



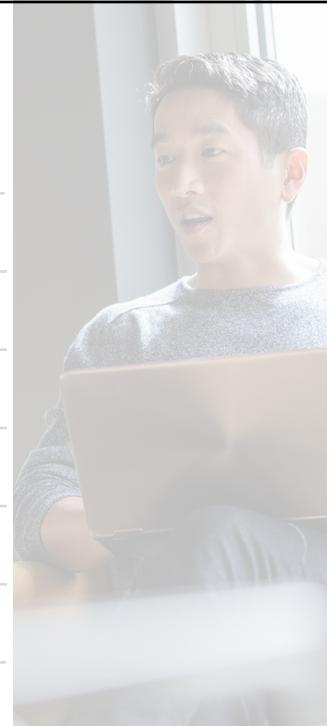
Azure SQL Database Managed Instance

Technical overview

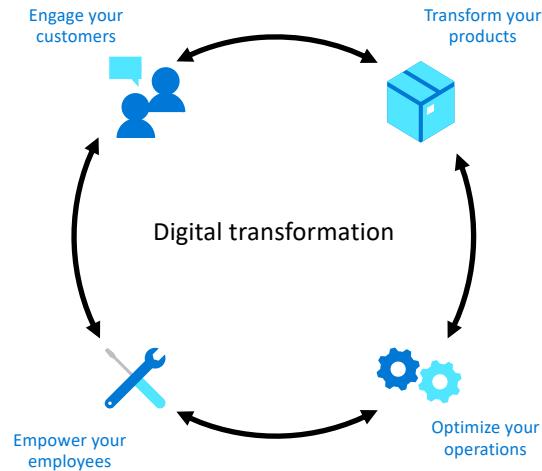
Shep Sheppard

Agenda

Intro to Azure SQL Database	Value prop, Platform benefits, TCO
Managed Instance overview	Managed Instance architecture, Features and management
Security & Networking	Security overview, Networking considerations, Hands-on-Lab
MI Features and capabilities	Key capabilities, limitations, backup & restore
Migration	Migration overview and options, Hands-on-Lab
MI & BI	Business Intelligence services + Managed Instance, Hands-on-Lab
Hyperscale	Hyperscale
Closing	Q&A, technical resources, etc.,



Technology is shaping how businesses innovate and grow



But data is more complex than ever

Each dimension of data is
constantly expanding

Volume

Velocity

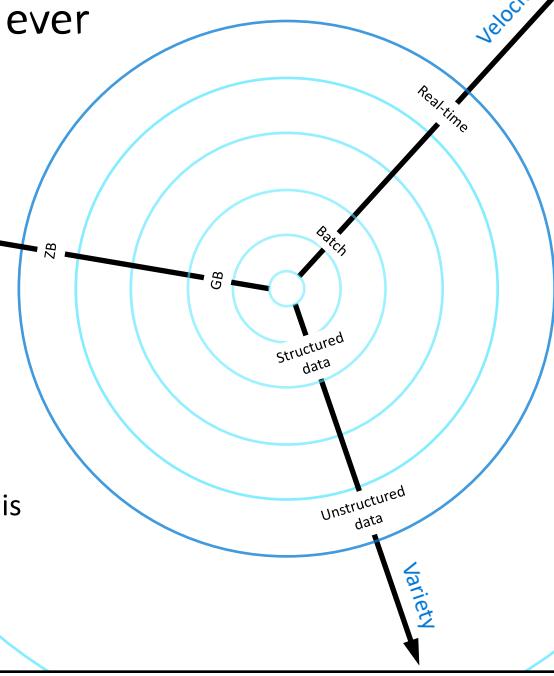
Real-time

Batch

Structured data

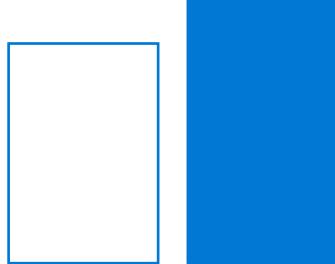
Unstructured data

Variety

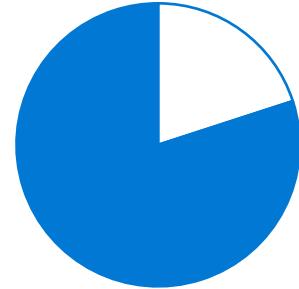


Getting ahead means getting to the cloud

Companies that embrace the cloud grow
19.6% faster



More than **80% of organizations** now
adopt cloud-first strategies

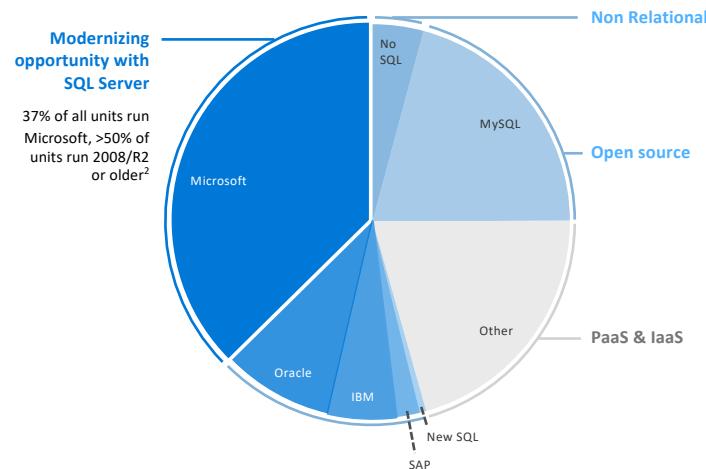


IT optimization is key to digital transformation

Priorities

- Eliminate time spent managing “long tail” of applications – lift and shift to managed cloud
- Free up limited IT resources to drive transformation
- Migrate business critical apps to cloud – extend and innovate

IDC Worldwide Database Server Forecast



¹Pie Chart *IDC Worldwide DB Forecast Dec 2016

Migrate to the cloud with Azure SQL Database

Breakthrough productivity & performance



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

Industry-leading security



Layers of security and 99.99 percent availability SLA

Built-in intelligence



Intelligent performance tuning and intelligent protection

Seamless and compatible



The broadest SQL Server compatibility and VNET support

Competitive TCO



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

[The best and most economical cloud destination](#)

Breakthrough productivity and performance



30x
faster transactions with in-memory OLTP



100x
performance gains with in-memory analytics

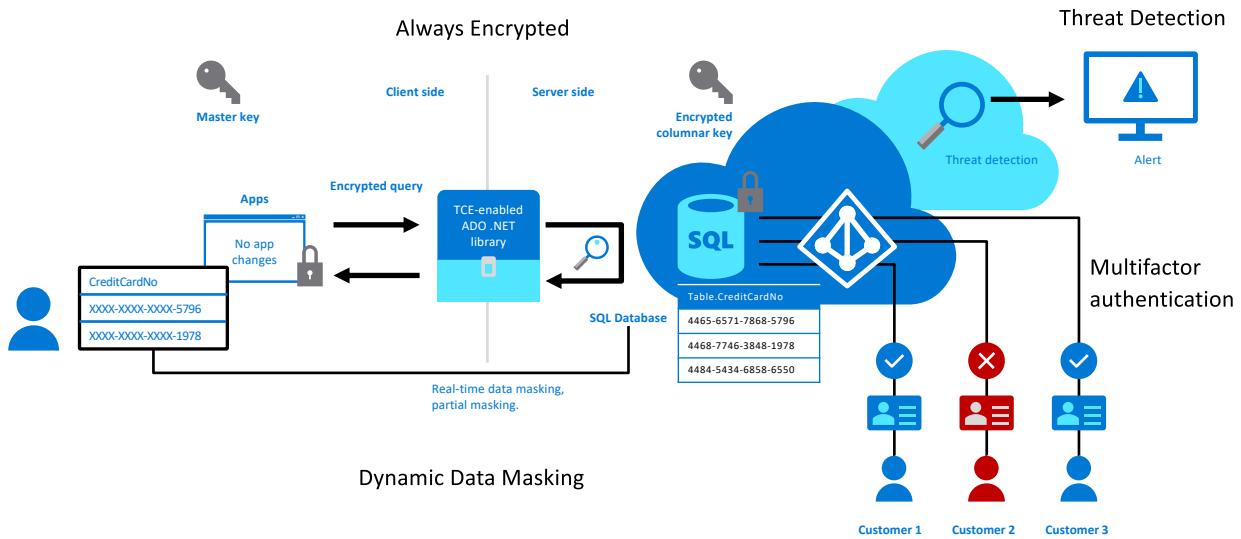


near **100%**
uptime with dynamic scalability



100TB +
Auto scaling up to 100TB with Hyperscale

Industry-leading security

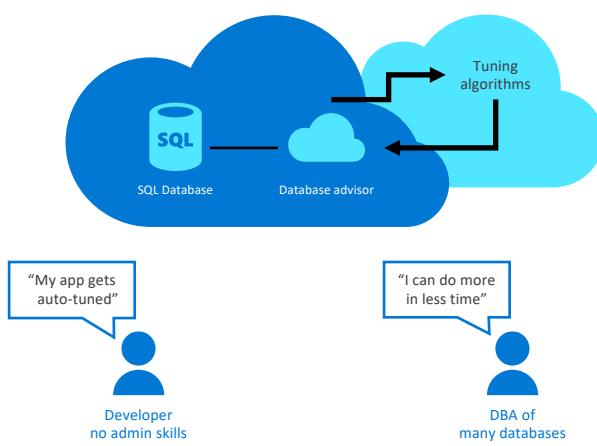


Built-in intelligence

Intelligent Performance learns unique database patterns and automatically tunes for improved performance

Adaptive query processing

Accelerate parallel queries and improve scaling of frequent queries with Intelligent Query Processing



Seamless and compatible

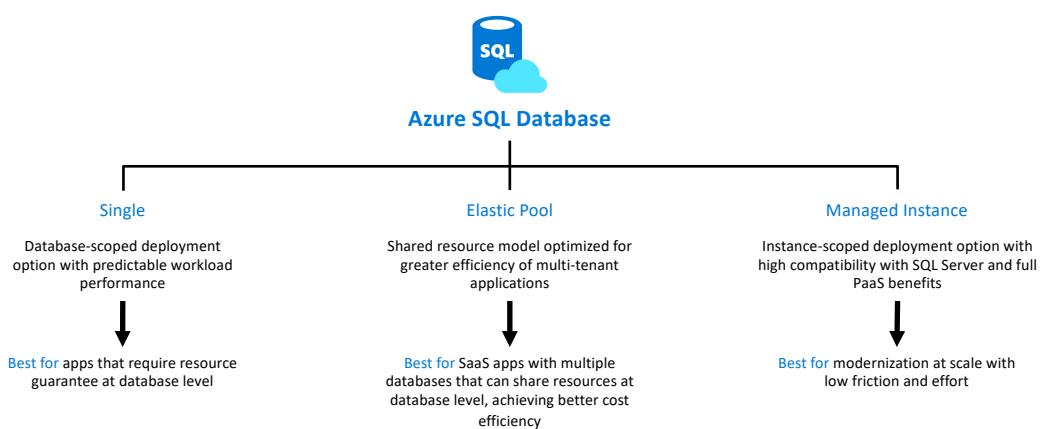
Compatibility challenges

- 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

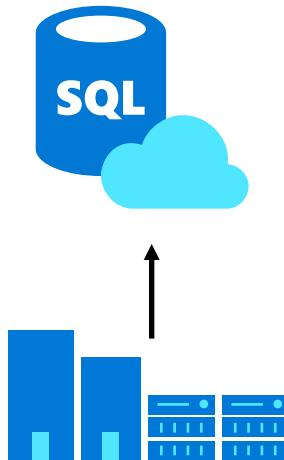
- Database Migration Service migrates from multiple sources at scale to accelerate the transition to the cloud
- Native Virtual Network (VNET) support with Managed Instance and fully-managed security
- Managed Instance combines the best of SQL Server with the operational and financial benefits of the cloud

Azure SQL Database resource types



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**



Dedicated resources and familiar tools

Enable full isolation from other tenants without resource sharing

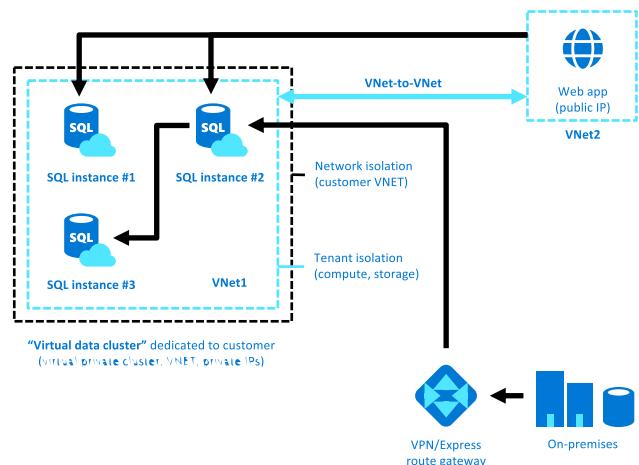
Promote secure communication over private IP addresses with native VNET integration

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



Competitive TCO

Azure SQL Database offers the most cost-effective path to the cloud

- Leverage your on-premises licenses in the cloud with Azure Hybrid Benefit
- Save even more by prepaying for compute resources with reserved capacity
- Get competitive TCO and SQL DB discounted for dev/test



Trade in on-premises cores with Azure Hybrid benefit

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

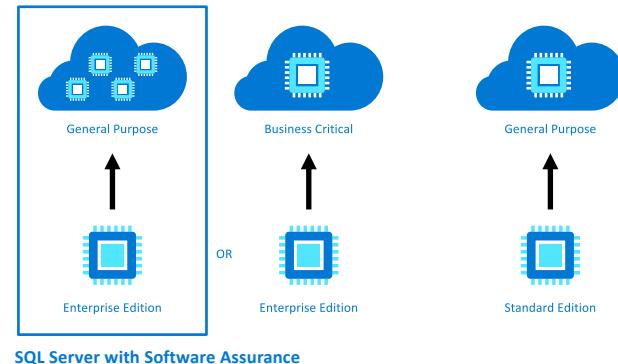
1 Standard license core =
1 General Purpose core

1 Enterprise license core =
1 Business Critical core

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

[SQL Server license trade-in values](#)

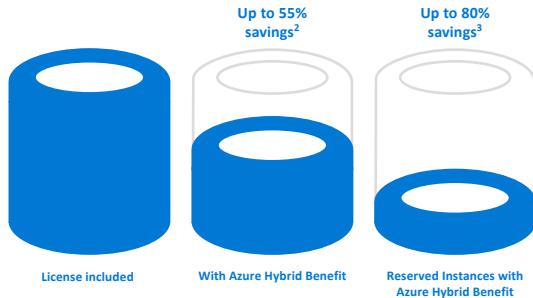
[SQL Database vCore-based options](#)



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.

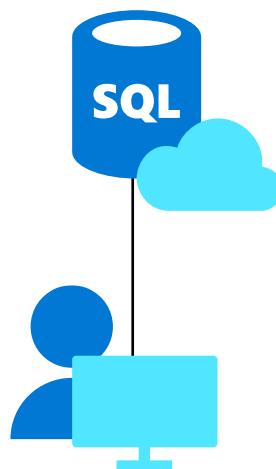
²Savings based on eight vCore SQL Database Managed Instance Business Critical in West 2 US Region, running 730 hours per month. Savings are calculated from on demand full price (license included) against base rate with Azure Hybrid Benefit plus 3-year reserved capacity commitment. Savings excludes Software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

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

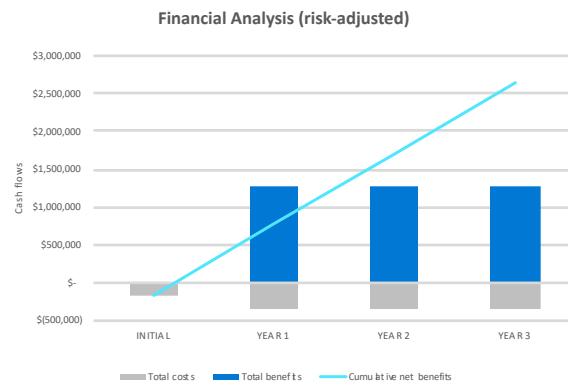
Financially-backed 99.99% availability SLA²

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



Source: [The Total Economic Impact™ of Microsoft Azure SQL Database Managed Instance](#), Forrester Consulting, September 2018

Customers can focus on their business

Your work so far

- Hardware purchasing and management
- Protect data with backups (with health checks and retention)
- High availability implementation
- Disaster recovery implementation
- Ensure compliance with standards on your own
- Secure your data from malicious users and mistakes
- Role out updates and upgrades
- Monitor, troubleshoot, and manage at scale
- Tune and maintain for predictable performance

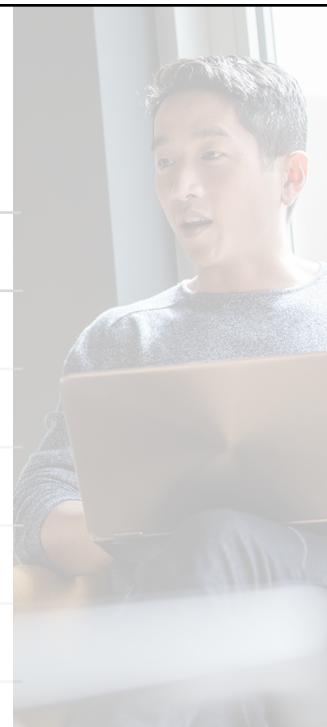
How SQL Database helps

- Built-in scale on-demand
- Built-in point-in-time restore
- Built-in 99.99% SLA and auto-failover
- Built-in geo-redundancy and geo-replication
- Built-in easy to use features
- Built-in easy to use features
- Built-in updates and upgrades
- Built-in easy to use features
- Built-in easy to use features

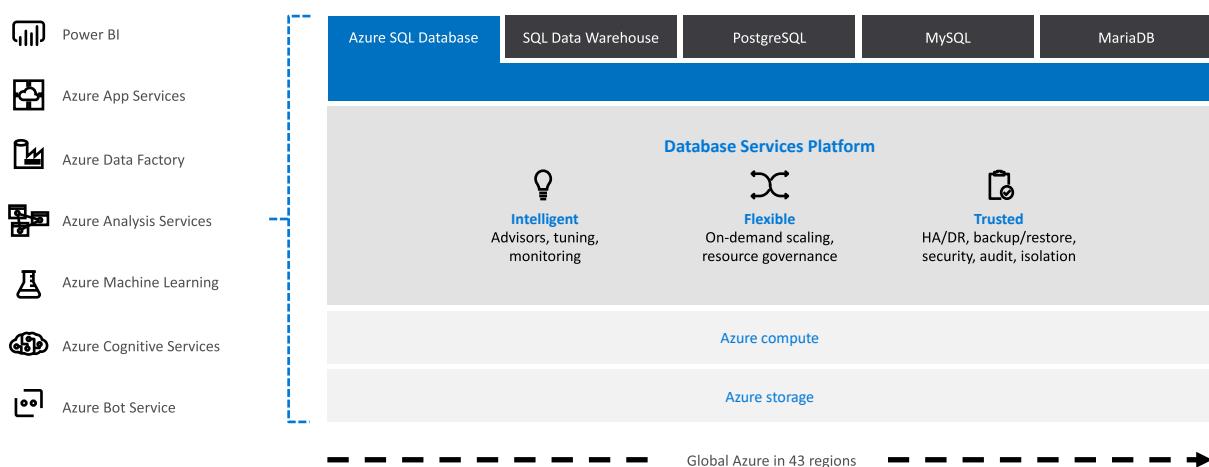
We take care of your database chores

Agenda

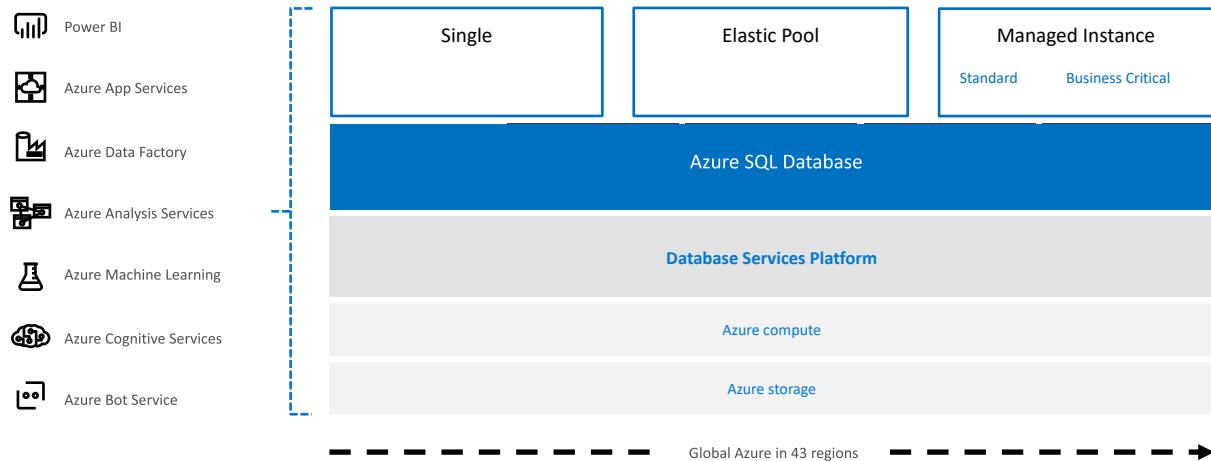
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Azure relational database platform

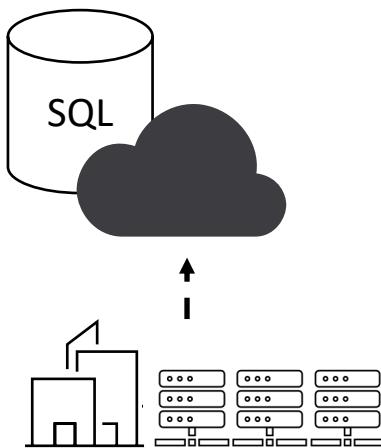


Azure relational database platform

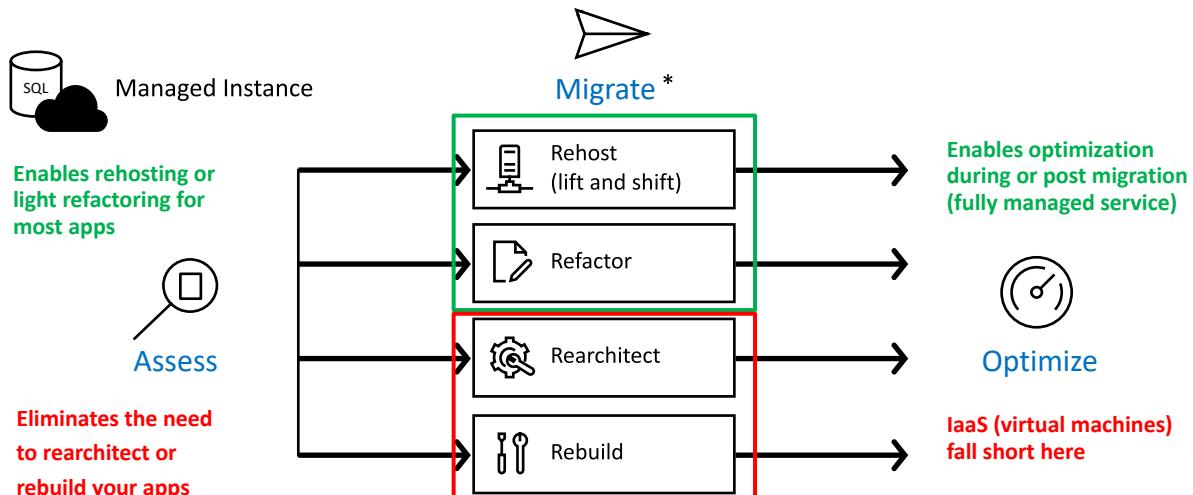


Who is Managed Instance for?

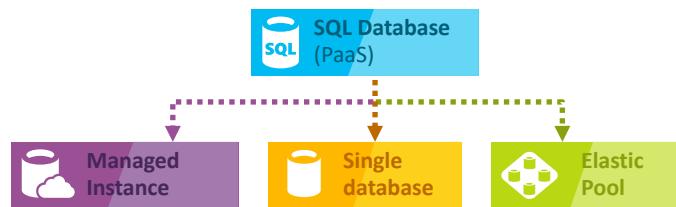
Customers looking to **migrate a large number of apps** from on-premise or IaaS, self-built or ISV provided, with **as low migration effort as possible & cost being a crucial factor**



Azure Database migration journey



* 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.



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 Database Provides 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 VNet Private IP addresses Express Route / VPN connectivity 	<ul style="list-style-type: none"> Transparent Frictionless Competitive

Put your DBs on autopilot and focus on your business...
 Tired of managing hardware, software & business continuity?

You can stop doing it, Managed Instance has it built-in

	Compute & storage provisioned on demand Fast & online scaling Full stack updates and patches
	Backups with health checks Point-in-time restore (configurable retention *)
	99.99% availability with automatic failover Disaster recovery with single geo secondary (multiple*)

* - features coming soon

Put your DBs on autopilot and focus on your business...
 Is it hard to secure data and ensure standards compliance?
 Is it hard to monitor and tune all your workloads?

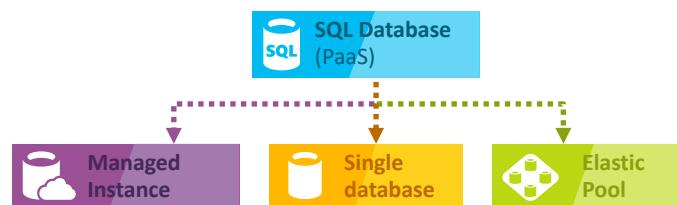
It's much easier with the Managed Instance

	Compliance with all major industry standards Threat detection with automatic alerting
	Intelligent query processing Automatic performance tuning*
	Monitoring at scale with Intelligent Insights Data discovery and classification* Vulnerability assessment

* - features coming soon

Demo

“It’s just SQL”



Fully-managed service	SQL Server compatibility	Full isolation and security	New pricing options
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Save time with familiar SQL Server tools and resources

Eliminate app changes with full SQL Server programming surface

Use familiar SQL Server features in SQL Database Managed Instance

Full compatibility with SQL Server 2005+

A diagram illustrating the compatibility of the service with existing tools. It shows a central human figure connected by dashed lines to two icons: one representing a local database system (containing a wrench and screwdriver) and another representing a cloud-based system (containing a wrench and screwdriver). This visualizes how the service maintains compatibility with traditional SQL Server tools while being deployed to the cloud.

Tools for your journey to the cloud

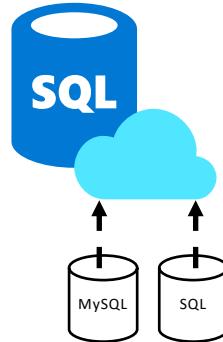
Seamless and compatible

Azure Database Migration Service

A diagram illustrating the migration process. It shows a local server rack icon at the bottom connected by an upward-pointing arrow to a cloud icon containing multiple database cylinders. This visualizes the seamless migration of databases from on-premises to the Azure cloud using the Azure Database Migration Service.

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 |

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

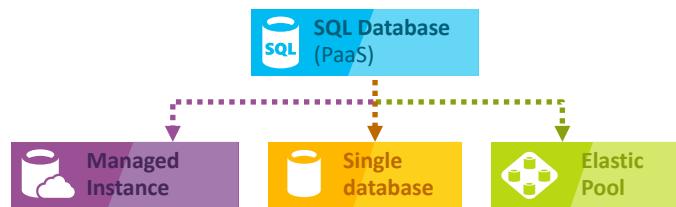
* - features coming soon

Easily migrate from SQL Server & modernize

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

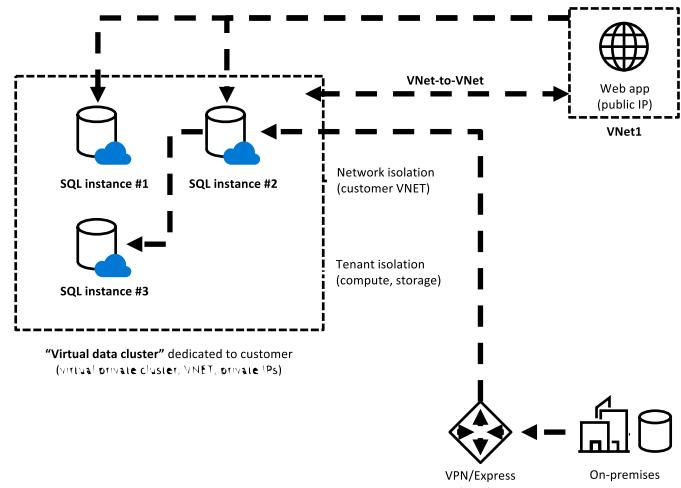
No, because Managed Instance lets you modernize at your pace

	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

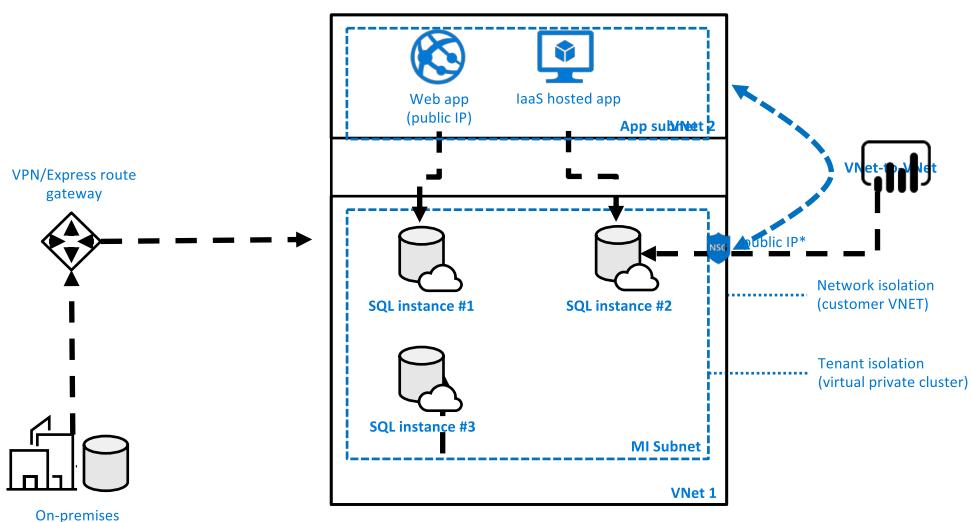


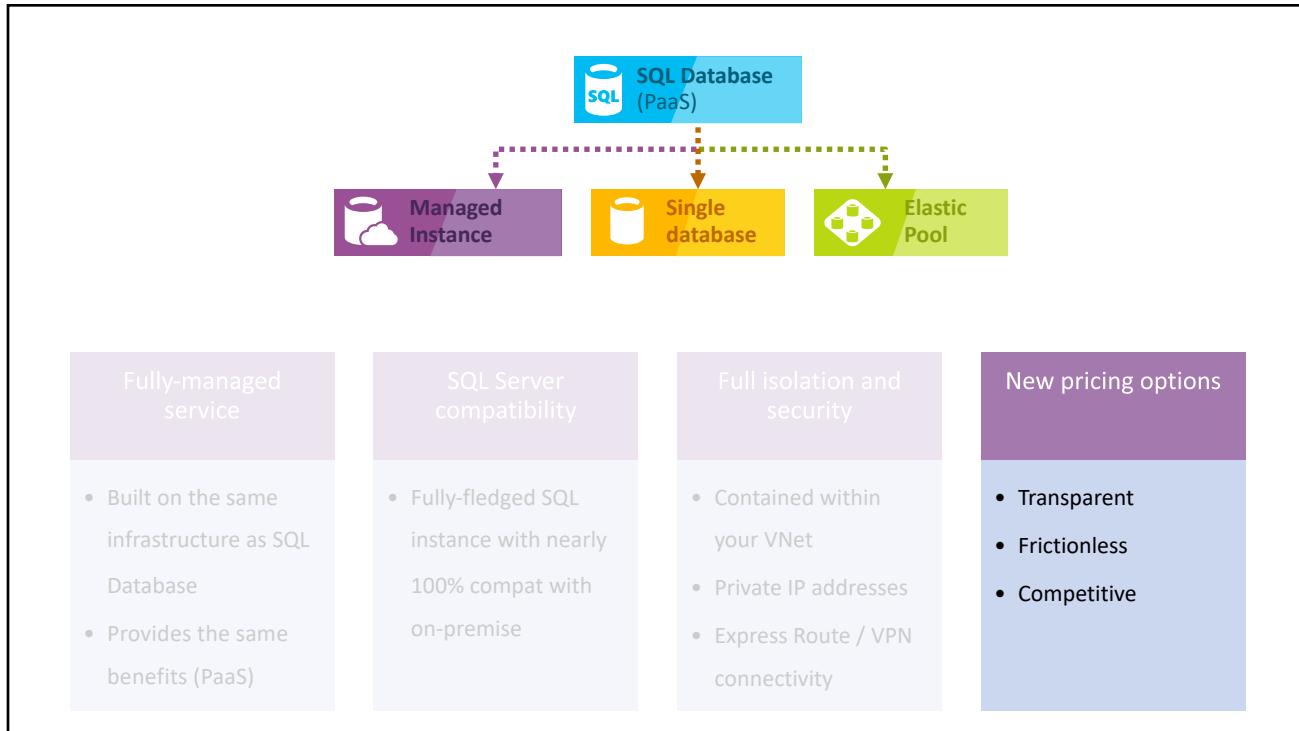
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Dedicated resources through customer isolation



Isolation and connectivity of Managed Instance





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 or US East price, under fully priced model (license included), on Sept 14, 2018. Comparable AWS RDS SQL db r3 2xlarge AWS prices based on US East (N. Virginia). Single AZ vs AWS RDS compared to SQL TAI General Purpose. Et multi-AZ in AWS RDS compared to SQL TAI Business Critical.

Lab



Introduction to SQL Managed Instance

This lab demonstrates how to create an Azure SQL Database Managed Instance using the Azure Portal in a dedicated subnet of a virtual network. You will learn how to configure networks, security capabilities, and privacy capabilities of your Managed Instance. You will also understand how to size your MI, create disaster recovery protections, and manage & monitor security and performance tuning.



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.

Azure SQL DB Managed Instance labs

WELCOME TO

Instructor-led Labs

- ① Read through the list of previously created labs to find the one you're interested in using
- ② Once you've found it, click "Schedule Lab" to get started to go to the scheduling tool
- ③ Once you've submitted your lab request, you'll receive a confirmation notification
- ④ Your lab provider will send you reminders as the date for your lab gets closer



Self-paced labs: <https://www.microsoft.com/handsonlabs/selfpacedlabs>

Instructor led labs: <https://www.microsoft.com/handsonlabs/instructorledlabs>

Deployment resources

Portal Deployment walk-through

<https://docs.microsoft.com/en-us/azure/sql-database/sql-database-managed-instance-create-tutorial-portal>

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

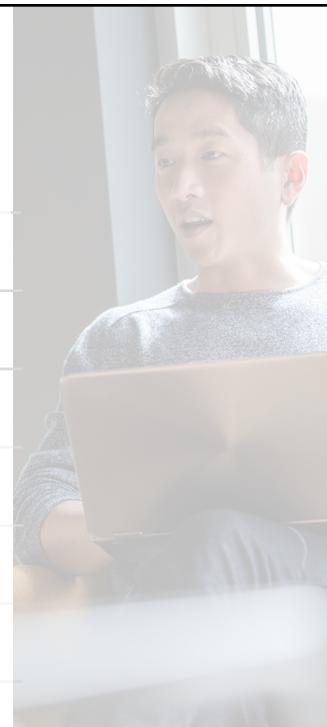
ARM Template Deployment walk-through

<https://blogs.msdn.microsoft.com/sqlserverstorageengine/2018/07/02/deploy-azure-sql-managed-instance-network-environment-using-arm/>

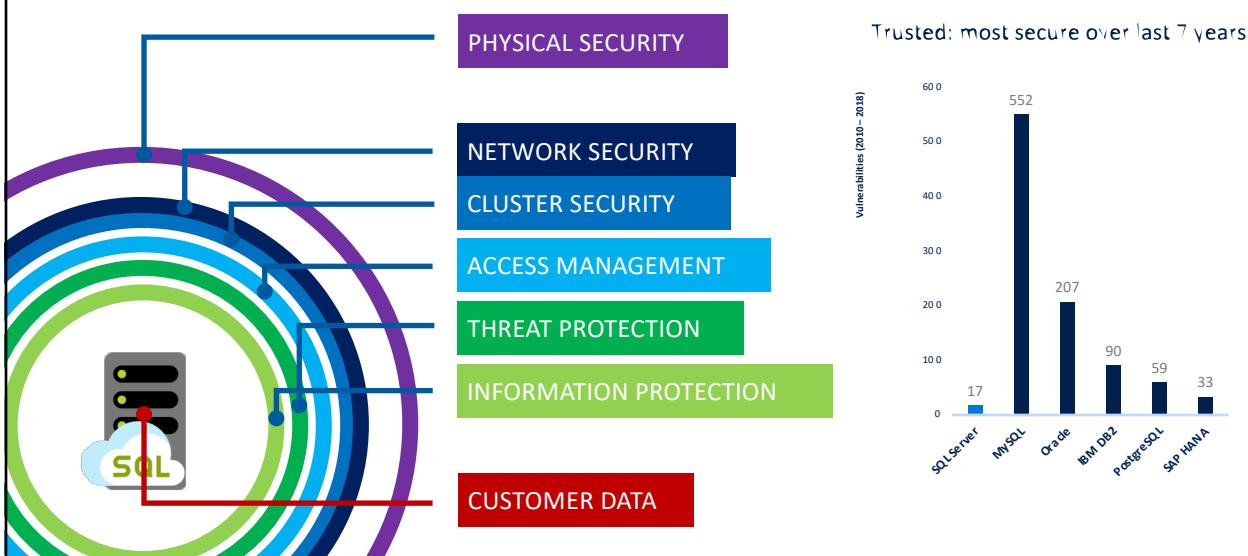
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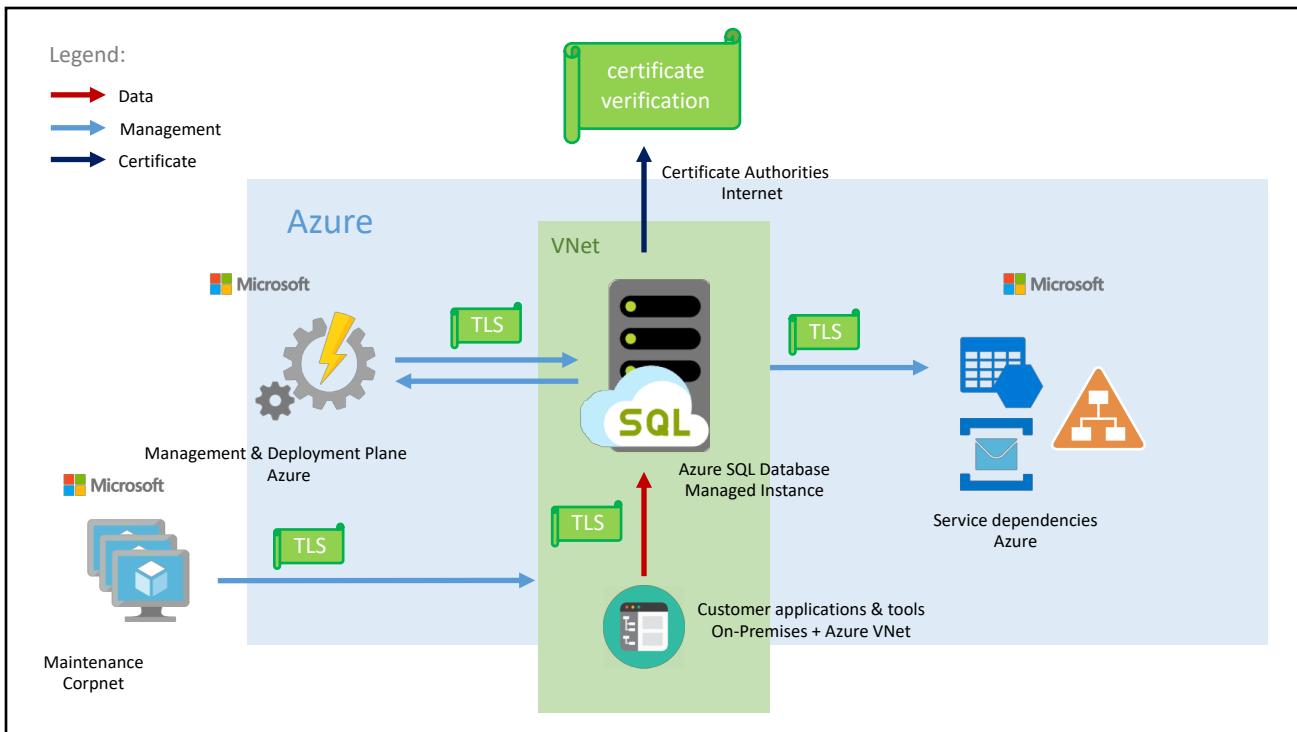
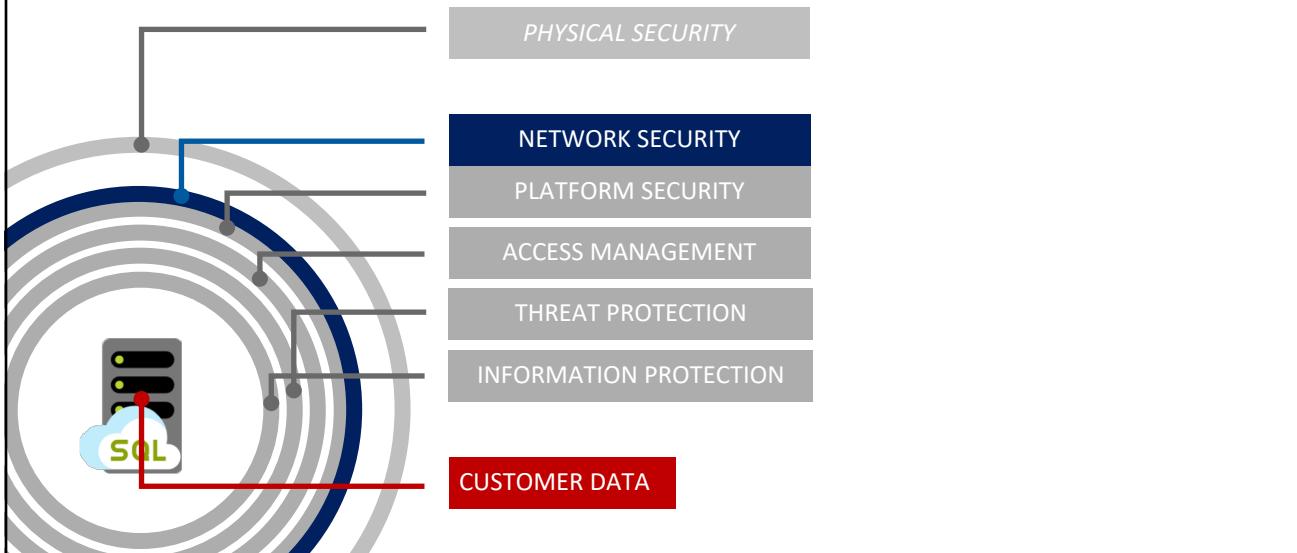
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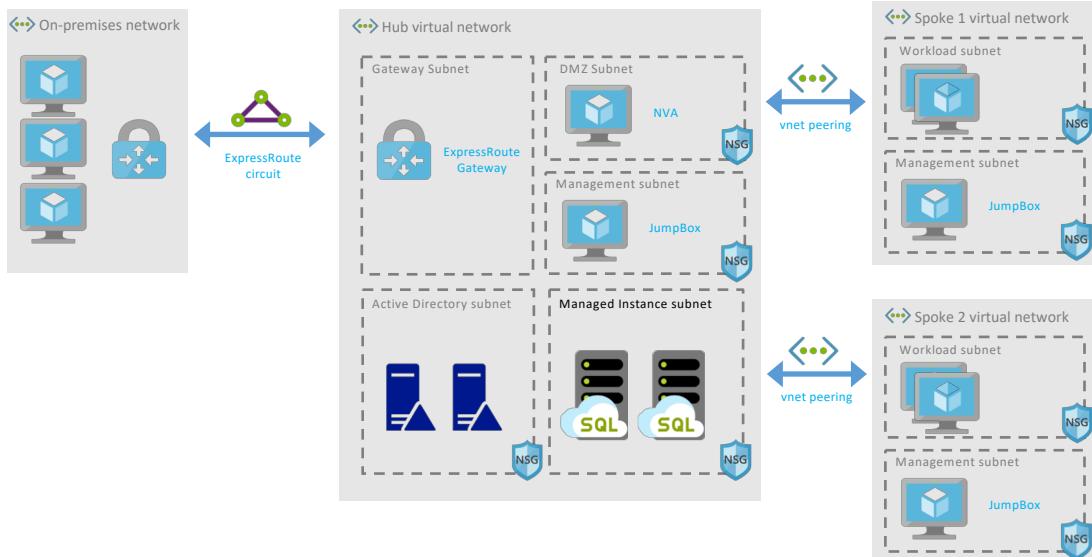
Enterprise-grade security that is easy to use



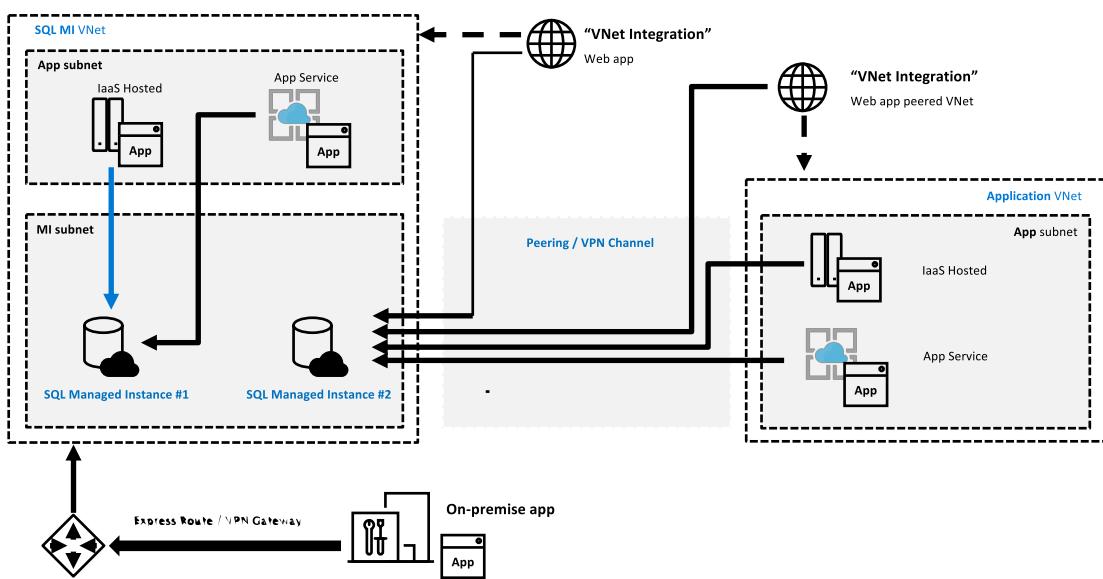
Securing the network



Hub & spoke architecture with MI



Host your application in the cloud or keep on-premises



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

Reference docs for latest info <https://docs.microsoft.com/en-us/azure/sql-database/sql-database-managed-instance-vnet-configuration#requirements>

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 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

Virtual network guidance

Create the required route table and associate it

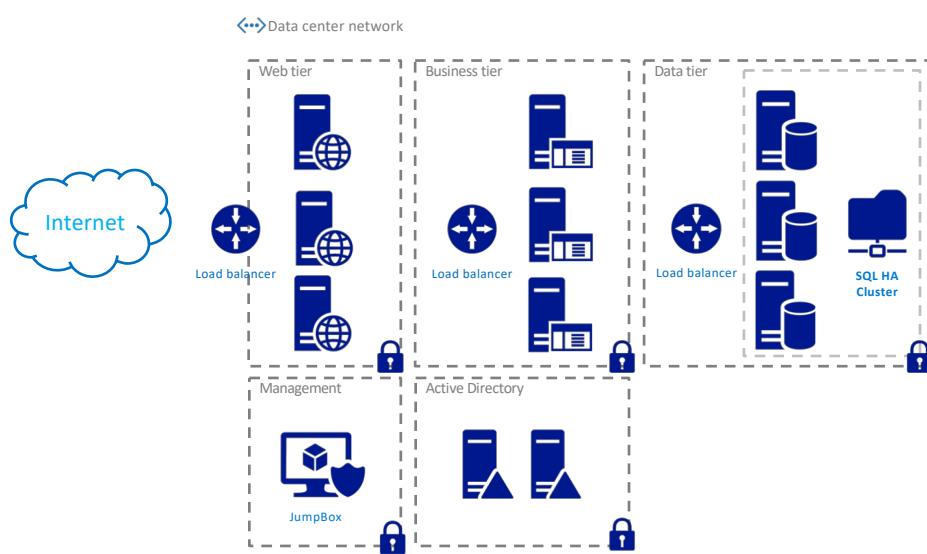
- Create new Route table
- 0.0.0.0/0 Next Hop Internet**
- Associate route table with the Managed Instance subnet

Name	Any valid name
Subscription	Your subscription
Resource Group	Select the resource group you created in the previous procedure
Location	Select the location you specified in the previous procedure
Disable BGP route propagation	Enabled

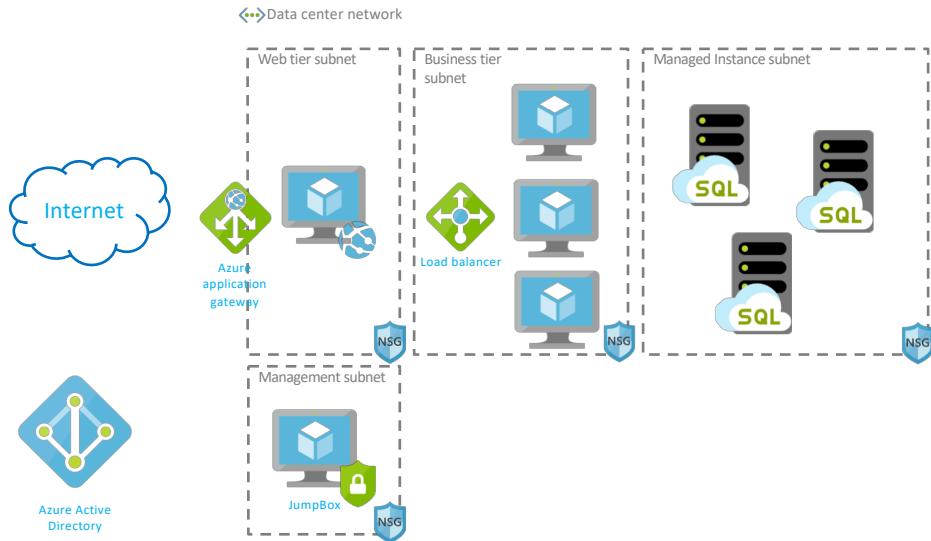
Demo

Preparing a subnet for deployment of Managed Instance

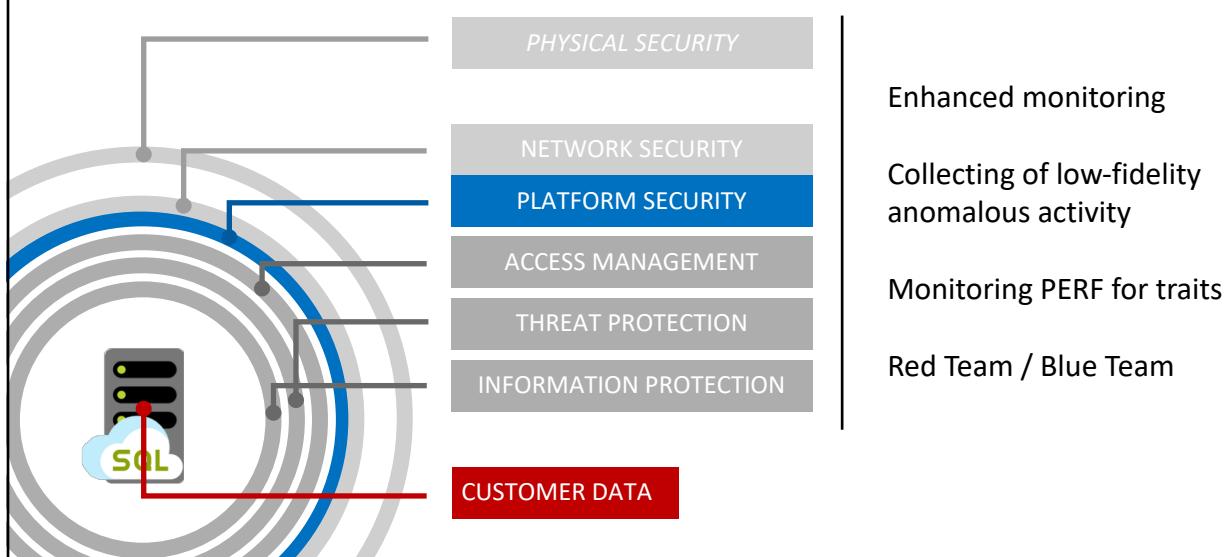
N-tier Architecture in Customer Data Center



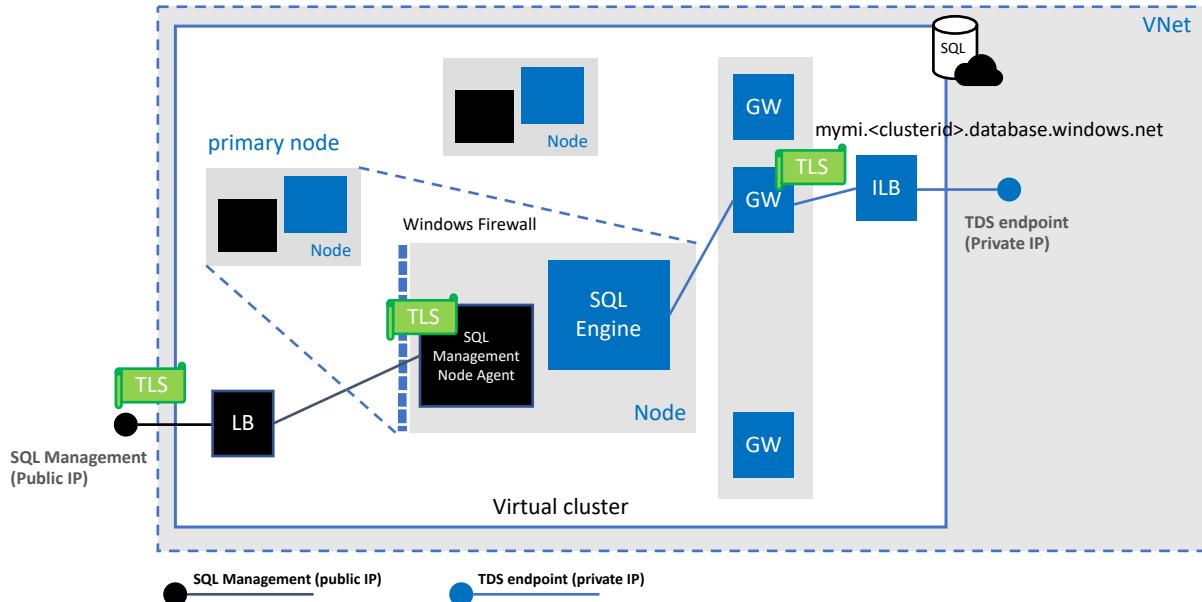
N-tier Architecture in Azure



Securing the platform



Virtual cluster



Platform/Service Security

We assume breach...

- Enhanced monitoring of our Azure Assets
- Collection of low-fidelity anomalous activity (automated hunting)
- Monitoring PERFD for traits of crypto currency mining
- ... and large set of other detections that we don't talk about publicly

Attack team, **SQL Red Team**, tries to get in, gain a foothold, escalate privileges, and maintain persistence

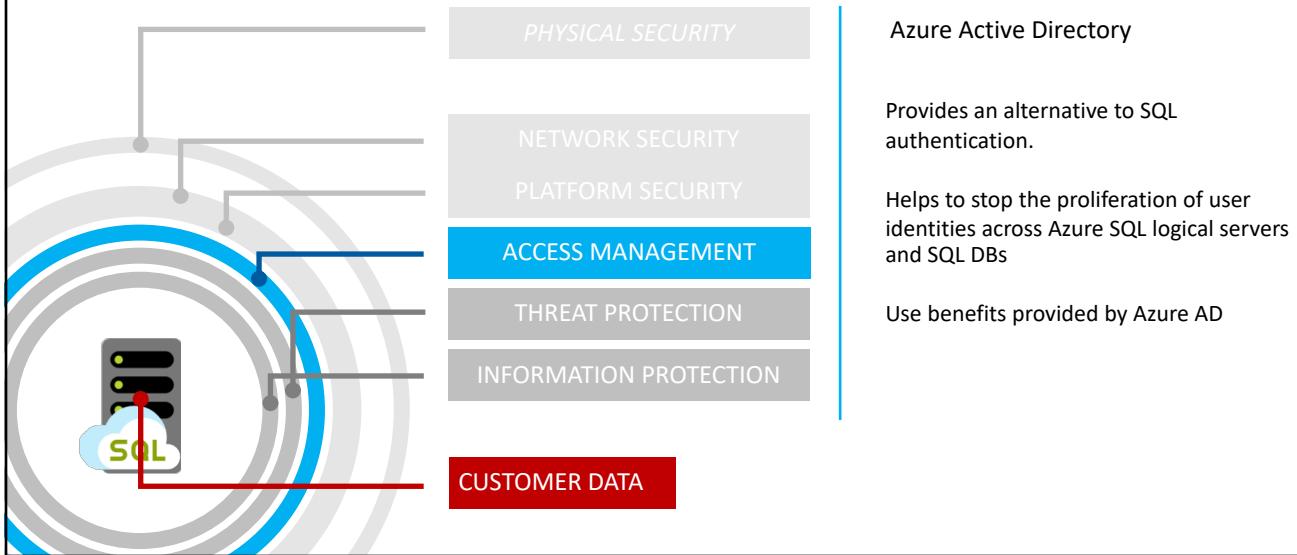
SQL Blue Team practices defense-in-depth

When we detect something, e.g., failed login attempts, we defend...

If it involves customer, we will notify

Many times this is the customer's own security and compliance scanners!

Configuring authentication



Azure Active Directory Authentication

Central ID Management

Simplified Permission Management

Can help you
Eliminate Storing
Passwords

With support for Multi-factor authentication

Universal /
Interactive
Authentication

Flexible Configuration

Supported in many
Tools and Drivers

Other Capabilities

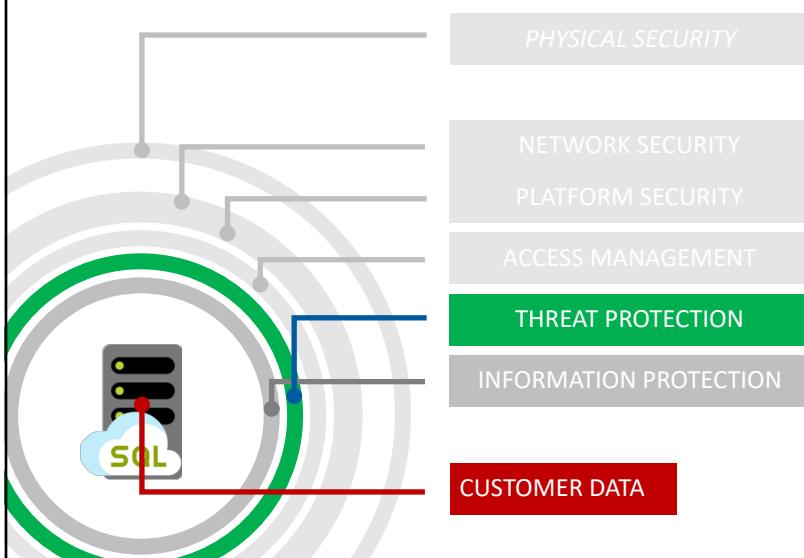
Row-level security

Data Discovery & Classification

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

Data Masking (dynamic, static in private preview)

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)

Threat Protection

SQL Auditing

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

Advanced Threat Protection

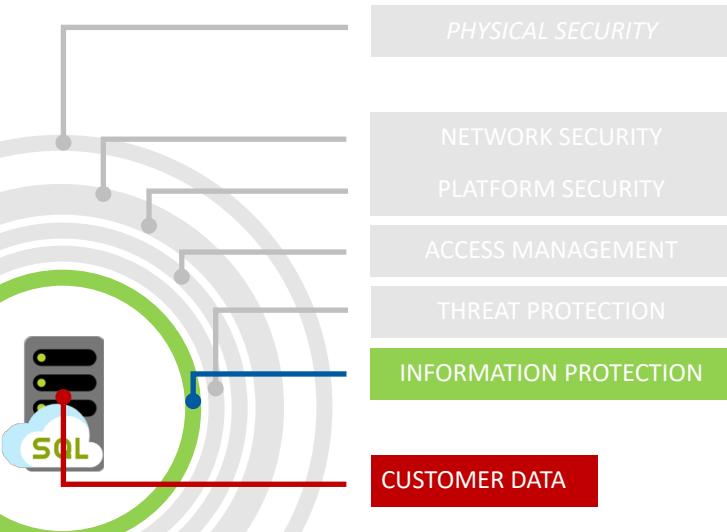
Vulnerability Assessment

Threat Monitoring (3 classes of threats)

Demo

Threat Detection

Protecting the data



Encryption-in-flight
(aka. Transport Layer Security TLS)

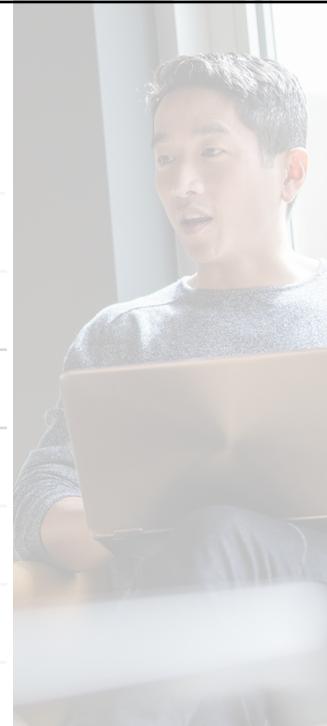
Encryption-at-rest
(aka. Transparent Data Encryption TDE) Service-
or User-managed keys Backup encryption

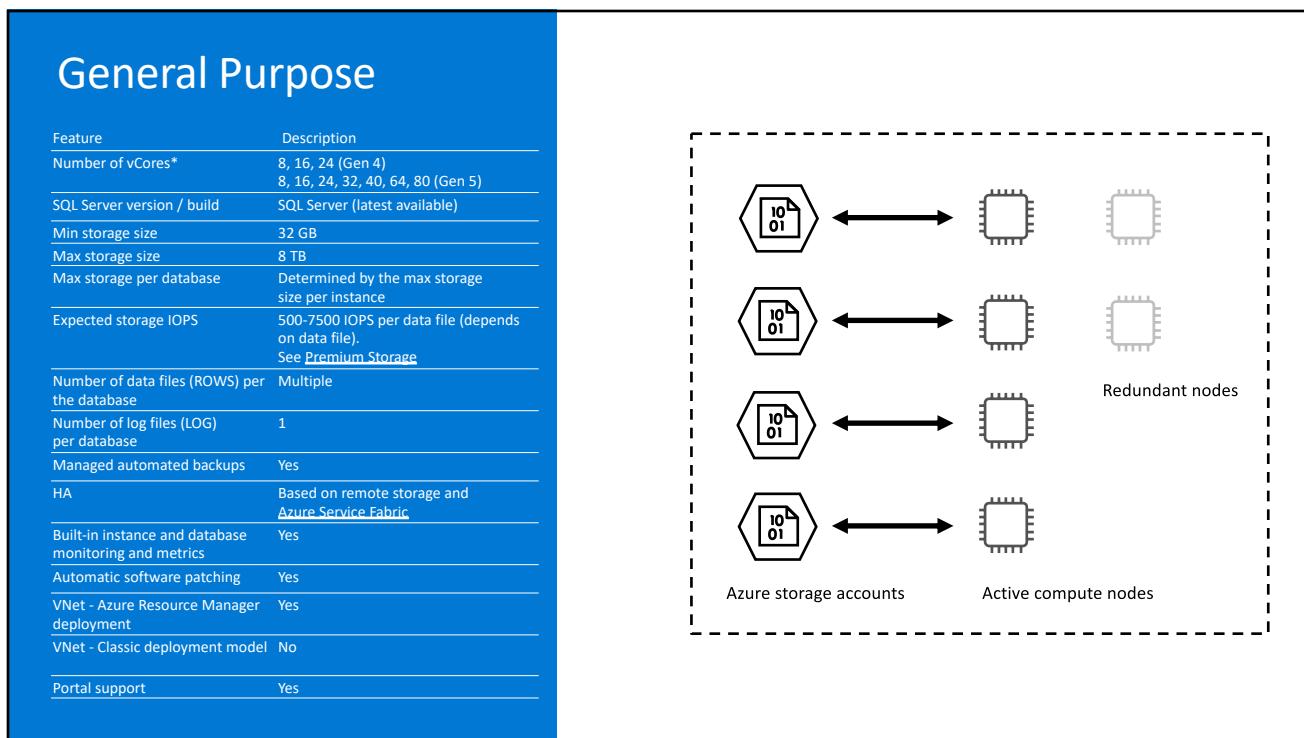
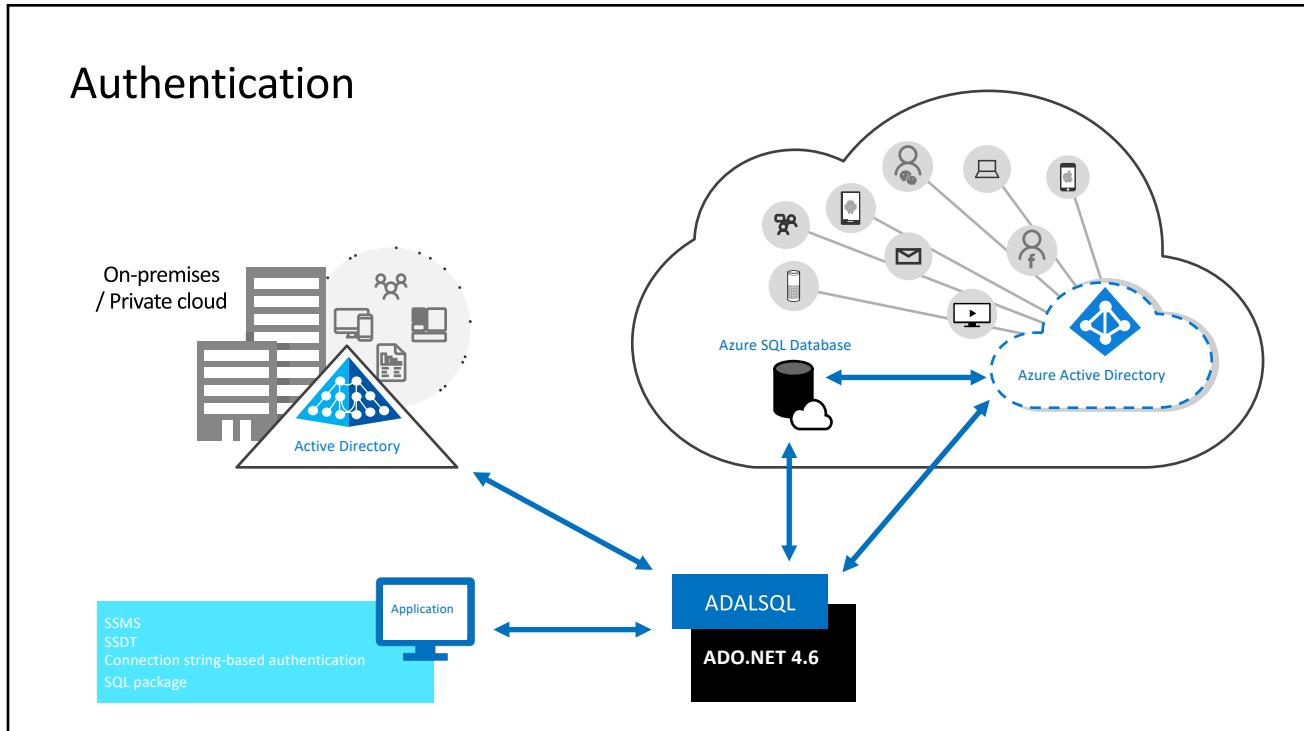
Encryption-in-use
(Always Encrypted)*

Key management with
Azure Key Vault

Agenda

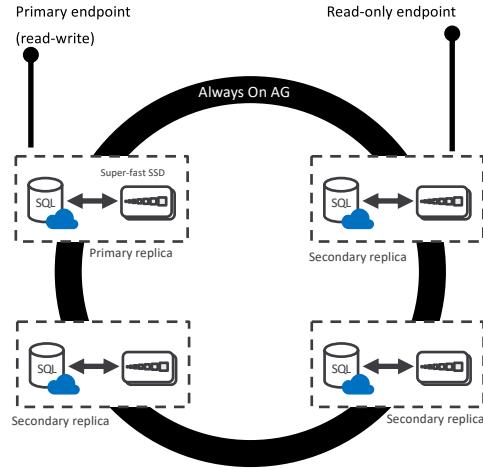
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Hyperscale	Hyperscale
Closing	Q&A, technical resources, etc.,





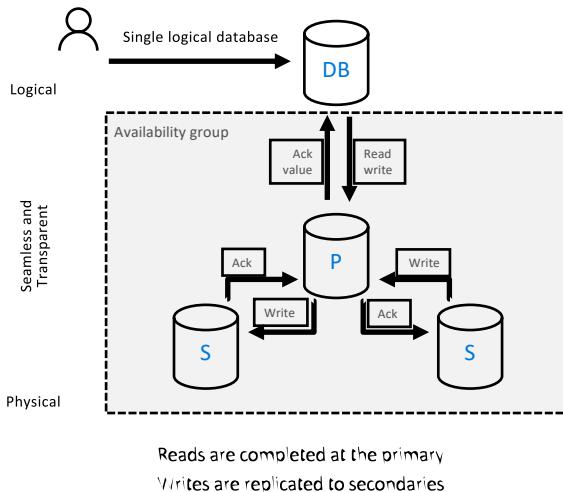
Business Critical

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 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

Built-in high availability



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)

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.

Contact Microsoft

Explore jointly on how to use Database Compatibility based certification.

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

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](#)

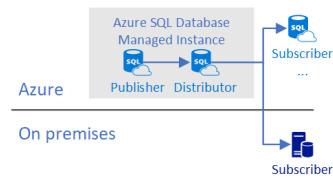
Some restrictions when used with a Managed Instance

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

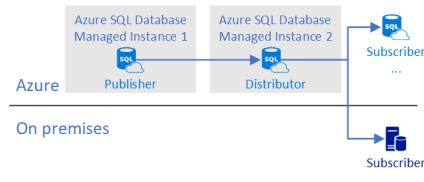
Additions to support Managed Instance

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

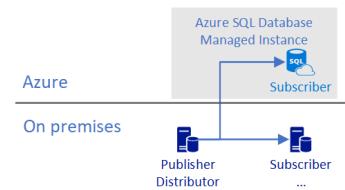
Publisher with Local Distributor on MI



Publisher with Remote Distributor on MI



Publisher and distributor on-premises with subscriber on managed instance



Database Compatibility Based Certification

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Easy to use tools to help you access migration

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Query Plan shape protection.

Overall process

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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.

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

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

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Hyperscale	Hyperscale
Closing	Q&A, technical resources, etc.,



Tools for your migration journey

Data Migration Assistant (DMA)

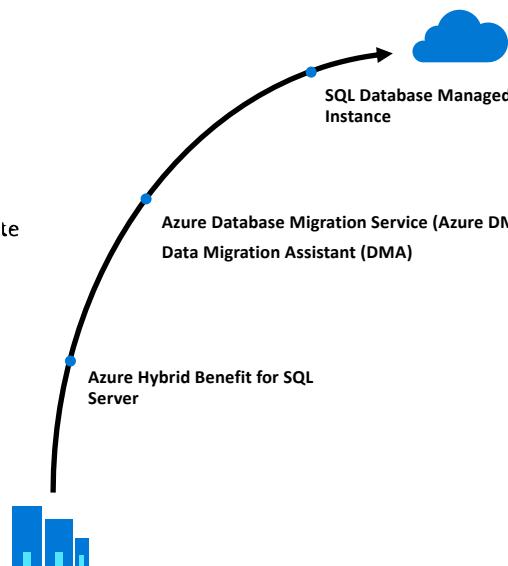
Enables upgrades to SQL Server and Azure SQL Database

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.



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 Azure migration center homepage. At the top, there's a banner for an upcoming webcast titled "Migrate to Azure with Confidence". Below the banner, there are three main navigation tabs: "Assess", "Migrate", and "Optimize". The "Assess" tab is currently selected. On the left, there's a "ON-PREMISES" section. In the center, there's a large call-to-action button with the text "Learn how migrating to Azure yields powerful results". At the bottom right, there's a "Chat with an expert" button.

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

Expedite migration with Azure Database Migration Service

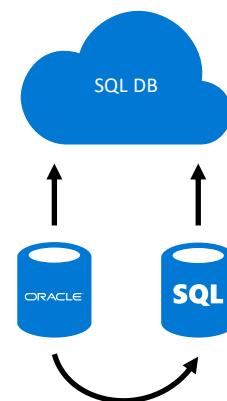
Fully managed Azure service platform for seamless and frictionless data migration at scale

Database migrations with minimal downtime

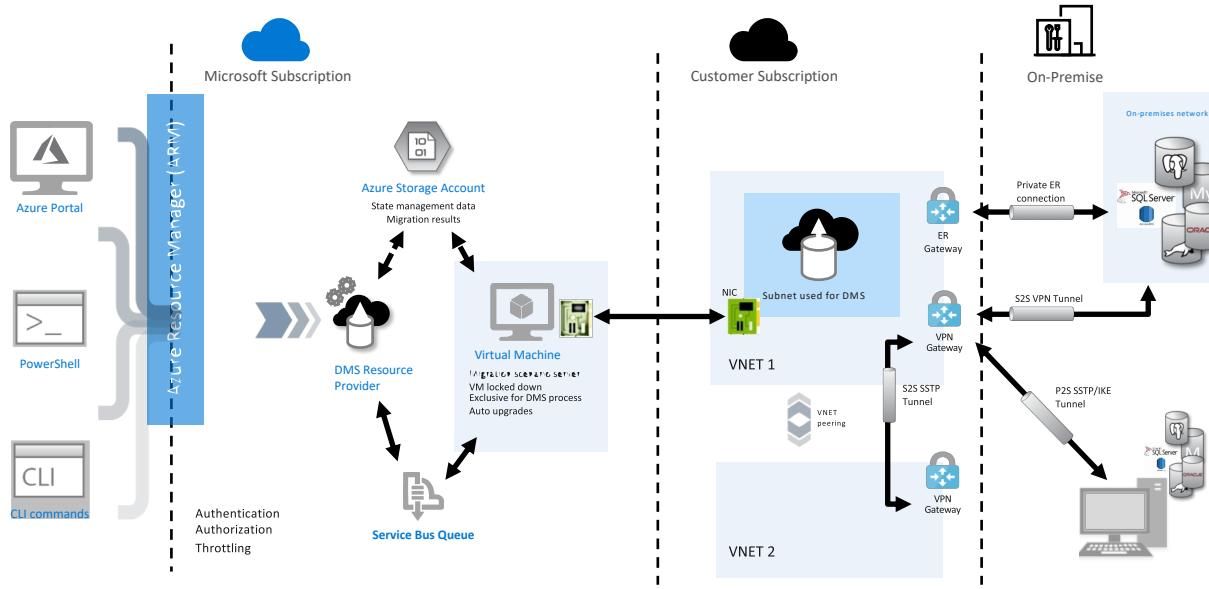
Migrate SQL Server & 3rd party databases to Azure SQL Database

Built for scale and reliability

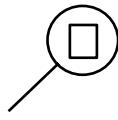
Azure Database Migration Service



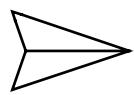
Azure Database Migration Service



Azure Database migration journey



Assess

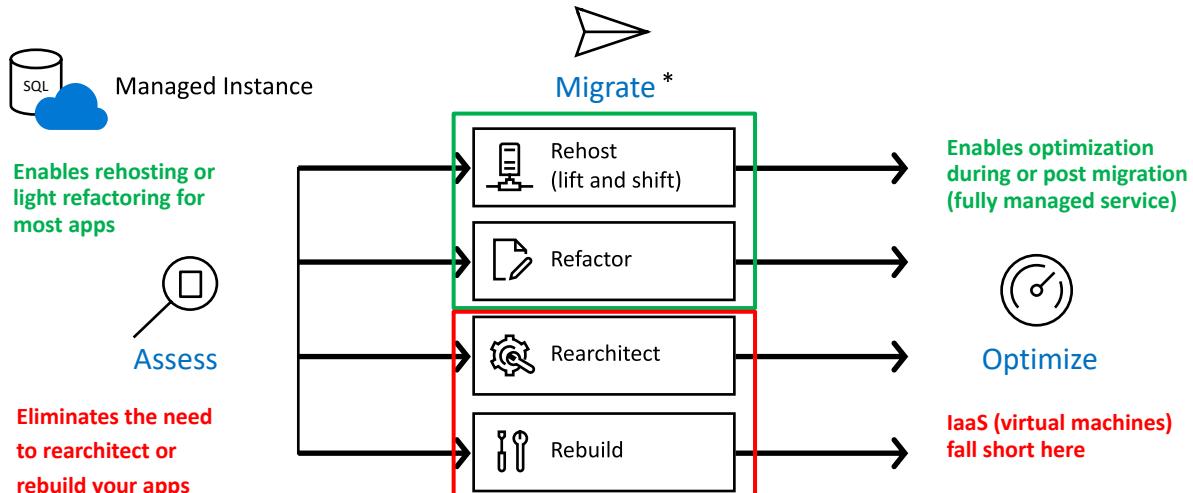


Migrate

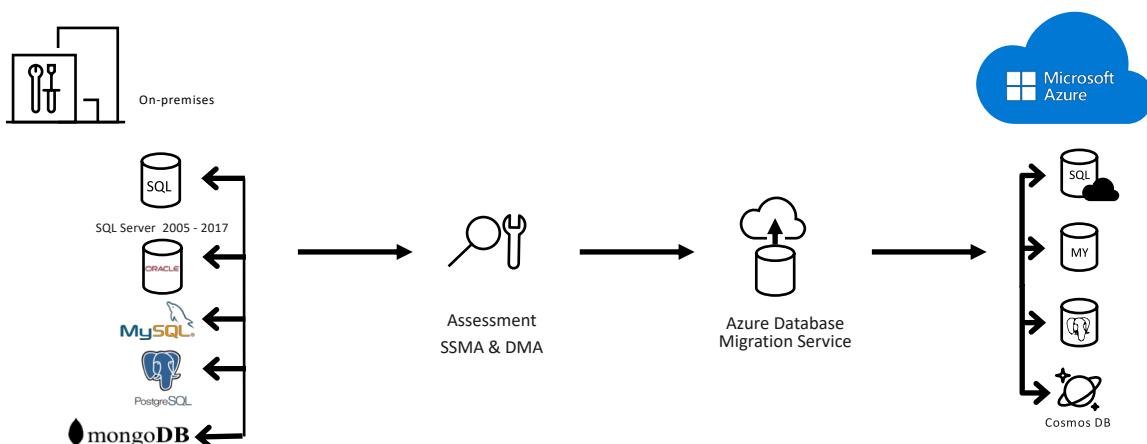


Optimize

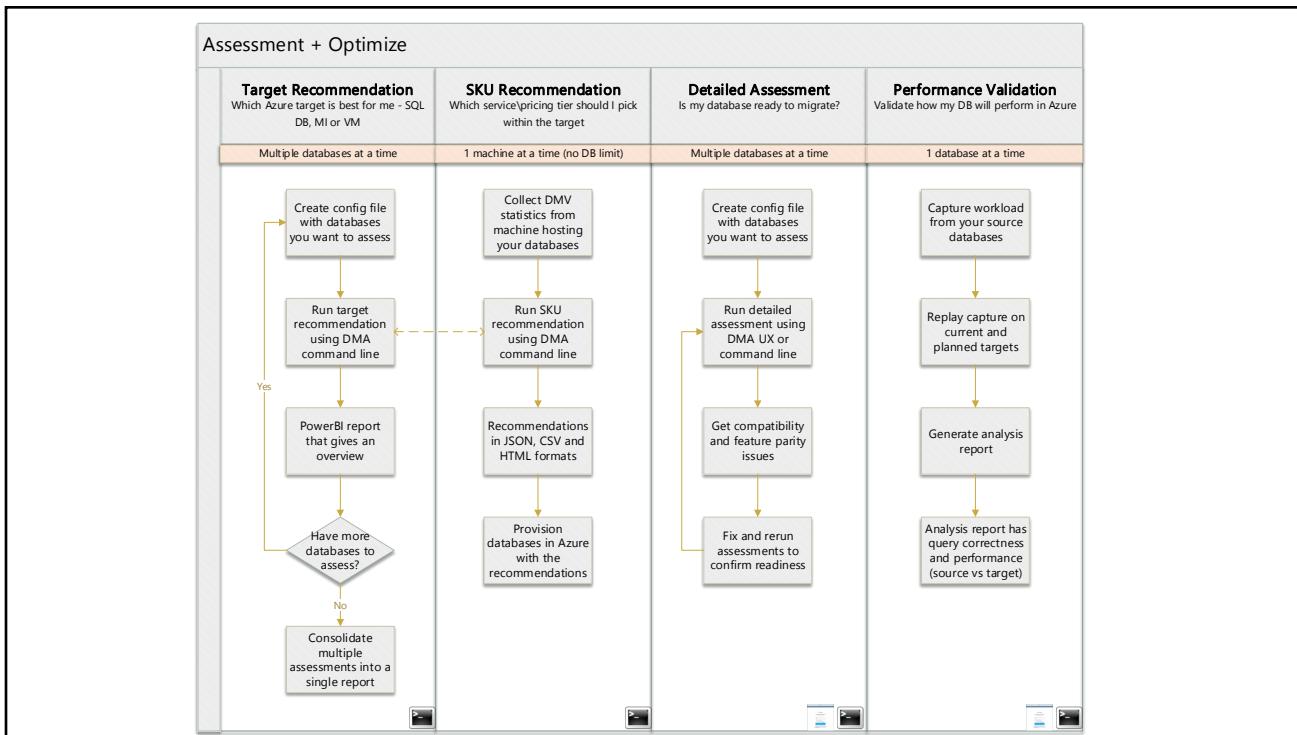
Azure Database migration journey



Migrating databases using Azure Database Migration Services



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



Target Recommendation

Create database config file

```

<?xml version="1.0" encoding="utf-8" ?>
<TargetRecommendationConfiguration>
<TargetRecommendationUri>http://microsoft.com/sqlserver/Advisors/TargetRecommendationConfiguration</TargetRecommendationUri>
<AssessmentName>MyAzureAssessmentName</AssessmentName>
<AssessmentDatabases>
    <AssessmentDatabase><connectionString>1</connectionString></AssessmentDatabase>
    <AssessmentDatabase><connectionString>2</connectionString></AssessmentDatabase>
    <AssessmentDatabase><connectionString>n</connectionString></AssessmentDatabase>
</AssessmentDatabases>
<AssessmentResultJsonPath>/json/output/file</AssessmentResultJson>
</TargetRecommendationConfiguration>
    
```

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 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
    
```

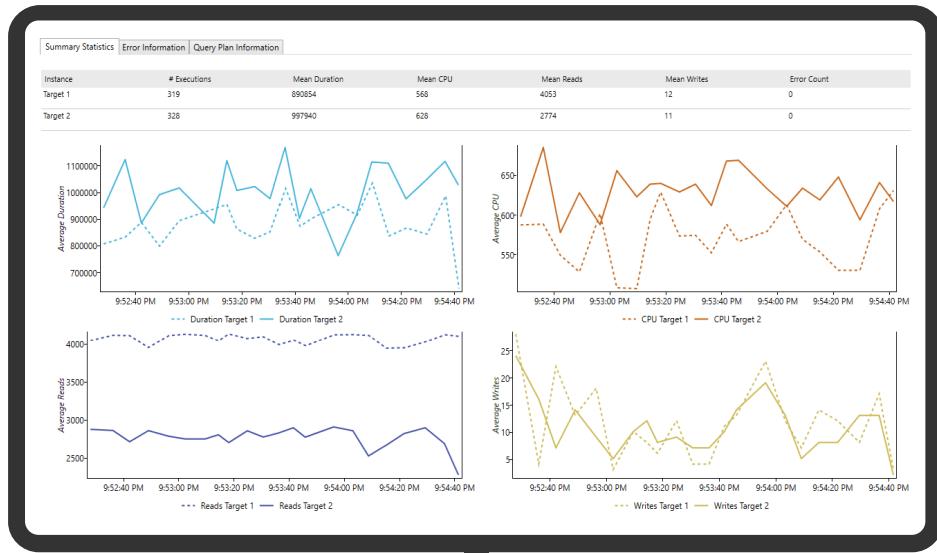
Run SKU recommendation using DMA CLI

```

Administrator: Command Prompt
C:\Program Files\Microsoft Data Migration Assistant> .\DmaCmd.exe /Action=SKURecommendation /SkuRecommendationInputDataFilePath="C:\TestOut\out.csv" /SkuRecommendationTsvOutputResultsFilePath="C:\TestOut\prices.tsv" /SkuRecommendationJsonOutputResultsFilePath="C:\TestOut\prices.json" /SkuRecommendationOutputResultsFilePath="C:\TestOut\prices.html" /SkuRecommendationPreventPriceRefresh=true
    
```

Power BI report

Database Experimentation Assistant

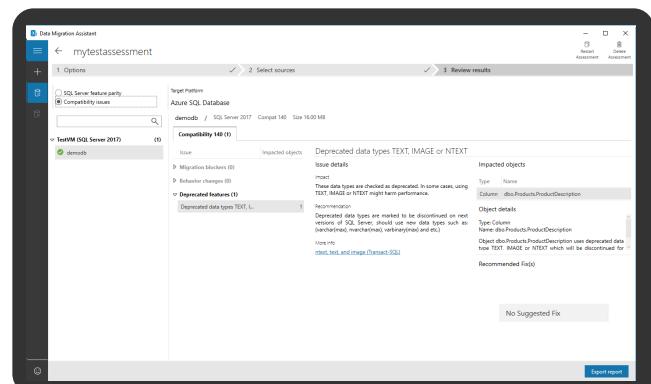


Data Migration Assistant

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

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.

Connecting to lab Azure SQL DB Managed Instance

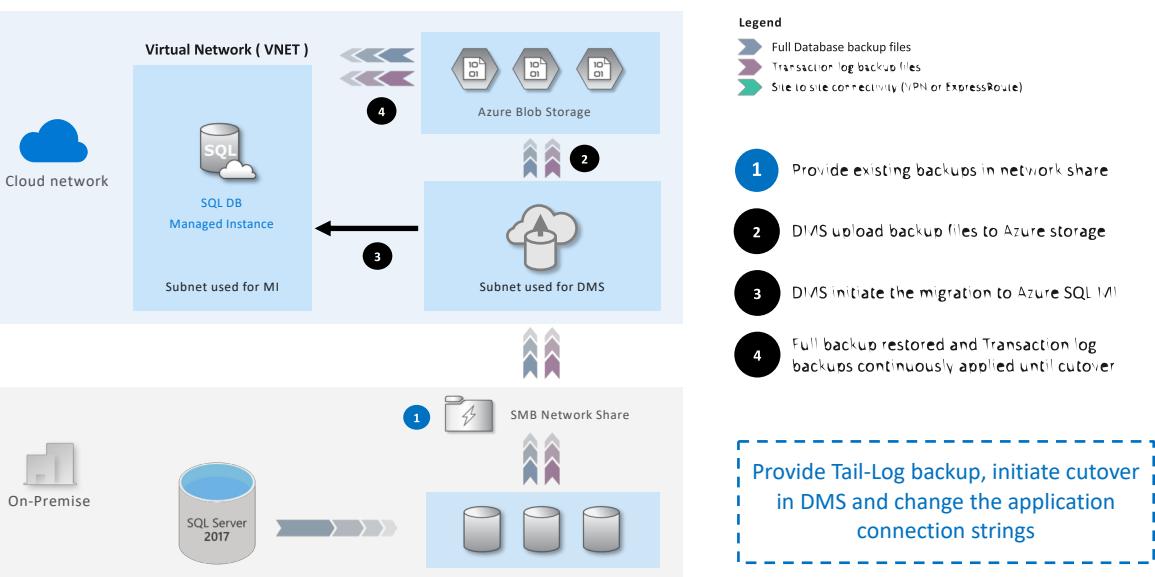
From Lab 2 – “Migration Using SQL Managed Instance”

RDP Username = labuser
RDP Password = *Lab password*

To connect to SQL MI use SSMS

SQL MI TEST = sqlmi-shared-01-test.568ebab56ce1.database.windows.net
SQL MI User = Labuser + resource group name ie (Labuserrg188393)
SQL MI password = Lab password (same as RDP password)

SQL -> SQL Database MI online migration workflow



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/>

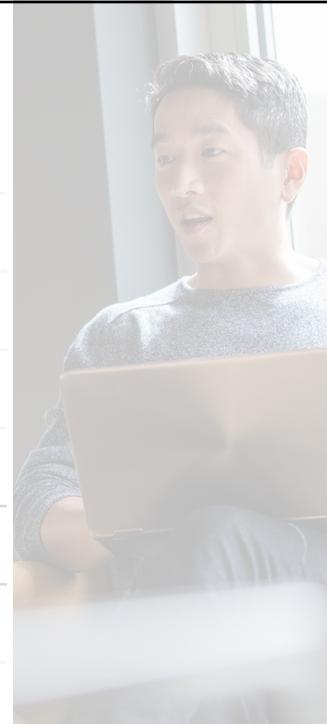
Database Experimentation Assistant: [Download](#)

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

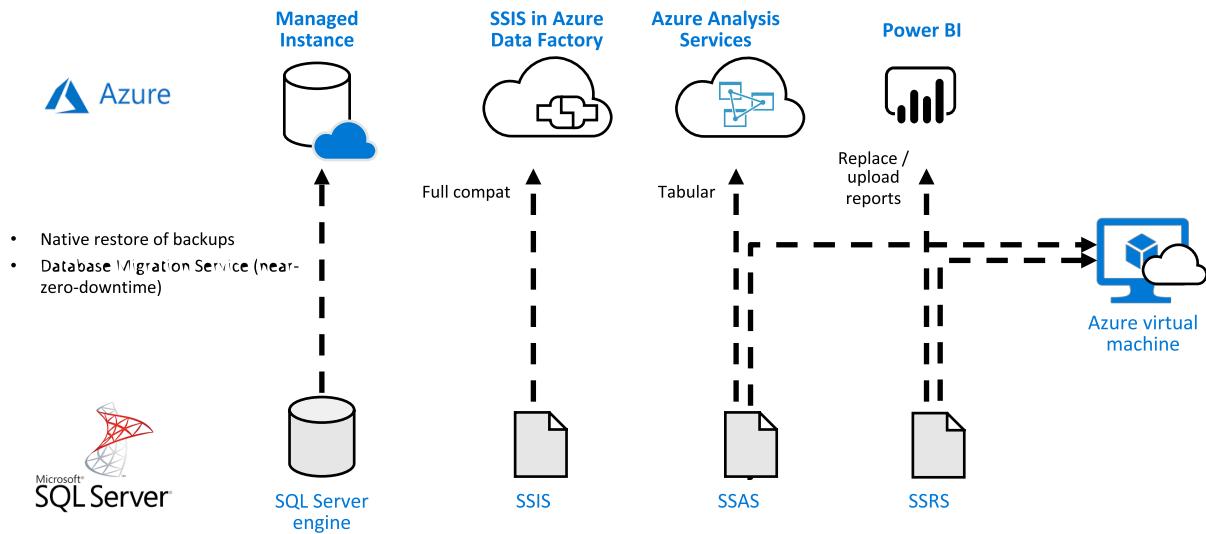
Data Migration Team Blog: blogs.msdn.microsoft.com/datamigration/

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Closing	Q&A, technical resources, etc.,



Migration to Azure



Business Intelligence Services

Not installed side-by-side with Managed Instance

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

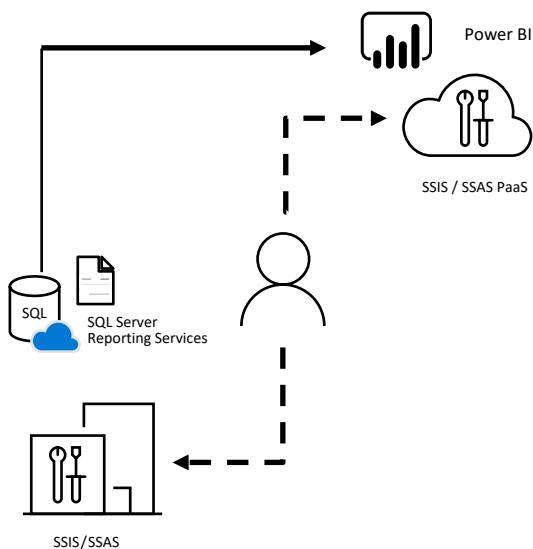
Migrate your OLAP models to Azure Analysis Services

... or run these services in Azure virtual machines

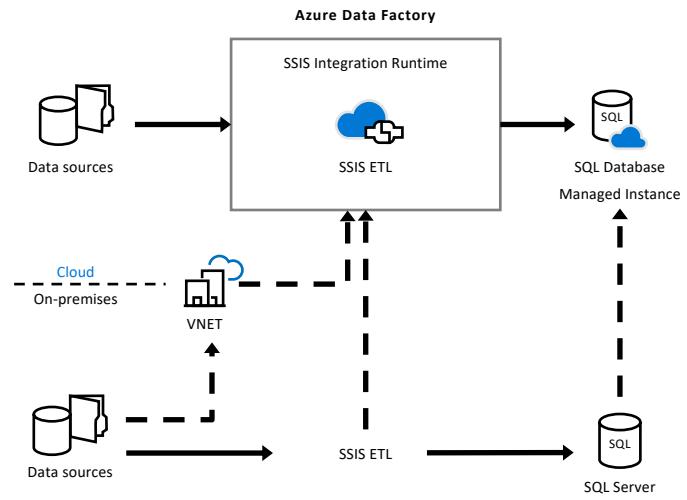
For SSRS: run in a virtual machine, or switch to Power BI

Recommendation:

Move BI solutions to PaaS model



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



Available Q2 CY 2018



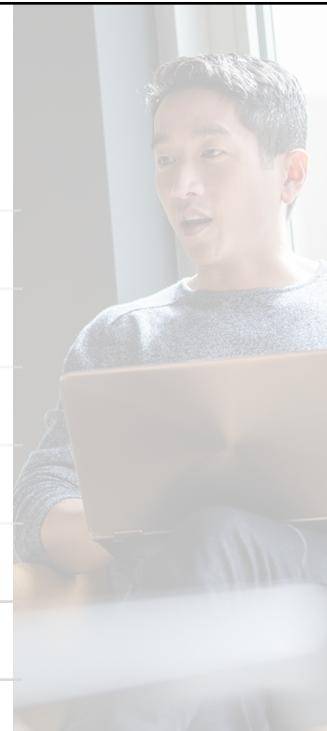
LAB

SQL Managed Instance data integration and business intelligence

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Closing	Q&A, technical resources, etc..



Inefficient data management and performance limitations

Productivity and performance challenges

- ⚠️ Very large databases face slow queries and downtime
- ⚠️ Dedicated resources needed for database administration
- ⚠️ Inability to effectively scale for multitenancy

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

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

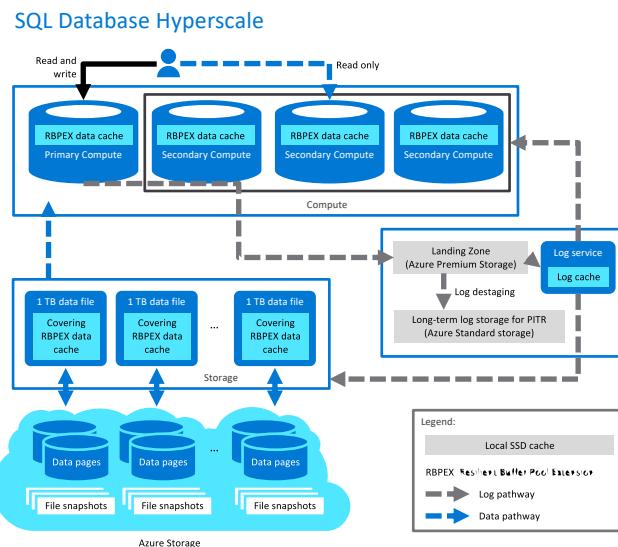
A new, highly scalable service tier that adapts on-demand to your workload's needs, auto-scaling up to 100TB per database.

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.

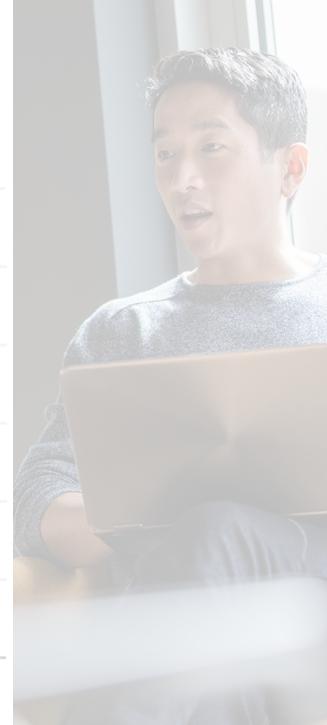
Compute and storage resources scale rapidly and independently without sacrificing performance.



The screenshot shows the Microsoft Azure portal interface for the "HyperscaleDemo2" database. The left sidebar includes links for Overview, Activity log, Tags, Diagnose and solve problems, Quick start, Query editor, Configure, Connection strings, Properties, Locks, Automation script, Monitoring, Alerts (Classic), Metrics, Diagnostic settings, Support + troubleshooting, Resource health, and New support request. The main content area displays the database configuration, including the server name (ready10demo.database.windows.net), location (West US 2), and various connection strings and metrics. A large digital clock on the right shows "00:00:00.00". The bottom section features a "Database data storage" pie chart (Used space: 50.21 TB, Allocated space: 54 TB, 93% used), a "Resource utilization (HyperscaleDemo2)" chart, and several "COMING SOON" cards for features like Transparent data encryption, Advanced Threat Protection, Automatic tuning, Auditing, Geo-Replication, Dynamic Data Masking, and others.

Agenda

Intro to Azure SQL Database	Value prop, Platform benefits, TCO
Managed Instance overview	Managed Instance architecture, Features and management
Security & Networking	Security overview, Networking considerations, Hands-on-Lab
MI Features and capabilities	Key capabilities, limitations, backup & restore
Migration	Migration overview and options, Hands-on-Lab
MI & BI	Business Intelligence services + Managed Instance, Hands-on-Lab
Hyperscale	Hyperscale
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
<u>Managed Instance ARM template reference</u>	SQL MI management through ARM templates & PowerShell (official docs and blogs)
<u>Create SQL MI using ARM templates</u>	
<u>Change size of SQL MI using PowerShell</u>	
<u>Cross-instance point-in-time restore in Azure SQL Database Managed Instance</u>	How to restore database to another instance
<u>CAT Blog: CPU and Memory Allocation on Azure SQL Database Managed Instance</u>	Explains how to interpret various information exposed in SSMS and DMVs regarding resource allocation in SQL MI
<u>CAT Blog: Storage best practices in General Purpose</u>	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
<u>CAT Blog: Consume SQL MI Error Log</u>	How to filter out unnecessary info from SQL error log and focus on what's important to your app using <code>sp_readmierrorlog</code>
<u>CAT Blog: Real time performance monitoring for Azure SQL DB Managed Instance</u>	Configuring and using <u>Telegraf</u> for real-time perf. monitoring in SQL Managed Instance
<u>BLOG: How to send emails in SQL MI using DbMail</u>	
<u>SCOM Management Pack for SQL MI</u>	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](#)

Documentation for Azure SQL Database Managed Instance

<https://aka.ms/sqlmidocs>



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