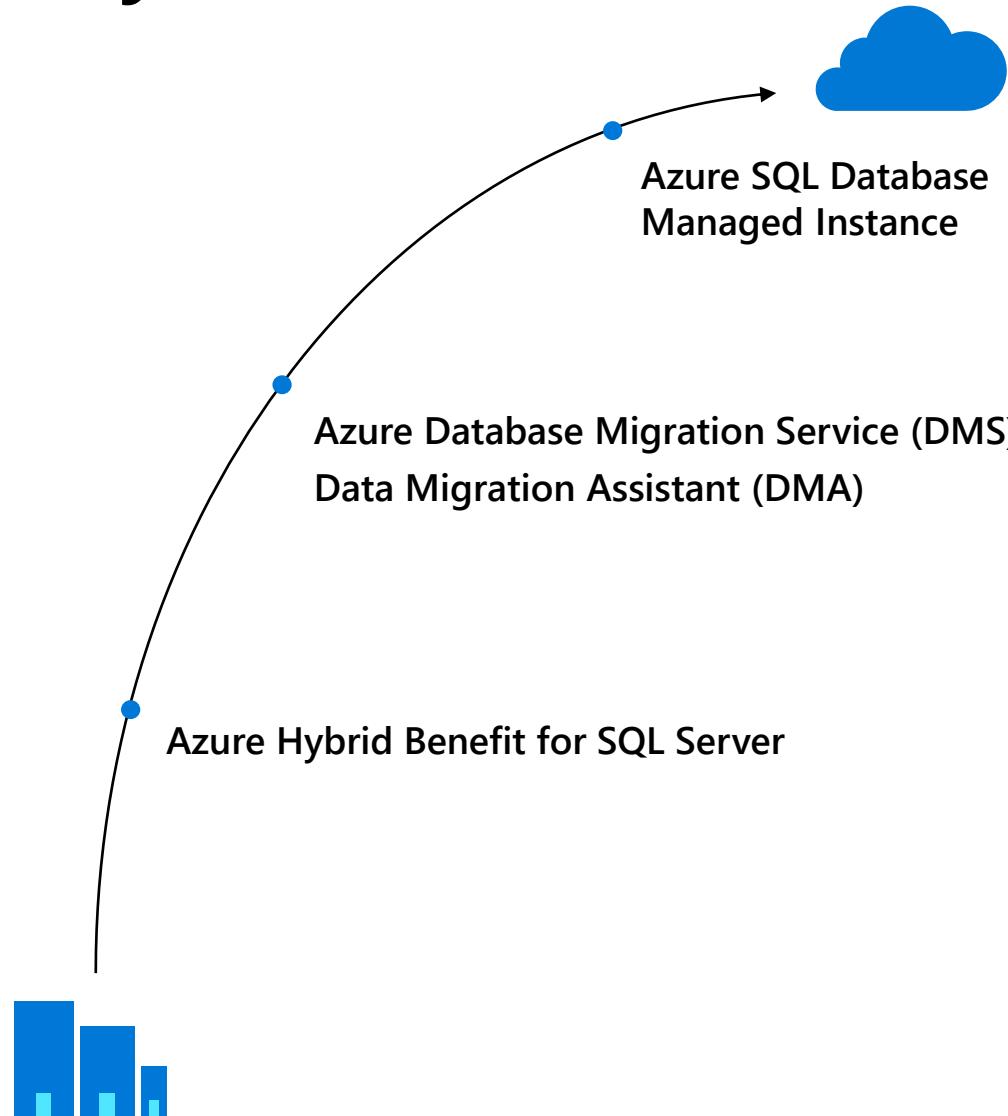
Enables upgrades to SQL Server and Azure SQL Database

Azure Hybrid Benefit for SQL Server

Maximizes current on-premises license investments to facilitate migration

Azure SQL Database Managed Instance

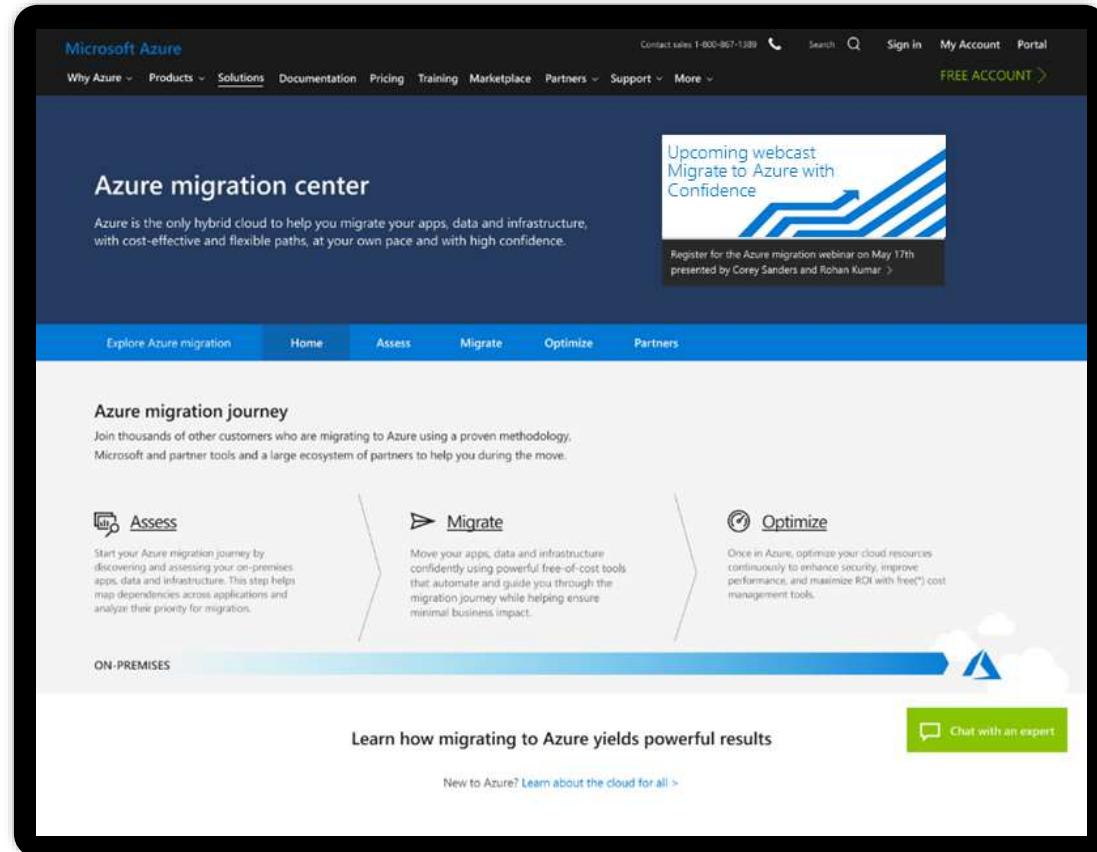
Facilitates lift and shift migration from on-premises SQL Server to PaaS



Your single destination for all thing's migration

Provides guidance, tools, and partners in context of your migration scenario

Azure migration center



The screenshot shows the Microsoft Azure migration center homepage. At the top, there's a navigation bar with links like 'Why Azure', 'Products', 'Solutions', 'Documentation', 'Pricing', 'Training', 'Marketplace', 'Partners', 'Support', and 'More'. On the right side of the header, there are links for 'Contact sales 1-800-867-1389', 'Search', 'Sign in', 'My Account', 'Portal', and a 'FREE ACCOUNT' button.

The main content area features a dark blue header with the text 'Azure migration center' and a subtext: 'Azure is the only hybrid cloud to help you migrate your apps, data and infrastructure, with cost-effective and flexible paths, at your own pace and with high confidence.' To the right of this is a graphic for an 'Upcoming webcast Migrate to Azure with Confidence' featuring a blue arrow pointing upwards.

Below the header, there's a navigation bar with links: 'Explore Azure migration', 'Home', 'Assess', 'Migrate', 'Optimize', and 'Partners'. The 'Assess' link is currently active, indicated by a blue underline.

The main section is titled 'Azure migration journey' with the subtext: 'Join thousands of other customers who are migrating to Azure using a proven methodology, Microsoft and partner tools and a large ecosystem of partners to help you during the move.' It then details three steps: 'Assess', 'Migrate', and 'Optimize'.

The 'Assess' step is described as starting the migration journey by discovering and assessing on-premises apps, data, and infrastructure. It uses a blue icon with a gear and a document.

The 'Migrate' step is described as moving apps, data, and infrastructure to Azure using powerful free-of-cost tools. It uses a blue icon with a circular arrow and a checkmark.

The 'Optimize' step is described as once in Azure, optimizing resources to enhance security, improve performance, and maximize ROI with free* cost management tools. It uses a blue icon with a gear and a bar chart.

At the bottom of the page, there's a call-to-action button 'Learn how migrating to Azure yields powerful results' and another button 'Chat with an expert'.

<https://azure.microsoft.com/en-us/migration/>

Expedite migration with Azure Database Migration Service

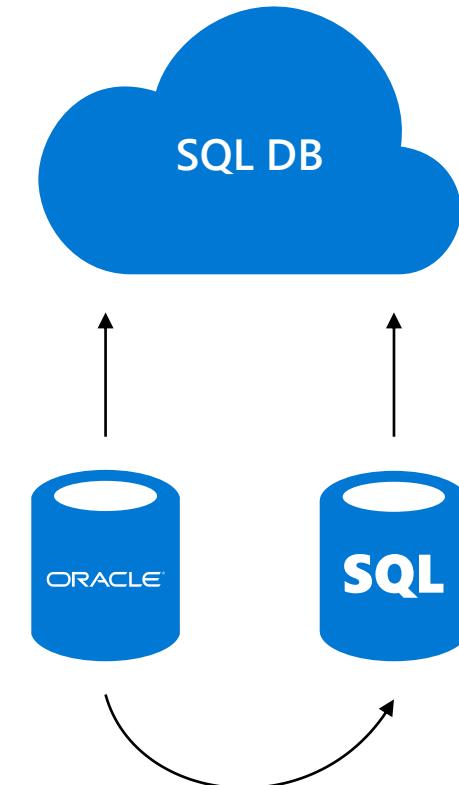
Fully managed Azure service platform for
seamless and frictionless data migration at scale

Database migrations with minimal downtime

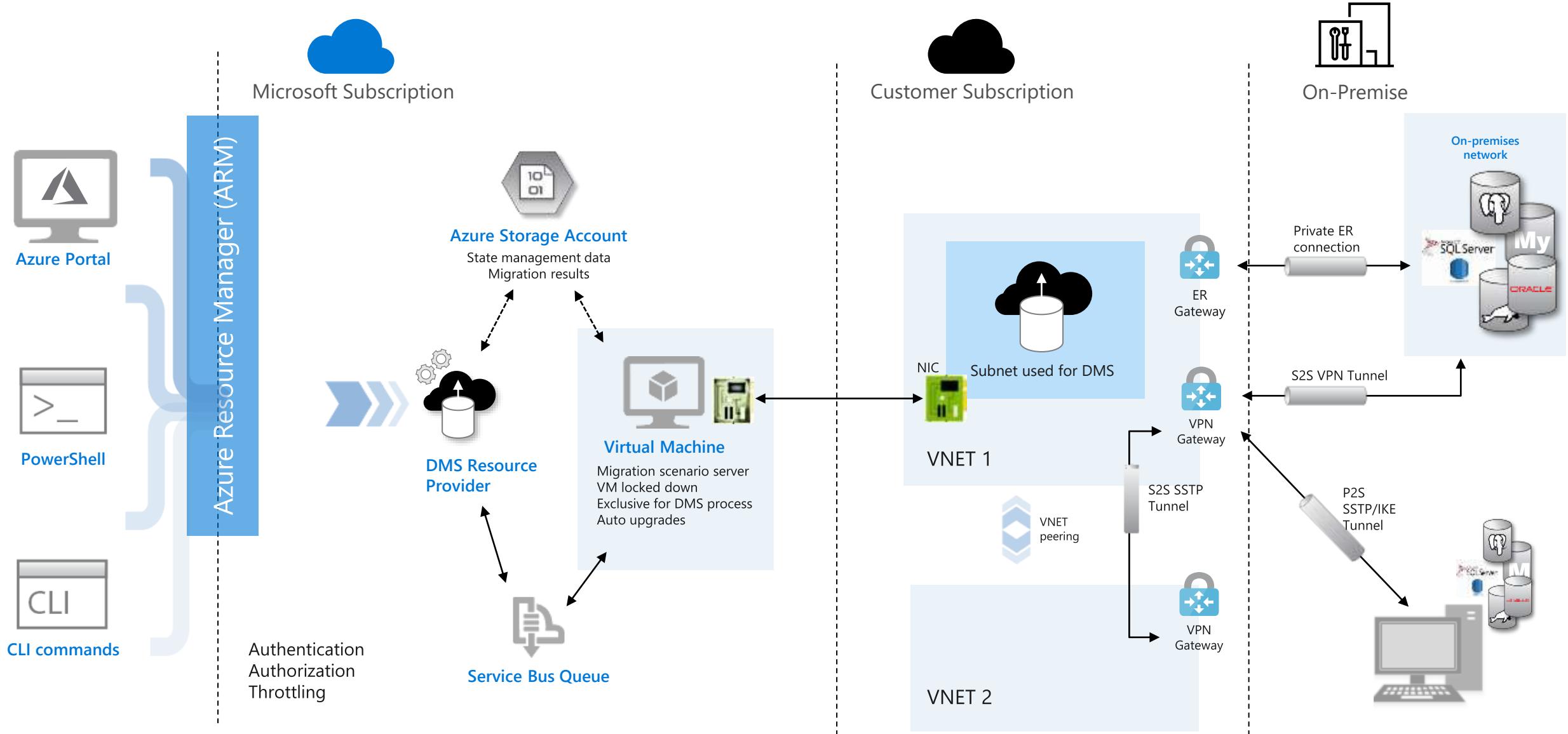
Migrate SQL Server & 3rd party databases to
Azure SQL Database

Built for scale and reliability

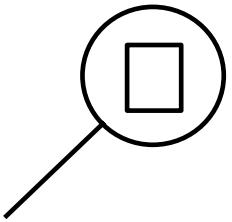
Azure Database Migration Service



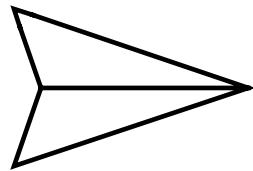
Azure Database Migration Service



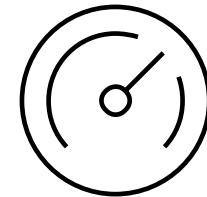
Azure Database migration journey



Assess



Migrate



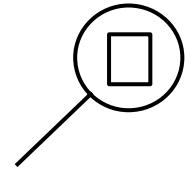
Optimize

Azure Database migration journey



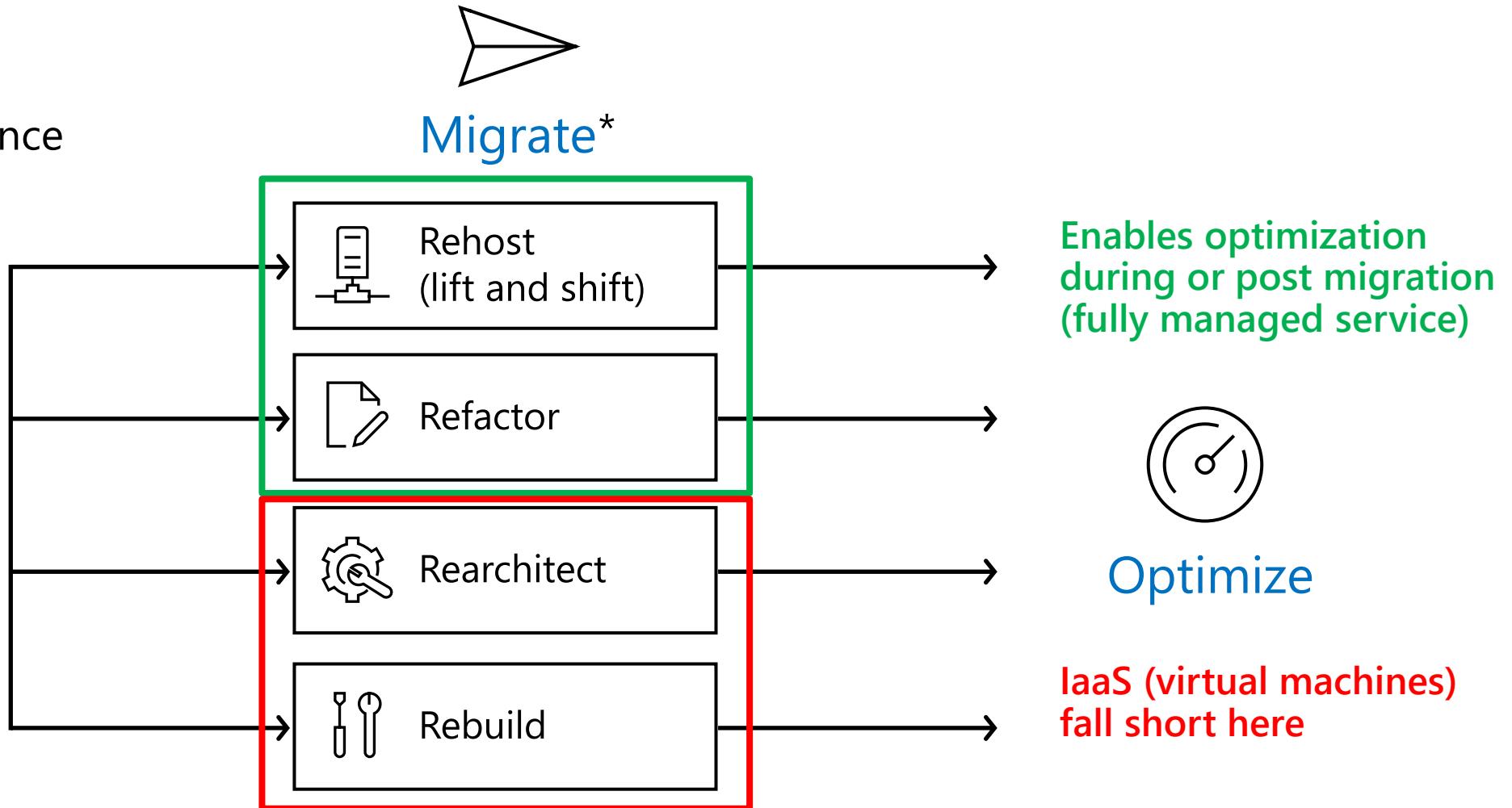
Managed Instance

Enables rehosting or
light refactoring for
most apps



Assess

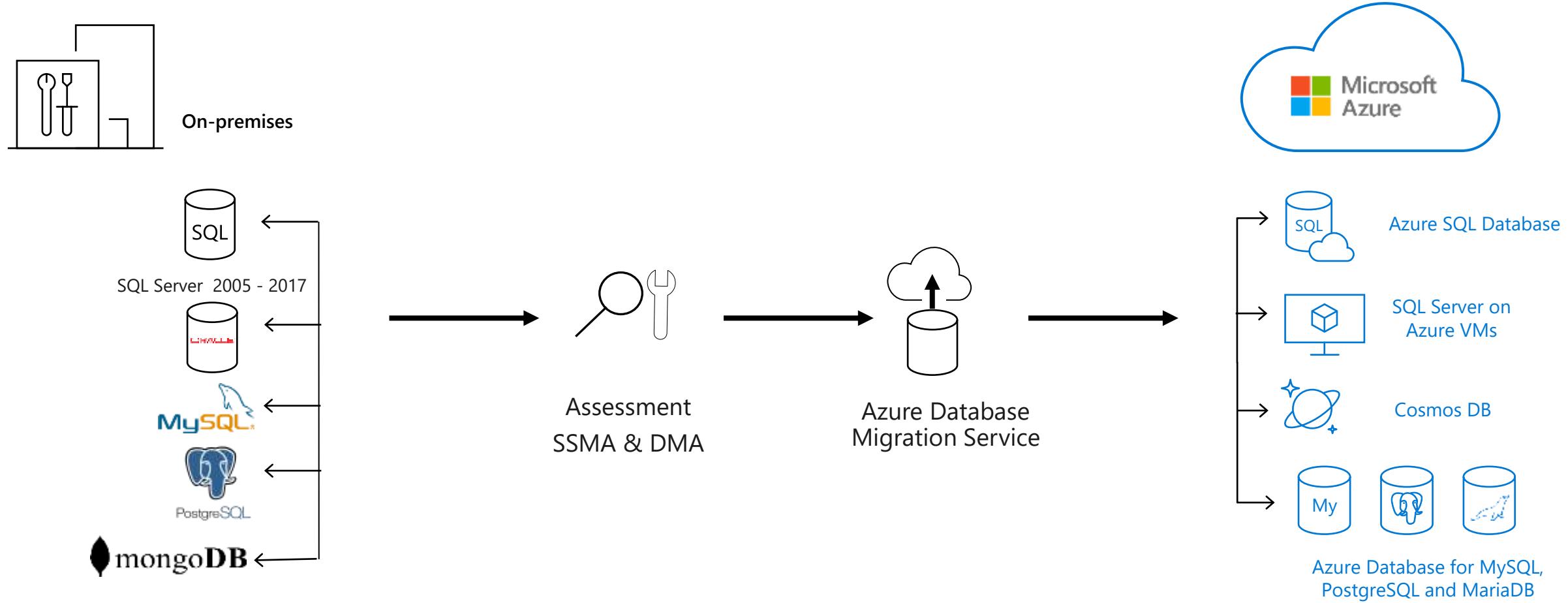
Eliminates the need
to rearchitect or
rebuild your apps



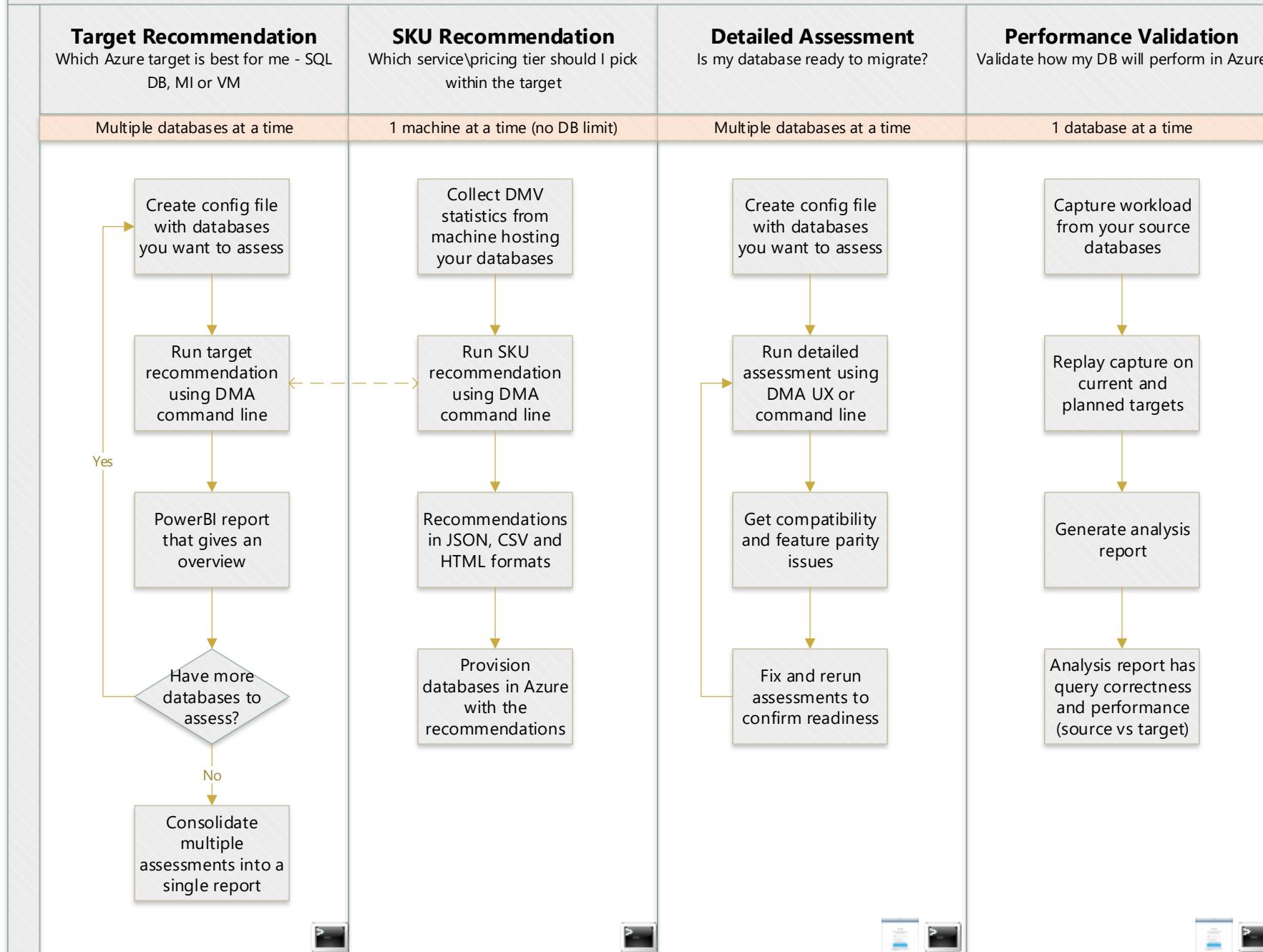
* These migration strategies are adopted from Gartner research. Gartner also calls out a 5th strategy called "Replace," which is all about SaaS. We won't focus on that here.

Migrating databases using Azure Database Migration Services

Seamless, end to end solution | Near-zero downtime | Resilient | Migrate at-scale from multiple sources



Assessment + Optimize



Target Recommendation

Create database config file

```
Untitled - Notepad
File Edit Format View Help
<?xml version="1.0" encoding="utf-8" ?>
<TargetRecommendationConfiguration>
  xmlns="http://microsoft.com/schemas/SqlServer/Advisor/TargetRecommendationConfiguration"
    <AssessmentName>your-assessment-name</AssessmentName>
    <AssessmentDatabases>
      <AssessmentDatabase>connection string 1</AssessmentDatabase>
      <AssessmentDatabase>connection string 2</AssessmentDatabase>
      ...
      <AssessmentDatabase>connection string n</AssessmentDatabase>
    </AssessmentDatabases>
    <AssessmentResultJson>path/to/json/output/file</AssessmentResultJson>
  </TargetRecommendationConfiguration>
```

Run target recommendation using DMA CLI

```
Administrator: Command Prompt
C:\Program Files\Microsoft Data Migration Assistant>DmaCmd.exe
/AssessmentName="string" /AssessmentDatabases="connectionString
1" \["connectionString2"\] \[/AssessmentTargetRecommendations="True"\] /AssessmentEvaluateRecommendations|/AssessmentEvaluateCompatibilityIssues
```

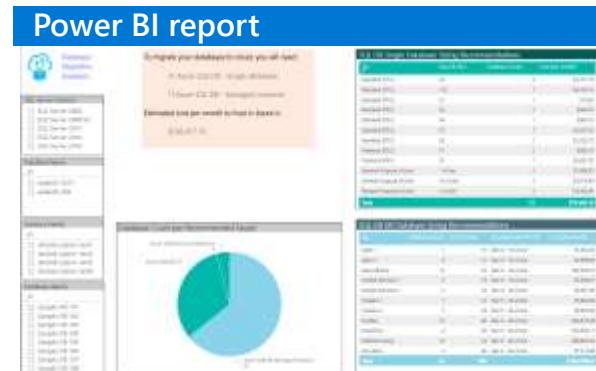
SKU Recommendation

Collect DMV statistics from your database

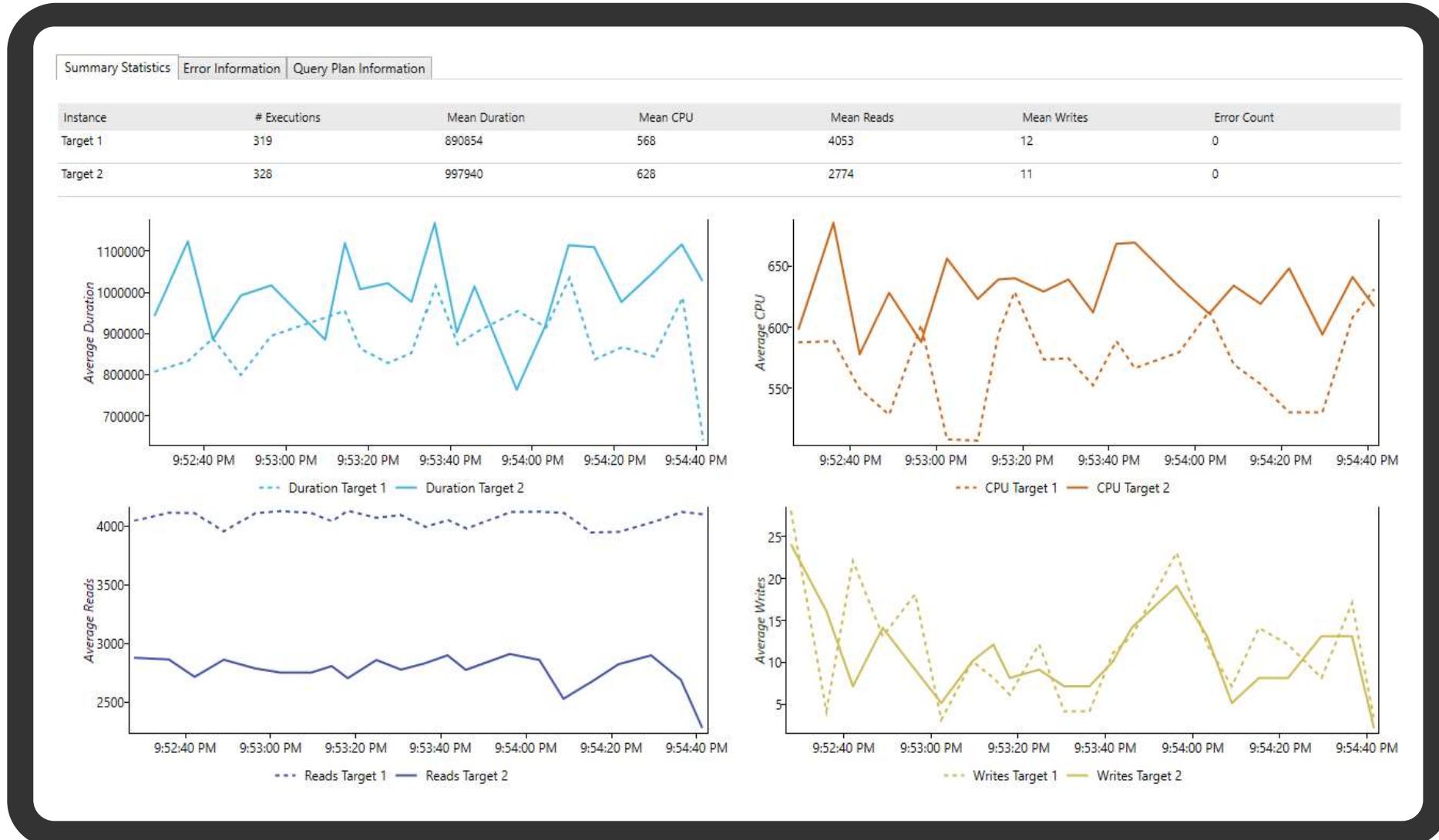
```
Windows PowerShell ISE
File Edit View Tools Debug Add-ons Help
PS C:\Program Files\Microsoft Data Migration Assistant> Dir *SKU*.ps1
Directory: C:\Program Files\Microsoft Data Migration Assistant
Mode LastWriteTime Length Name
-a---- 8/16/2018 10:34 AM 27437 SkuRecommendationDataCollectionScript.ps1
```

Run SKU recommendation using DMA CLI

```
Administrator: Command Prompt
C:\Program Files\Microsoft Data Migration Assistant>.\DmaCmd.exe
/Action=SkuRecommendation /SkuRecommendationInputFilePath
="C:\TestOut\out.csv" /SkuRecommendationTsvOutputResultsFilePath
="C:\TestOut\prices.tsv" /SkuRecommendationJsonOutputResultsFi
lePath="C:\TestOut\prices.json" /SkuRecommendationOutputResults
FilePath="C:\TestOut\prices.html" /SkuRecommendationPreventPric
eRefresh=true
```



Database Experimentation Assistant

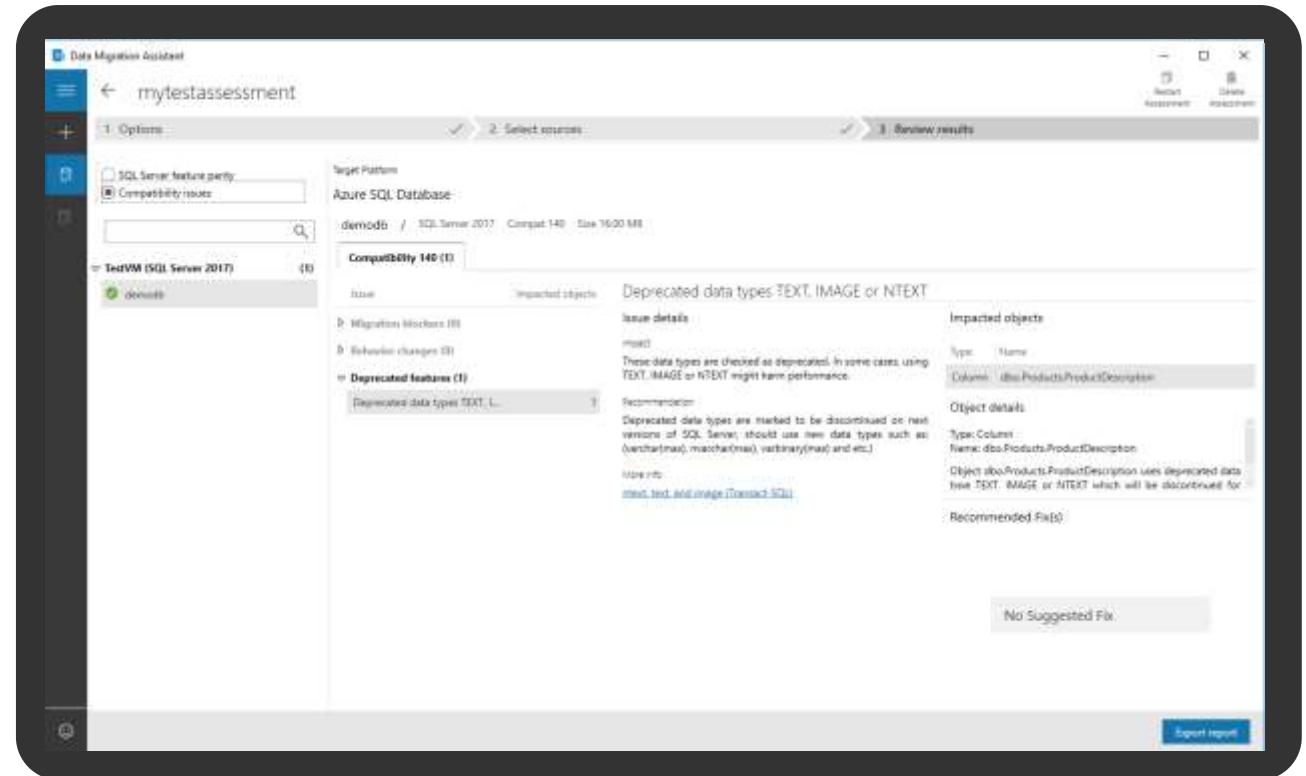


Data Migration Assistant

Assess on-premises SQL Server instance(s)
for migrating to Azure SQL database(s)

Discover issues that can affect an upgrade

Migrate an on-premises SQL Server instance
to a modern SQL Server instance



Demo

Data Migration Assistant

Business Intelligence Services

Not installed side-by-side with Managed Instance

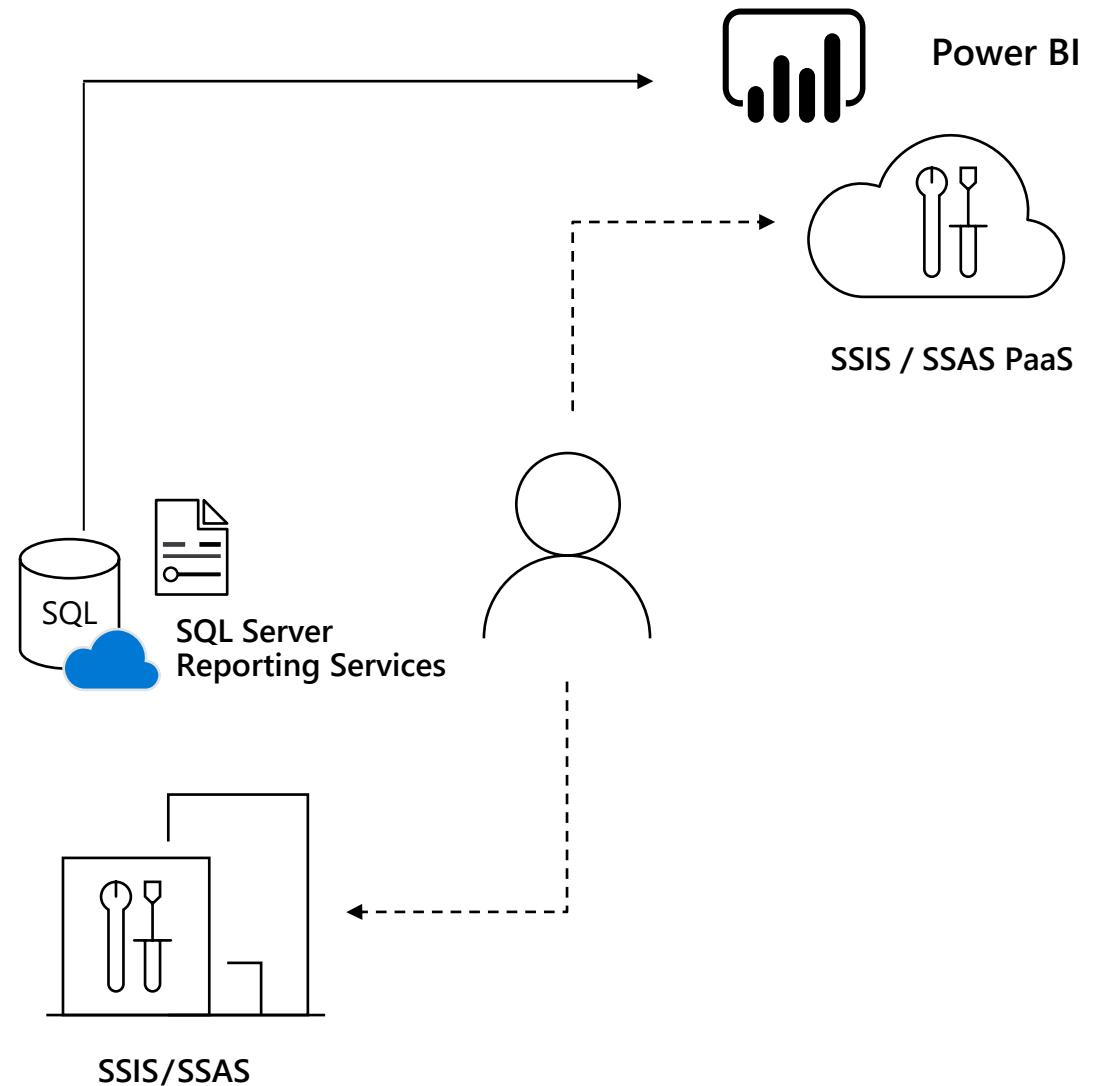
Migrate your SSIS packages to new SSIS on Azure Data Factory (PaaS service)

Migrate your OLAP models to Azure Analysis Services

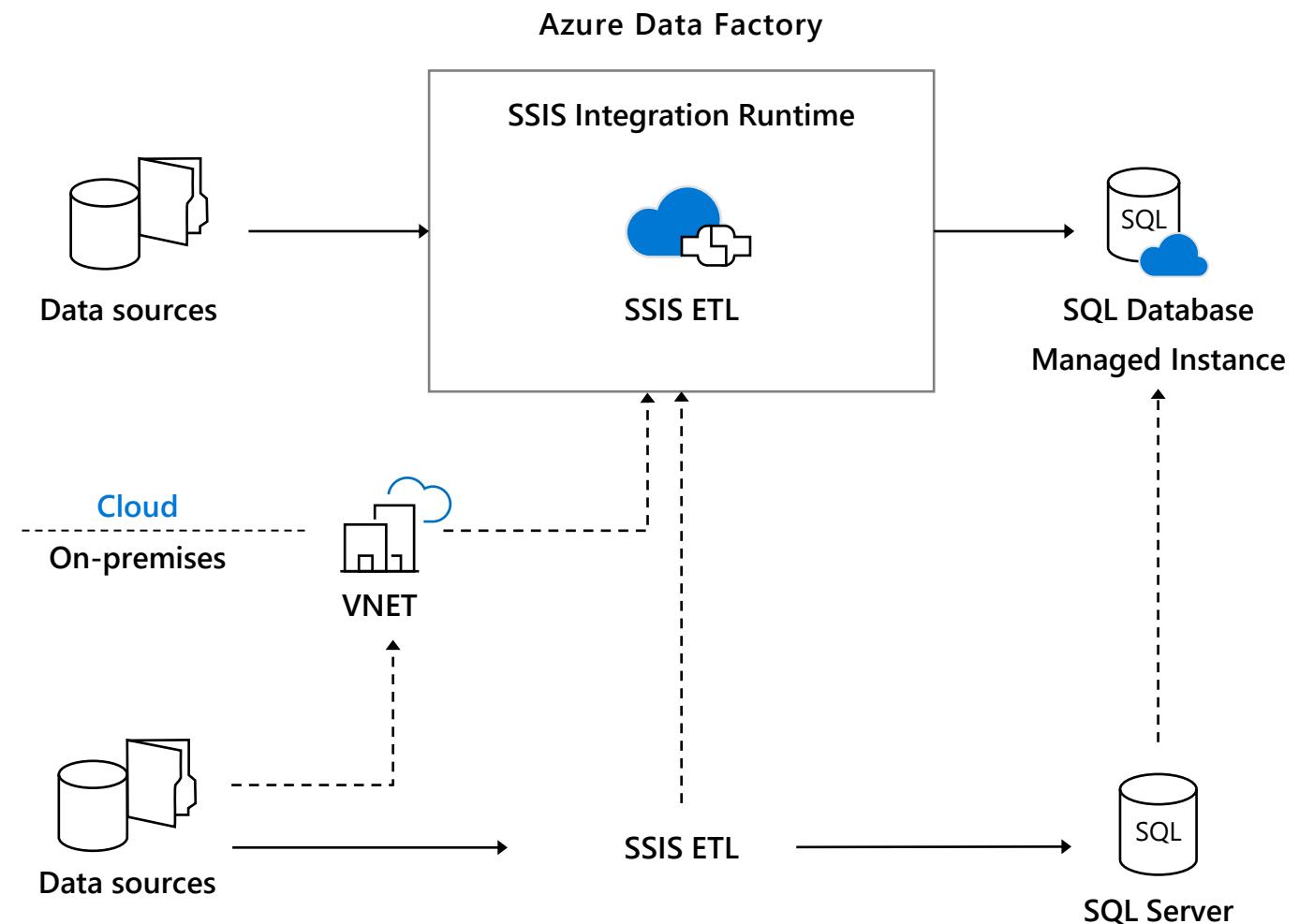
... or run these services in Azure virtual machines

For SSRS: run in a virtual machine, or switch to Power BI

Recommendation:
Move BI solutions to PaaS model



Lift your SQL server integration services (SSIS) packages to azure





Lab

SQL Managed Instance data integration and business intelligence

Learn to control the seamless orchestration of your enterprises' data integration efforts through an extensive tour of Azure Data Factory.

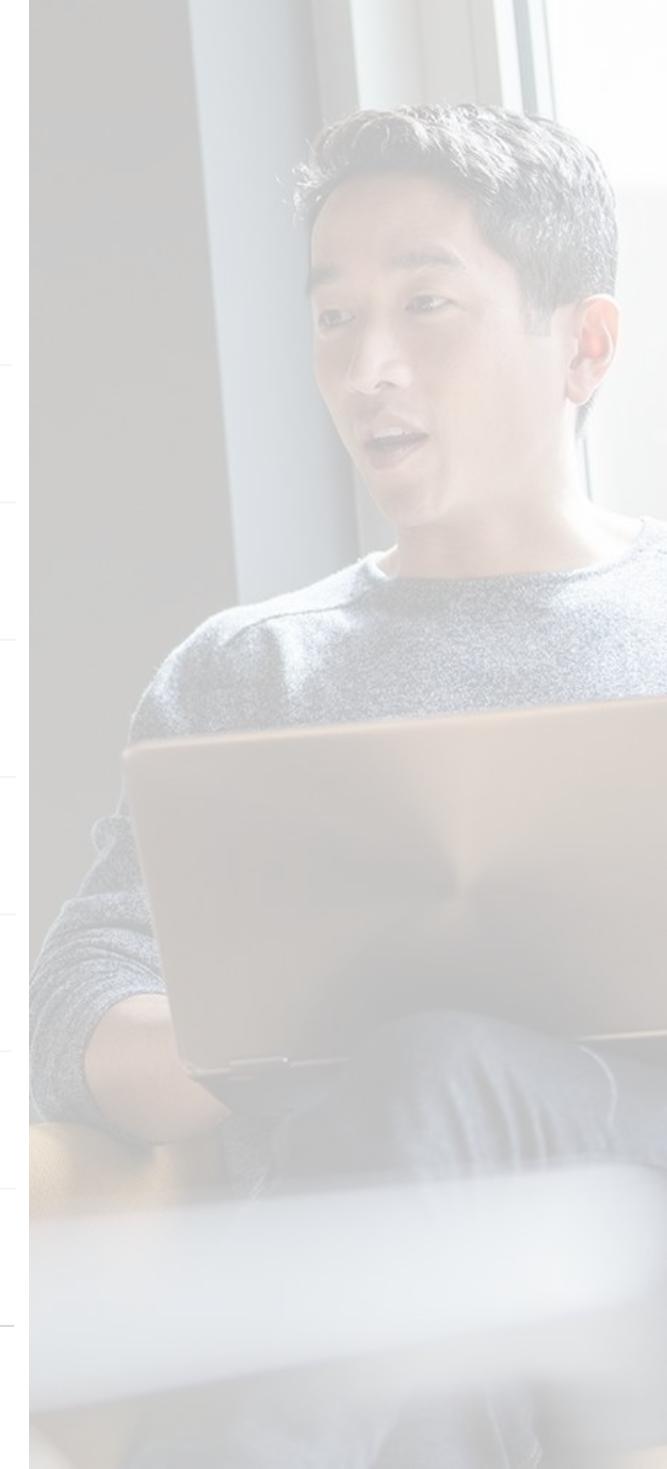
Lab

Migrate using Azure SQL Database Managed Instance

<http://tinyurl.com/????????>

Agenda

Intro to Azure SQL Database	Value prop, Platform benefits, TCO
Managed Instance overview	Managed Instance overview and architecture, Hands-on-lab
Security & Networking	Security overview, Networking considerations, demos
Features and capabilities	Key capabilities, limitations, backup & restore
Replication & Monitoring	Replication and Monitoring, demo
Migration	Migration overview and options, Hands-on-Lab
Data migration tasks	Microsoft ETL/ELT Services, Hands-on-Lab
Hyperscale	Working with large workloads, demo
Closing	Q&A, technical resources, etc.



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	SQL MI management through ARM templates & PowerShell (official docs and blogs)
Create SQL MI using ARM templates	
Change size of SQL MI using PowerShell	
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 in 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 <code>sp_readmierrorlog</code>
CAT Blog: Real time performance monitoring for Azure SQL DB Managed Instance	Configuring and using 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

Learn more about Azure SQL Database in the [Azure blog](#)

Read about the [Database Migration Service announcement](#)

Download the [Migration Cookbook](#)

