



# Introduction to Azure SQL Database

Module 1



## Learning Units covered in this Module

- Lesson 1: Basic concepts of Azure SQL Database
- Lesson 2: How to create Azure SQL Database
- Lesson 3: Introduction to Managed Instances
- Lesson 4: Introduction to Elastic Database Pools in Azure SQL Database

# Lesson 1: Basic concepts of Azure SQL Database

# Objectives

After completing this learning, you will be able to:

- Describe the basic concept and architecture
- Describe the difference between the purchase models.
- Describe the service tiers compute and hardware generation of the Azure SQL Database.



# What is Microsoft Azure?

Microsoft Azure is Microsoft's public cloud computing platform

Over 140 countries across 60 regions worldwide

Windows and Linux

Scale globally

- Reach more locations, faster, with the performance and reliability of a vast global infrastructure.

Safeguard data

- Rely on industry-leading data security in the region and across our network.

Promote sustainability

- Help build a clean-energy future and accelerate progress toward your sustainability goals.

# What is Microsoft Azure?

<https://azure.microsoft.com/en-us/global-infrastructure/regions/>



# Cloud Hosting Models

Managed by customer

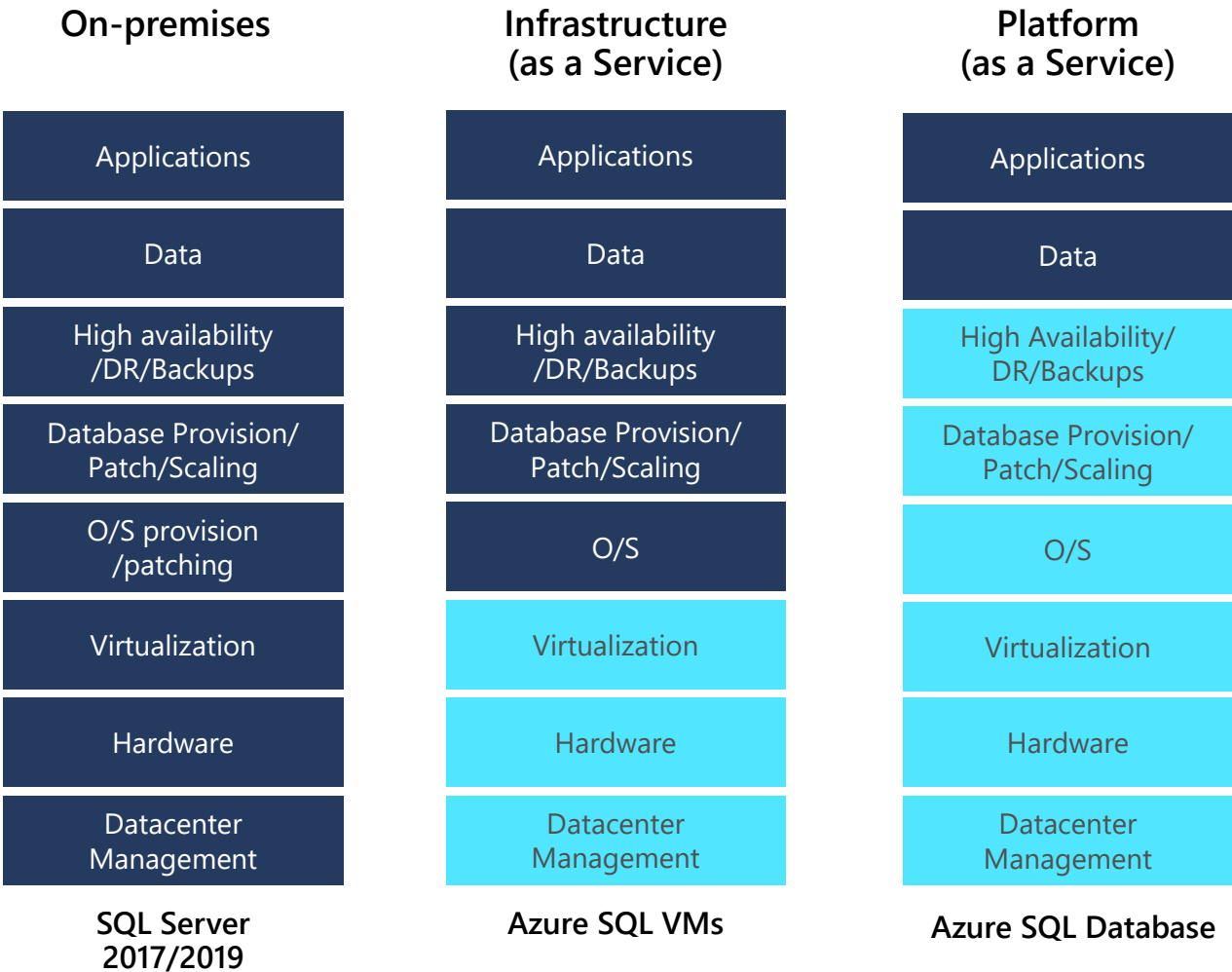
Managed by Microsoft

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

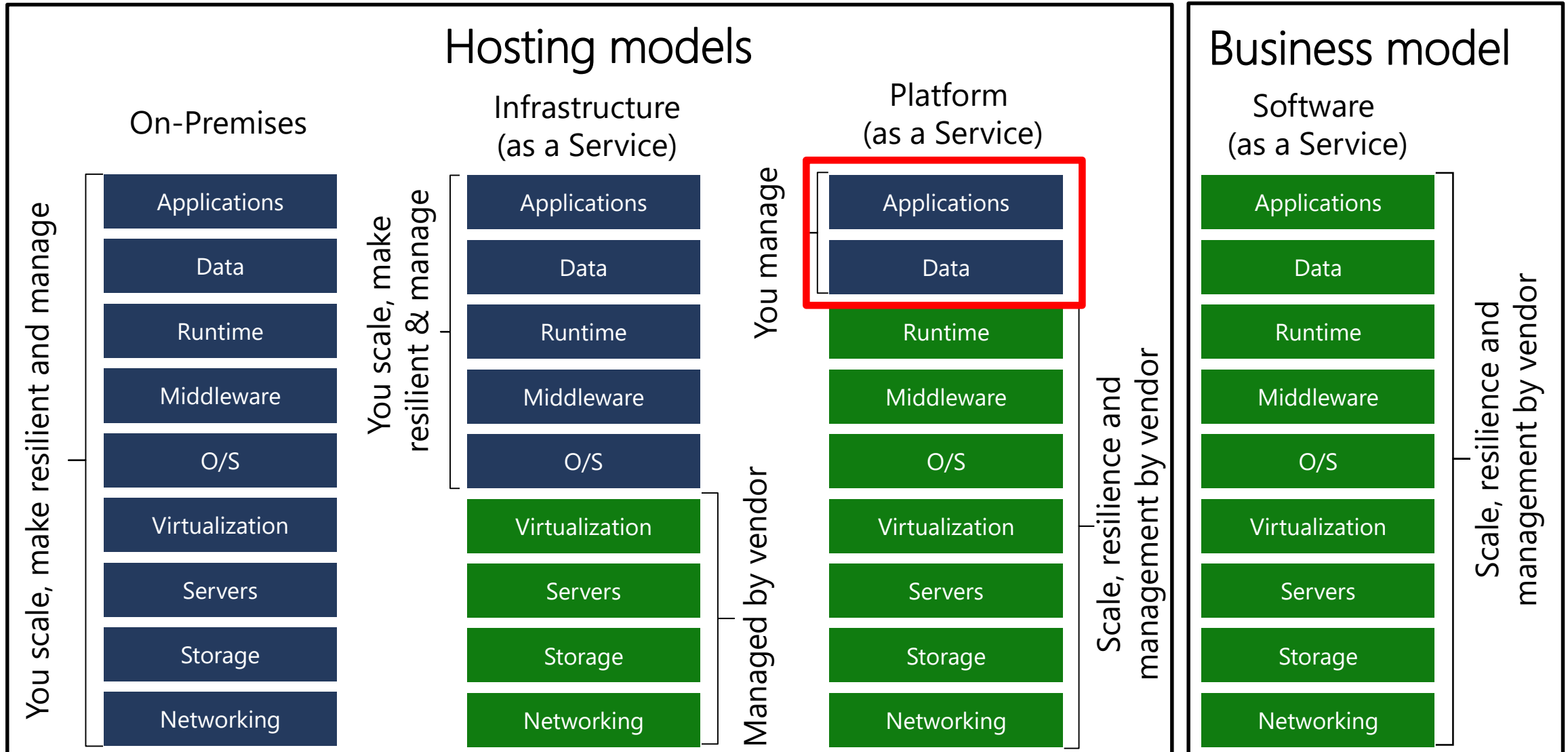
**Infrastructure-as-a-Service** reduces cost categories related to data center and compute

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

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

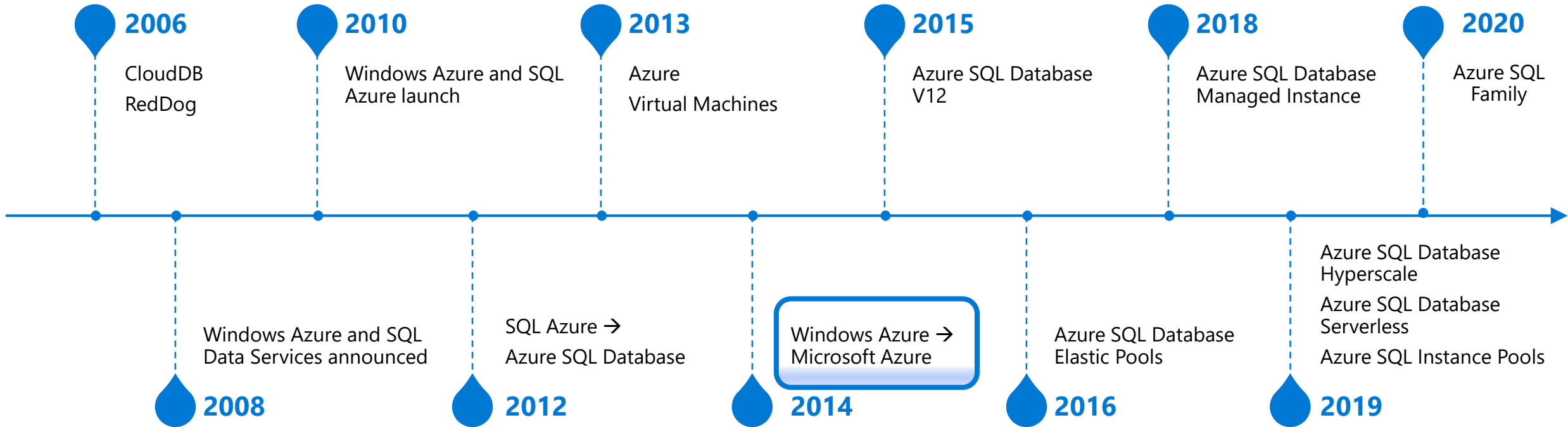


# Database as a Service





# Azure SQL has come a long way



# Azure SQL Family

## Explore Azure SQL database services



### SQL Server on Azure Virtual Machines

Migrate your SQL workloads to Azure with ease while maintaining complete SQL Server compatibility and operating system-level access

[Learn more >](#)



### Azure SQL Managed Instance

Modernize your existing SQL Server applications at scale with an intelligent, fully managed service

[Learn more >](#)



### Azure SQL Database

Support modern cloud applications on an intelligent, fully managed service that includes serverless compute

[Learn more >](#)

# What are my options?



## I want a Virtual Machine

Azure manages the hardware

You own the OS and SQL Server

You own monitoring and HADR



SQL Server in  
Azure Virtual Machine



## I want a SQL Server

Azure manages the hardware and OS

You get a SQL Server, but we help  
you manage it

You need SQL Server feature  
compatibility and low friction move



Managed Instance  
Single Instance Pool

## I want a database

Azure manages the hardware, OS,  
and SQL Server

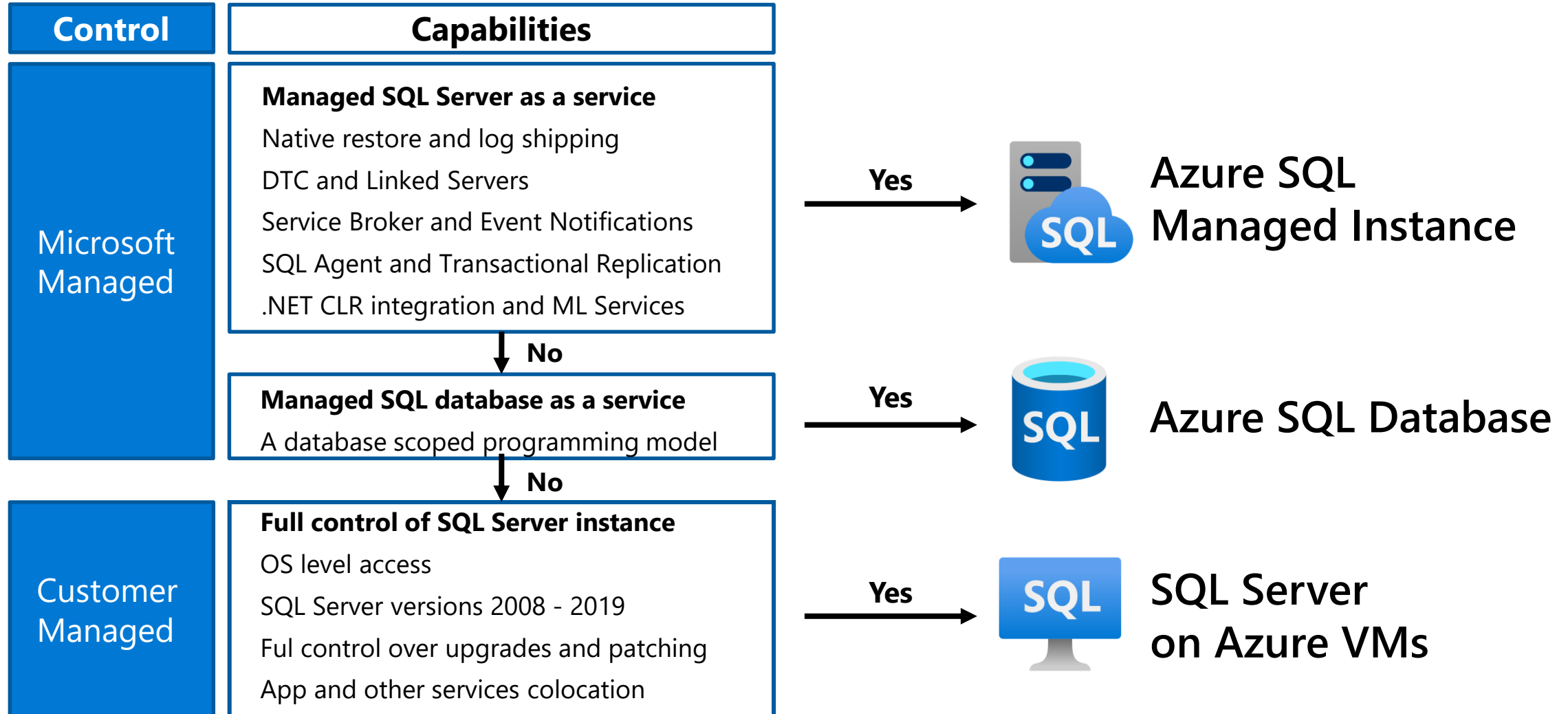
Azure gives you predictable  
performance

Azure provides HADR, monitoring,  
and intelligence



Azure SQL Database  
Single Elastic Pool

# Which Azure SQL offering is right for you?



# Azure SQL PaaS deployment options



## Azure SQL Database

### Managed instances

Best for most lift-and-shift migrations to the cloud



#### Single instance

- SQL Server surface area (vast majority).
- Native virtual network support.
- Fully managed service.

#### Instance pool\*

- Resource sharing between multiple instances to price optimize.
- Simplified performance management for multiple databases.
- Fully managed service.

\*Instance pool is currently in public preview, more details [here](#)

### Databases

Best for modern cloud applications. Hyperscale and serverless options are available



#### Single database

- Hyperscale storage (up to 100TB).
- Serverless compute.
- Fully managed service.

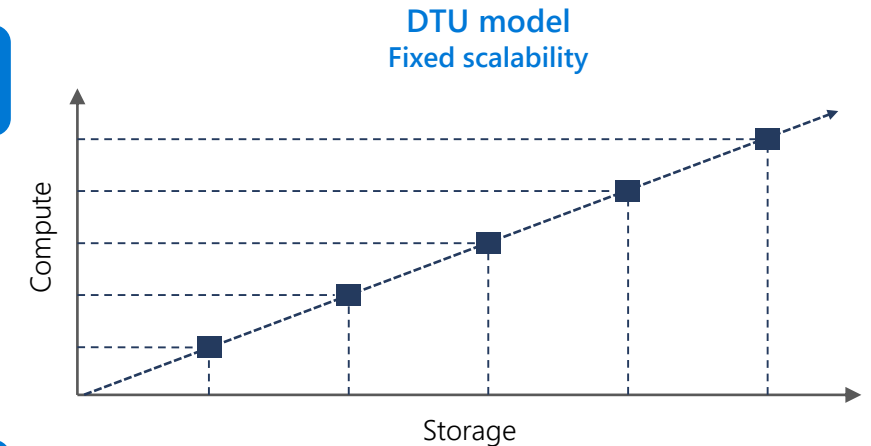
#### Elastic pool

- Resource sharing between multiple databases to price optimize.
- Simplified performance management for multiple databases.
- Fully managed service.

# Azure SQL Database Purchasing models and resources

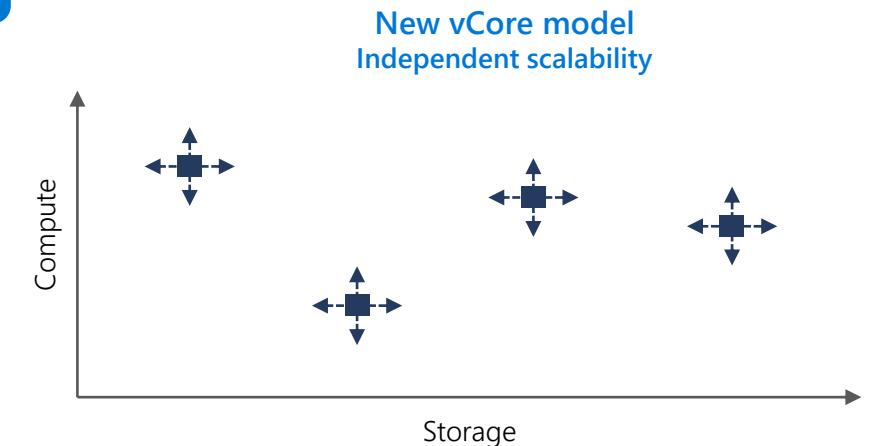
## Database Transaction Unit (DTU) model

- Pre-packaged, bundled unit that represents the database power.
- Designed for **predictable performance**, but somewhat inflexible and limited in options.
- DTU sizing offers simplicity of choice.
- Blended measure of CPU, memory, and read-write rates.



## vCore model

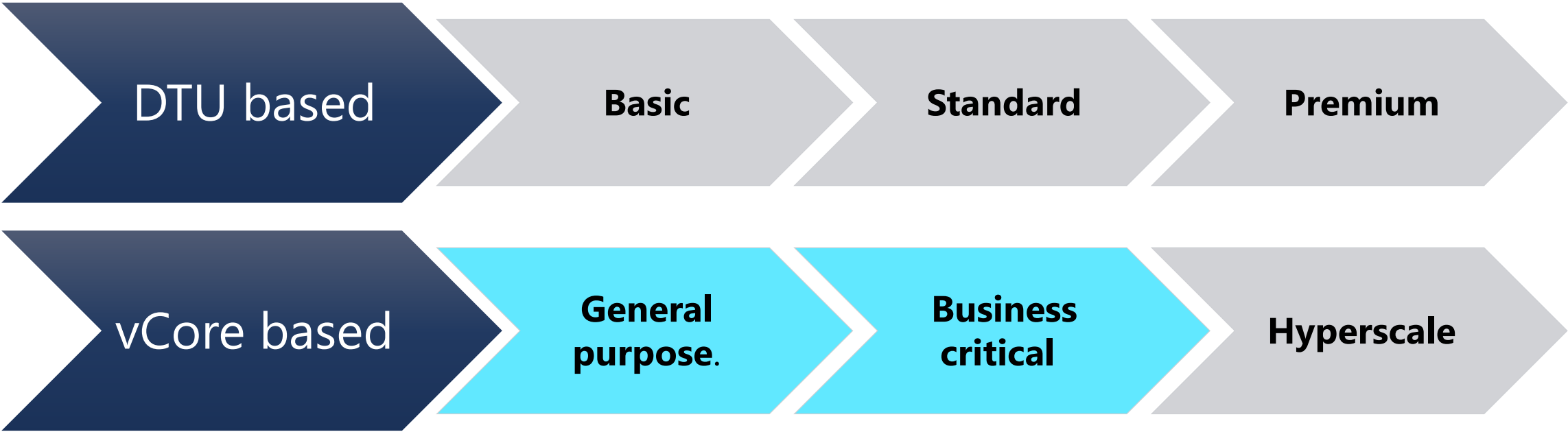
- À La carte approach deconstructs the DTU model into separate parts.
- Customers can select compute and storage independently.
- Allows customers to right-size their compute requirements in the cloud.
- vCore sizing offers flexibility of choice.
- Provides a choice between a **provisioned compute tier** and a **serverless compute tier**.



## Purchasing models available for Azure SQL Database deployment:

Purchasing model/ Deployment model	DTU based	vCore based
Single Database	✓	✓
Elastic Pool	✓	✓
Managed Instance	✗	✓
Hyperscale service tier (single databases)	✗	✓

# Overview Service Tiers



Standard 100DTUs = 1vCore  
Premium 125DTUs = 1vCore



# Changing Performance Levels (DTU)

## PowerShell

- Set-AzSqlDatabase

## REST

- Update database

## Azure CLI

- az sql db update

## T-SQL

- ALTER DATABASE ... MODIFY  
(EDITION = ...)

**Service and compute tier**

Select from the available tiers based on the needs of your workload. The vCore model provides a wide range of configuration controls and offers Hyperscale and Serverless to automatically scale your database based on your workload needs. Alternately, the DTU model provides set price/performance packages to choose from for easy configuration. [Learn more](#)

Service tier

DTUs [Compare DTU options](#)

**5 (Basic)**

Data max size (GB)

---

**DTU-based purchasing model**

- Basic (For less demanding workloads)
- Standard (For workloads with typical performance requirements)
- Premium (For IO-intensive workloads)

# Changing Performance Levels (vCore)

## PowerShell

- Set-AzSqlDatabase

## REST

- Update database

## Azure CLI

- az sql db update

## T-SQL

- ALTER DATABASE ... MODIFY (EDITION = ...)

### Service and compute tier

Select from the available tiers based on the needs of your workload. The vCore model provides a wide range of configuration controls and offers Hyperscale and Serverless to automatically scale your database based on your workload needs. Alternately, the DTU model provides set price/performance packages to choose from for easy configuration. [Learn more](#)

Service tier

General Purpose (Scalable compute and storage options) ▼

Compute tier

vCore-based purchasing model

General Purpose (Scalable compute and storage options)

Hyperscale (On-demand scalable storage)

Business Critical (High transaction rate and high resiliency)

DTU-based purchasing model

Basic (For less demanding workloads)

Standard (For workloads with typical performance requirements)

Premium (For IO-intensive workloads)

up to 80 vCores, up to 408 GB memory

[Change configuration](#)

Compute Hardware

Select the hardware configuration based on confidential computing hardware depends on

Hardware Configuration

### Save money

Already have a SQL Server License? Save with a license you already own with Azure Hybrid Benefit. Actual savings may vary based on region and performance tier. [Learn more](#)

☐ Yes ☒ No

vCores [Compare vCore options](#)



2

Data max size (GB) ⓘ



32

# Changing Compute Tier and Hardware (vCore)

## Service and compute tier

Select from the available tiers based on the needs of your workload. The vCore model provides a wide range of configuration controls and offers Hyperscale and Serverless to automatically scale your database based on your workload needs. Alternately, the DTU model provides set price/performance packages to choose from for easy configuration. [Learn more](#)

Service tier

General Purpose (Scalable compute and storage options) ▼

[Compare service tiers](#) ↗

Compute tier

- ☒ **Provisioned** - Compute resources are pre-allocated. Billed per hour based on vCores configured.
- ☐ **Serverless** - Compute resources are auto-scaled. Billed per second based on vCores used.

## Compute Hardware

Select the hardware configuration based on your workload requirements. Availability of compute optimized, memory optimized, and confidential computing hardware depends on the region, service tier, and compute tier.

Hardware Configuration

**Gen5**

up to 80 vCores, up to 408 GB memory

[Change configuration](#)

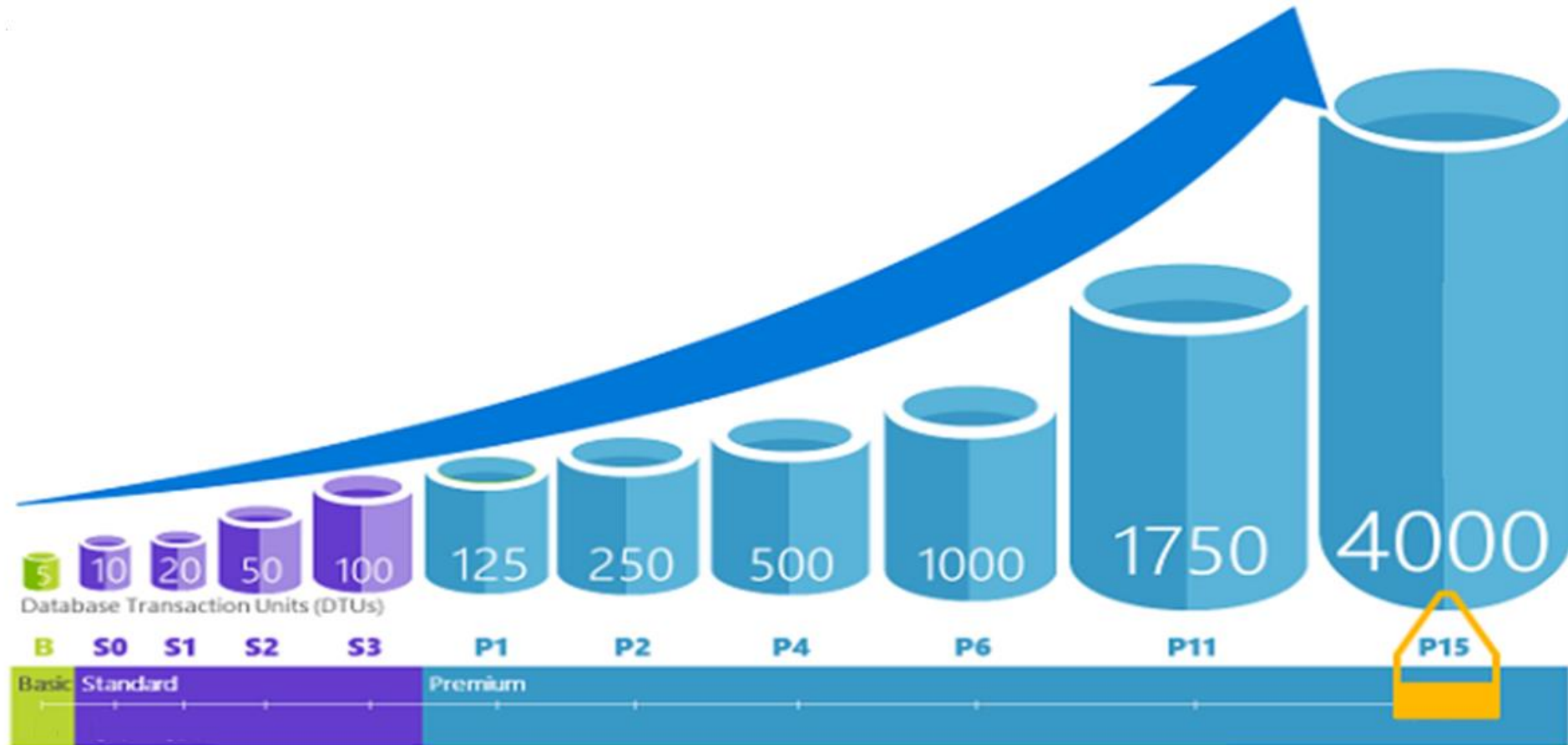
# Demonstration

## Overview of Service Tiers available for Azure SQL Database

- Review the different Service Tiers, Compute and Hardware options available while creating an Azure SQL Database.



# Database Transaction Units (DTUs)



# DTU-based model: Service Tiers

	Basic	Standard									Premium					
		S0	S1	S2	S3	S4	S6	S7	S9	S12	P1	P2	P4	P6	P11	P15
Built for	Light transactional workloads	Medium transactional workloads									Heavy transactional workloads					
Available SLA	99.99%															
Database max. size	2 GB	250 GB			1 TB									4 TB		
Point-in-time restore ("oops" recovery)	Any point within 7 days	7-35 days (7 days by default)														
Business continuity	Active geo-replication, up to four readable secondary backups															
Security	Auditing, row-level security, dynamic data masking, Advanced Threat Protection															
Performance objectives	Transactions per hour	Transactions per minute									Transactions per second					
Database transaction units (DTUs)	5	10	20	50	100	200	400	800	1,600	3,000	125	250	500	1,000	1,750	4,000


\$
\$\$\$

Resource limits for single databases using the DTU-based purchasing model

# vCore-based purchasing model: Provisioned compute tier

## **Simplicity:**

- We remain committed to the DTU-based model and the simplicity it offers customers who want a pre-configured solution.

## **Flexibility:**




- The vCore-based model reflects our commitment to customer choice and to simplify the hybrid benefit for customers migrating from on-premises.

## **Customers pay for:**

- Service tier + number of vCores.
- Type and amount of data storage.
- Number of IO.
- Backup storage (RA-GRS).



# vCore-based purchasing model: Provisioned compute tier

Service tier	 General purpose		 Business critical		 Hyperscale
Best for	Most budget-oriented workloads		Critical business applications with high IO requirements.		VLDB OLTP and HTAP workloads with highly scalable storage and read-scale requirements.
Deployment option	Single / Elastic Pools      Managed Instance		Single / Elastic Pools      Managed Instance		Single
Compute tiers	Gen5: 2 to 80 vCore Fsv2-series*: 72 vCore Serverless: 0.5 to 16 vCore		Gen5: 4 to 80 vCore	Gen5: 2 to 80 vCore M-series*: 128 vCore	Gen5: 4 to 80 vCore
Storage	Premium remote		Local SSD		Local SSD Cache
	5GB – 4TB per instance	32GB – 16TB per instance	5GB – 4TB per instance	32GB – 16TB per instance	Scale from 5GB to 100TB of storage in 1GB increments
In-Memory	Not supported		Supported		Not supported
Read-write IO	~2ms for all data access		<0.5ms for all data access		<0.5ms for hot data access ~2ms otherwise
Availability	1 replica, no read-scale replicas		3 read replicas, zone-redundant HA	3 replicas, 1 read-scale replica, zone-redundant HA	Primary read/write replica + up to 4 read replicas
Backups	RA-GRS, 7-35 days (7 days by default)		RA-GRS, 7-35 days (7 days by default)		LRS, ZRS, RA-GRS, 7-35 days (7 days by default)

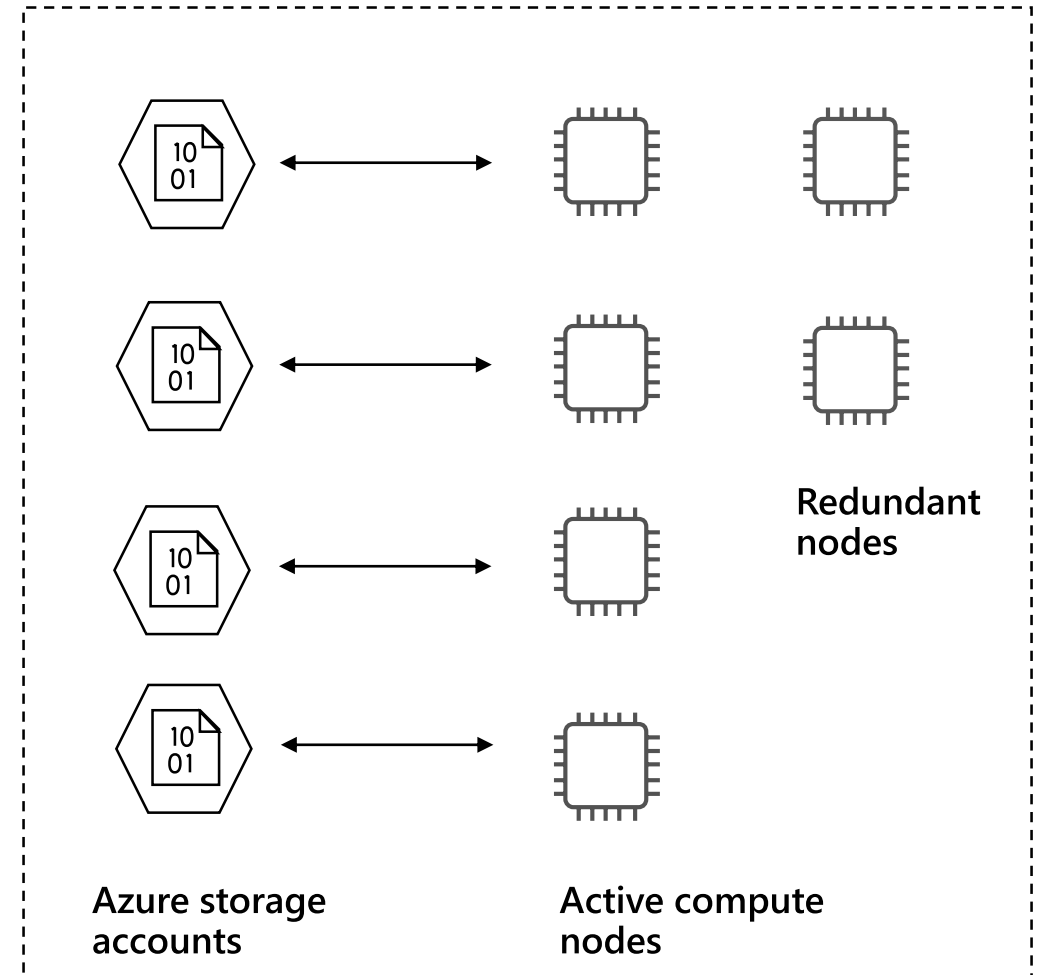
For latest information reference: <https://azure.microsoft.com/en-us/pricing/details/sql-database/>

\* Fsv2-series and M-series are currently in preview.



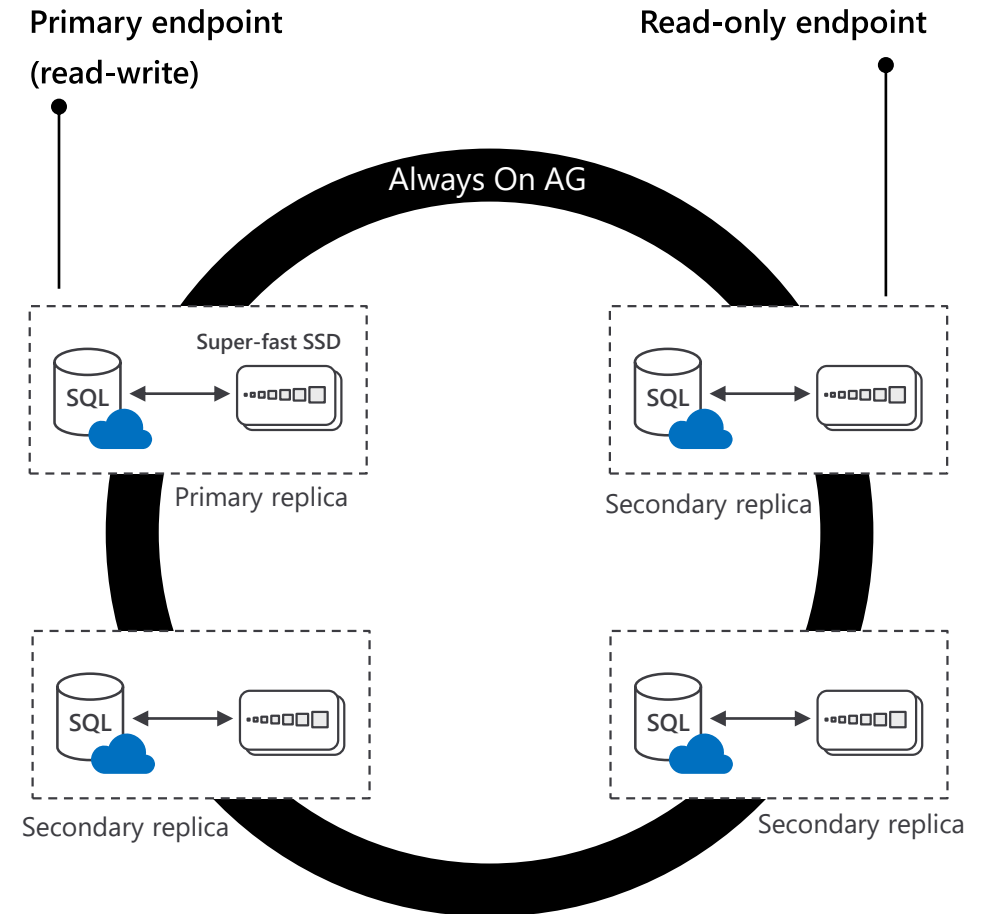
# General Purpose

Feature	Description
Number of vCores	8, 16, 24 (Gen 4) 8, 16, 24, 32, 40, 64, 80 (Gen 5) 72 (Fsv2-series)
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

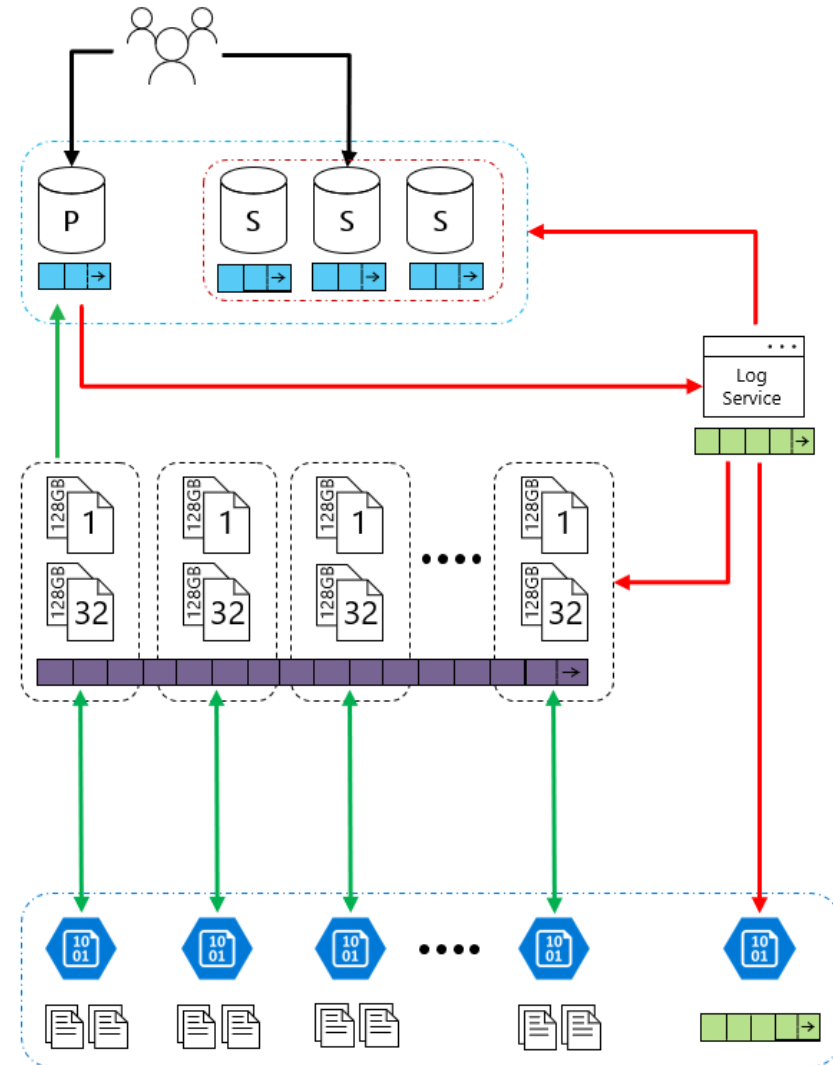
Feature	Description
Number of vCores	8, 16, 24, 32 (Gen 4) 8, 16, 24, 32, 40, 64, 80 (Gen 5) 128 (M-series)
SQL Server version / build	SQL Server (latest available)
Additional features	In-Memory OLTP 1 additional read-only replica (Read Scale-Out)
Min storage size	32 GB
Max storage size	Gen 4: 1 TB (all 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

# Hyperscale

Feature	Description
Number of vCores	Gen4: 1 to 24 vCore Gen5: 2 to 80 vCore
SQL Server version/build	SQL Server (latest available)
Additional features	4 read-scale replicas 100TB Data Support Constant Time Operations
Min storage size	4 GB
Max storage size	100TB Grows as customer data grows
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	High Availability is ensured on the storage layer
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



**Hyperscale Service Tier – Availability of Storage**

# Choose from hardware generations

	Gen 5	Fsv2-series	M-series	DC-Series
Hardware	Intel E5-2673 v4 (Broadwell) 2.3 GHz processors, fast eNVM SSD vCore=1 LP (hyper-thread)	Intel Xeon Platinum 8168 (SkyLake) processors	Intel Xeon E7-8890 v3 2.5 GHz processors	Intel® XEON E-2288G processors. Featuring Intel Software Guard Extension (Intel SGX))
Performance levels	1 to 80 vCores	72 vCores (1 vCore = 1 hyper-thread)	128 vCores (1 vCore = 1 hyper-thread)	Provision up to 8 vCores (physical)
Memory	5.1 GB per vCore for provisioned compute Up to 24 GB per vCore for serverless compute	1.9 GB per vCore	29 GB per vCore	4.5 GB per vCore
Storage	Up to 4TB remote SSD storage Up to 4TB local SSD storage	Up to 4TB remote SSD storage	Up to 4TB local SSD storage	Up to 4TB remote SSD storage

- Balance performance requirements and price with two hardware generations
- Match your on-premises application behavior
- Fsv2, M, and DC series are Generally available but in limited regions

# vCore-based purchasing model: Serverless compute tier



## On-demand flexible scale

Operate at the true rhythm of your business.

Adapts compute resources to the workload without sacrificing performance.

Automatically pauses and resumes.



## Cost-effective

Pay for performance. Period.

Pay only for compute resources you consume, on a per-second basis.

Further optimize costs with configurable compute thresholds.



Fully managed & intelligent  
Focus on your applications, not your infrastructure

Fully-managed and intelligent database service.

Built-in 99.99% availability.

---

Best for unpredictable and intermittent workloads on single databases, such as:



Dev/test



Line of Business



E-commerce

# Provisioned compute and serverless meet different needs

Optimize compute provisioning and billing for your workload

## Databases with provisioned compute...

Provision compute resources upfront.

Bill on an hourly basis.

### Common scenarios

Workloads with regular and substantial compute utilization.

Multiple databases with bursty usage patterns that can be consolidated into a single server and use *elastic pools* for better price optimization.



## Serverless databases...

Scale up or down to meet workload requirements, instead of pre-provisioning.

Bill on a per-second basis.

### Common scenarios

Workloads with unpredictable and intermittent usage patterns or performance requirements .

Workloads where the requirements are unknown, and you can delegate compute sizing to the service.



# Serverless price to performance with per-second billing

Compute resources scale dynamically up or down based on workload requirements.

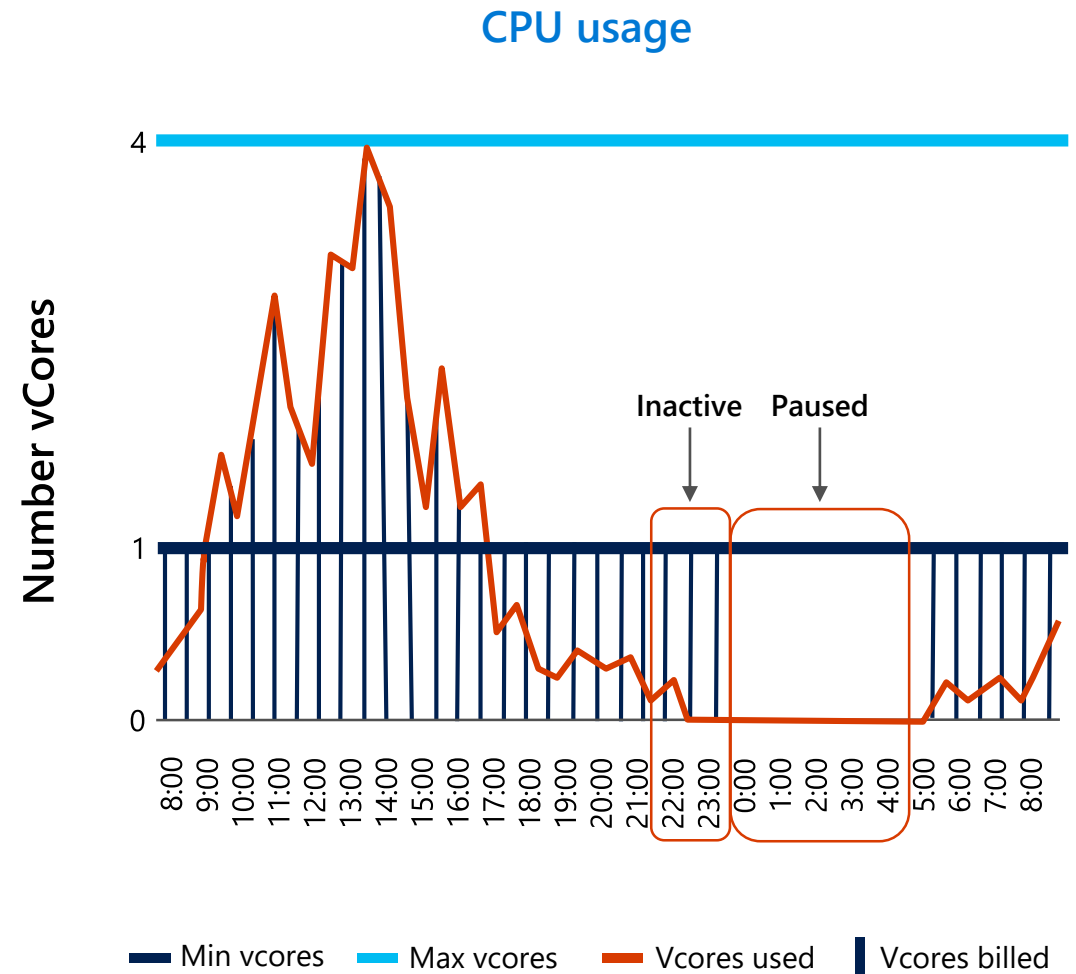
Configure minimum and maximum vCores to define the range of available compute capacity.

Use auto-pause delay to define the time period the dataset must be inactive before pausing.

The database is automatically resumed when the next login or other activity occurs.

Pay for compute based on the vCores and memory used per second, with lowest billing based on configured vCore minimum.

When the database is paused, the compute cost is zero and only storage costs are incurred.



# Pay only for what you need

DTUs			vCores		
Basic	Standard	Premium	General Purpose	Business Critical	Hyperscale
Small databases particularly those in development phases.	General purpose databases with moderate performance requirements.	Mission-critical databases with high performance and high-availability requirements.	Data applications with basic IO and basic availability requirements.	Business critical data applications with fast IO and high availability requirements.	VLDB OLTP and HTAP workloads with highly scalable storage and read-scale requirements.



**Elastic scale and performance:** Three service tiers within DTU-based model, and two tiers within vCore-based model let you scale up and down based on throughput needs and offer better resource isolation and an improved billing experience.



**Business continuity and data protection:** A spectrum of business-continuity features across tiers lets you dial up control over data recovery and failover.



**Familiar and fully-managed:** Near-complete SQL Server compatibility and unprecedented efficiencies as your applications scale with a near-zero maintenance service and a variety of familiar management tools and programmatic APIs.



# Identify the right Azure SQL Database/MI SKU for your on-premises database (I/II)

## Database Migration Assistant (DMA)

- Single database
- Elastic pools
- Managed instance

### Azure SQL DB SKU Recommendations

We have analyzed 3 databases. For each database, we have identified the minimum recommended Azure SQL DB SKU based off of the performance counters collected from your instances. For more detailed information about the predictions, please refer to one of the text-based output formats.

The sliders below can be used to adjust the compute level and the maximum data size for each database. After configuring the databases and entering the subscription information, click "Generate Provisioning Script" to generate a powershell script that can be used to provision the databases.

#### Subscription information

Subscription Id:	<input type="text"/>	Resource Group:	<input type="text"/>	Server Admin Username:	<input type="text"/>
Region:	<button>West US</button>	Server Name:	<input type="text"/>	Server Admin Password:	<input type="text"/>

#### Configure Databases

Provision	Database Name	Pricing Tier	Compute Level	Max Data Size	Est. Cost Per Month
<input checked="" type="checkbox"/>	edw_3g	<button>Premium</button>	P1 (125 DTU) <cost> <div><div></div></div>	Max Data Size: 40 Gb <cost> <div><div></div></div>	<cost>
<input checked="" type="checkbox"/>	mydb	<button>Premium</button>	P1 (125 DTU) <cost> <div><div></div></div>	Max Data Size: 5 Gb <cost> <div><div></div></div>	<cost>
<input checked="" type="checkbox"/>	tpcds1g	<button>Premium</button>	P1 (125 DTU) <cost> <div><div></div></div>	Max Data Size: 5 Gb <cost> <div><div></div></div>	<cost>
Total Estimated Monthly Cost					<cost>

NOTE: Price refresh failed for region West US. Prices shown are approximate. For the latest price, please consult the Azure Portal or retry with the proper authentication options enabled at a later time.

☐ I already have a SQL Server License (up to 55% savings).

Reset All to Recommended

Generate Provisioning Script

Questions?



# Knowledge Check

What are the differences between IaaS, PaaS, SaaS and where should you position Azure SQL Database?

What are the two purchasing models available?

What are the three vCore-based purchasing models that Azure SQL Database offers?

What are the differences between a provisioned compute tier and a serverless compute tier?

Which are the two deployment options that can use DTU-based or the vCore-based purchasing model?

## Lesson 2: How to create Azure SQL Database

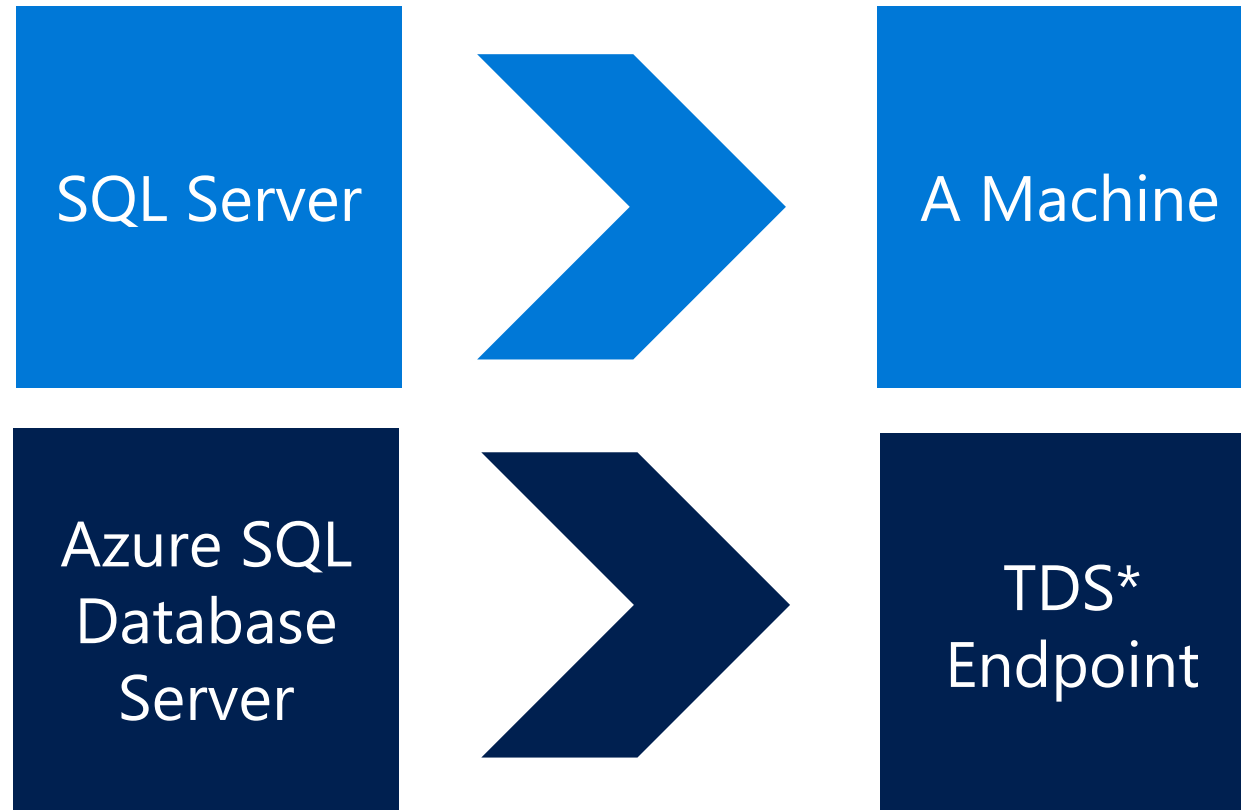
# Objectives

After completing this learning, you will be able to:

- Know which prerequisites are needed before you can create an Azure SQL Database.
- Create your first Azure SQL Database.



# Azure SQL Database Server is not a machine...



\*TDS = Tabular Data Stream

# Server Provisioning

Service head that contains databases

Connect via Fully Qualified Domain Name

Initially contains only a **master** database

## Create SQL Database Server

Microsoft

### Project details

Select the subscription to manage deployed resources and costs. Use resource groups like folders to organize and manage all your resources.

Subscription \*

PFE Subscription

Resource group \*

(New) AzureSQLDatabaseRG

[Create new](#)

### Server details

Enter required settings for this server, including providing a name and location.

Server name \*

dbsql essentials

.database.windows.net

Location \*

(US) East US

### Authentication

Select your preferred authentication methods for accessing this server. Create a server admin login and password to access your server with SQL authentication, select only Azure AD authentication [Learn more](#) using an existing Azure AD user, group, or application as Azure AD admin [Learn more](#), or select both SQL and Azure AD authentication.

Authentication method

☒ Use SQL authentication

☐ Use only Azure Active Directory (Azure AD) authentication

☐ Use both SQL and Azure AD authentication

Server admin login \*

sqlserveradmin

Password \*

.....

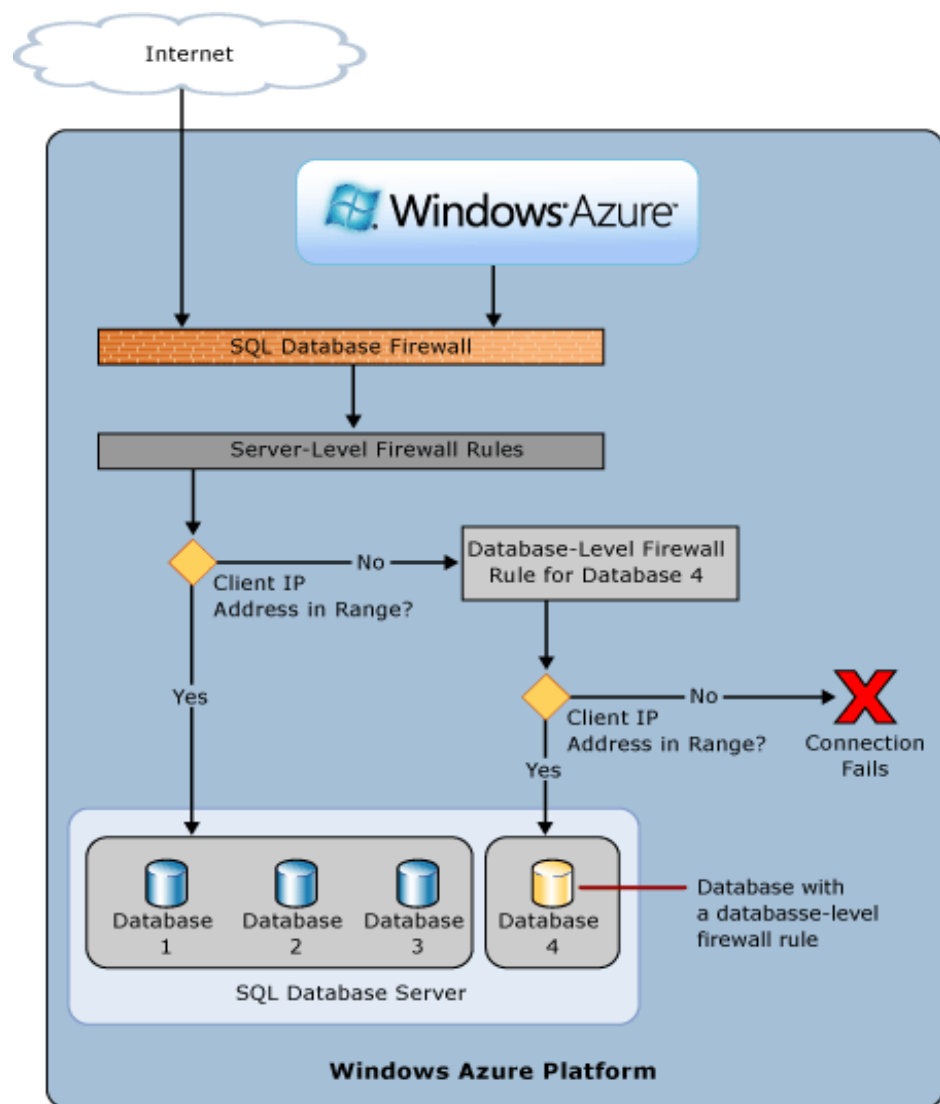
Confirm password \*

.....

[Review + create](#)

[Next : Networking >](#)

# Azure SQL Database Firewall



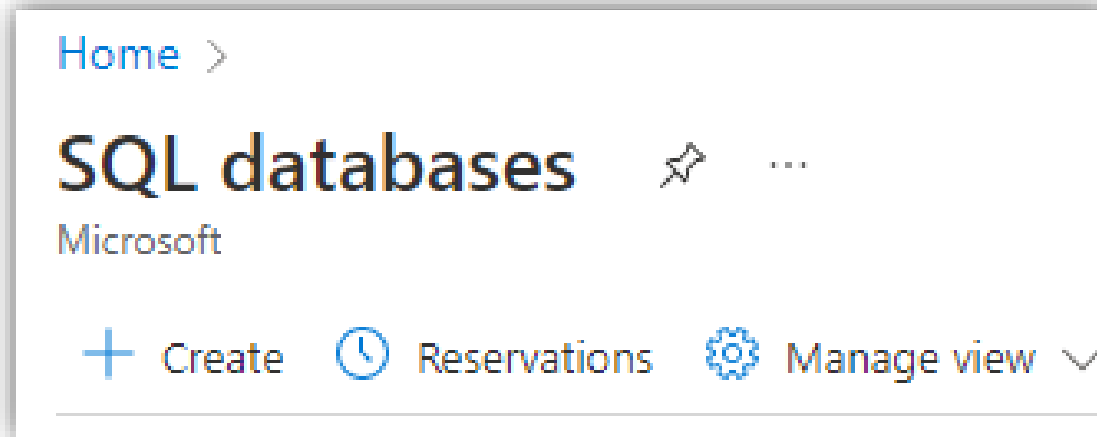
IP Address-based access control for SQL Database

Rules at the server and/or database level

No IP authorized by default, not even Azure itself



# Create the database



## PowerShell:

```
New-AzSqlDatabase -ResourceGroupName "reourcegroupsqlgsp"
-SERVERNAME "server1" -DatabaseName "database1"
-Edition "Standard" -RequestedServiceObjectiveName "S1"
```

## Transact-SQL:

```
CREATE DATABASE MyFirstAzureSQLDatabase
(MAXSIZE = 500 MB, EDITION = 'standard', SERVICE_OBJECTIVE = 'S1');
```

# Demonstration

## Create your first Azure SQL Database

- Create a new server, configure the firewall rules and create an Azure SQL Database (DTU based).



# Create an Azure SQL Database

- Exercise 1: Create a new SQL Server (logical server).
- Exercise 2: Create firewall rules.
- Exercise 3: Create an Azure SQL Database (DTU Based).



Questions?



# Knowledge Check

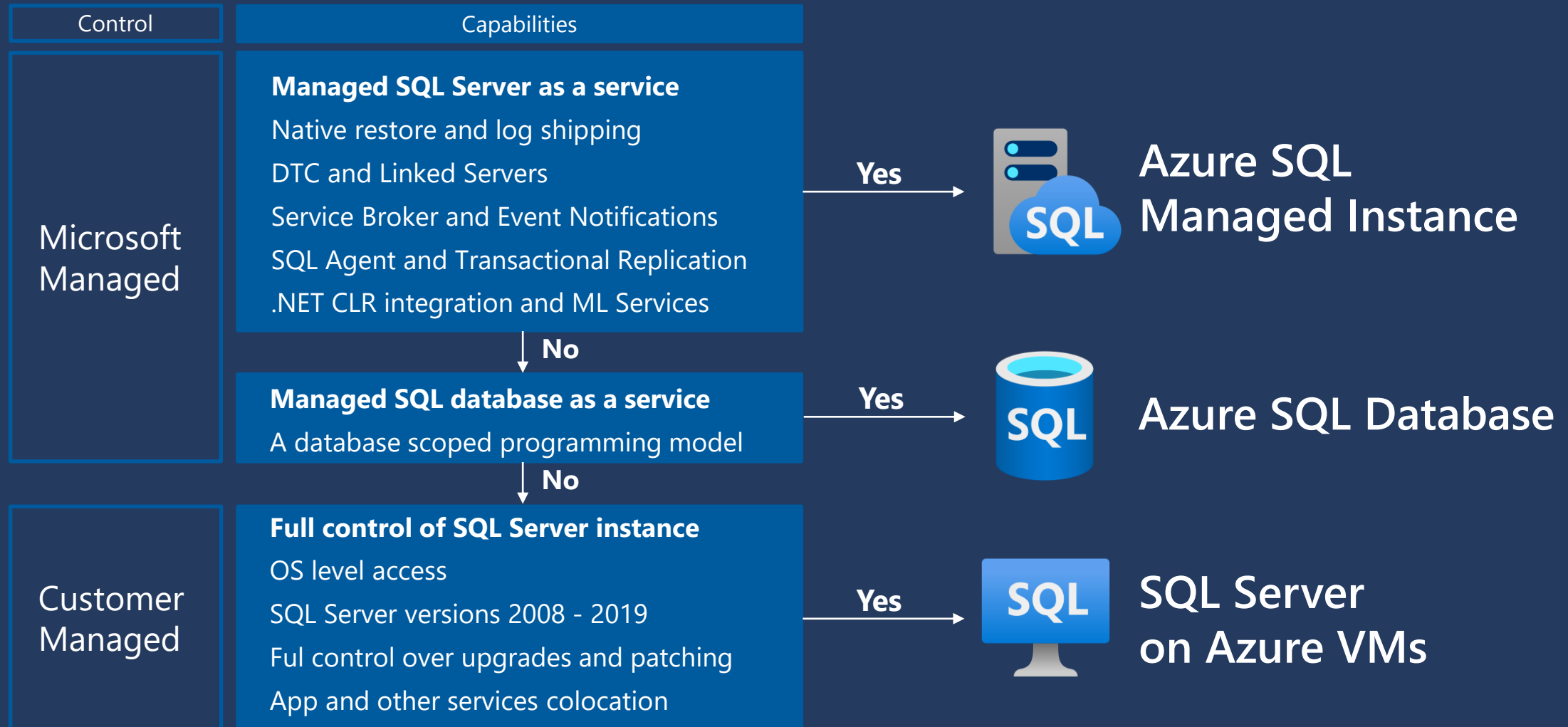
Why do you need to configure the Azure SQL Database Firewall and why is it important?

What options do you need to specify to create an Azure SQL Database?

What is a SQL server (logical server)?

# Lesson 3: Introduction to Managed Instances

# Which Azure SQL offering is right for you?



# Service tiers

## General purpose (GP) service tier

Great for most business workloads.

Remote storage  
IOPS  
\$  
Built-in HA

 P 16TB

## Business critical (BC) service tier

For workloads that require low latency, In-Memory, readable secondary.

Local SSD storage  
IOPS++  
\$\$\$  
Built-in HA  
In-Memory

 P  S  S  R 16TB

## Resource limits

Memory  
Max Log Size  
I/O throughput and latency  
Size of TempDB  
Max concurrent workers  
Backup Retention



# Service tiers

## General purpose (GP) service tier

Great for most business workloads.

Remote storage  
IOPS  
\$  
Built-in HA

 P 16TB

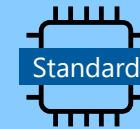
## Business critical (BC) service tier

For workloads that require low latency, In-Memory, readable secondary.

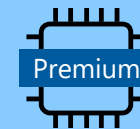
Local SSD storage  
IOPS++  
\$\$\$  
Built-in HA  
In-Memory

 P  S  S  R 16TB

## Hardware options



**Standard series**  
80 vCores  
5 GB per vCore

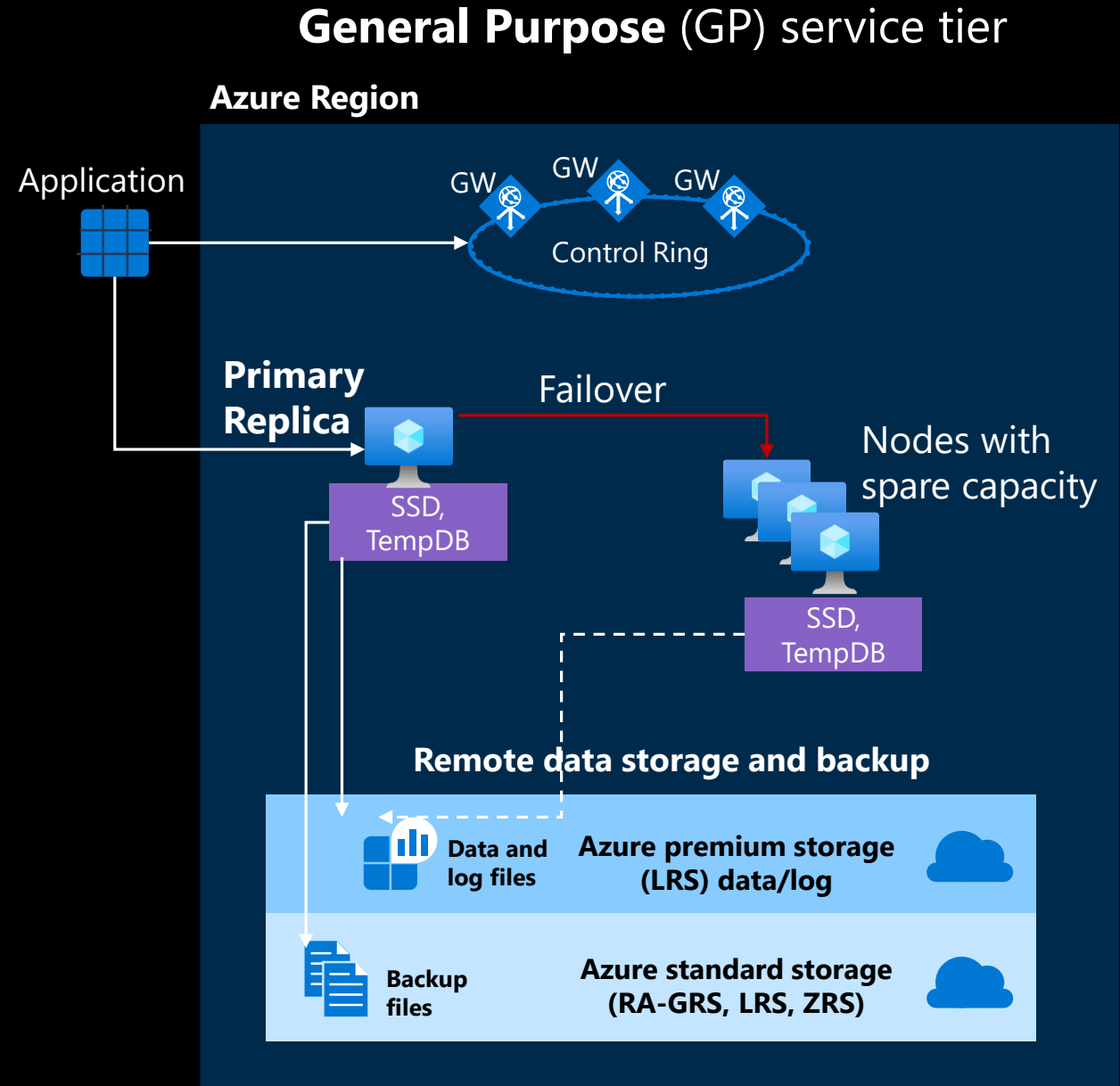


**Premium series**  
80 vCores  
7 GB per vCore

**Memory optimized**  
64 vCores  
13.6 GB per vCore

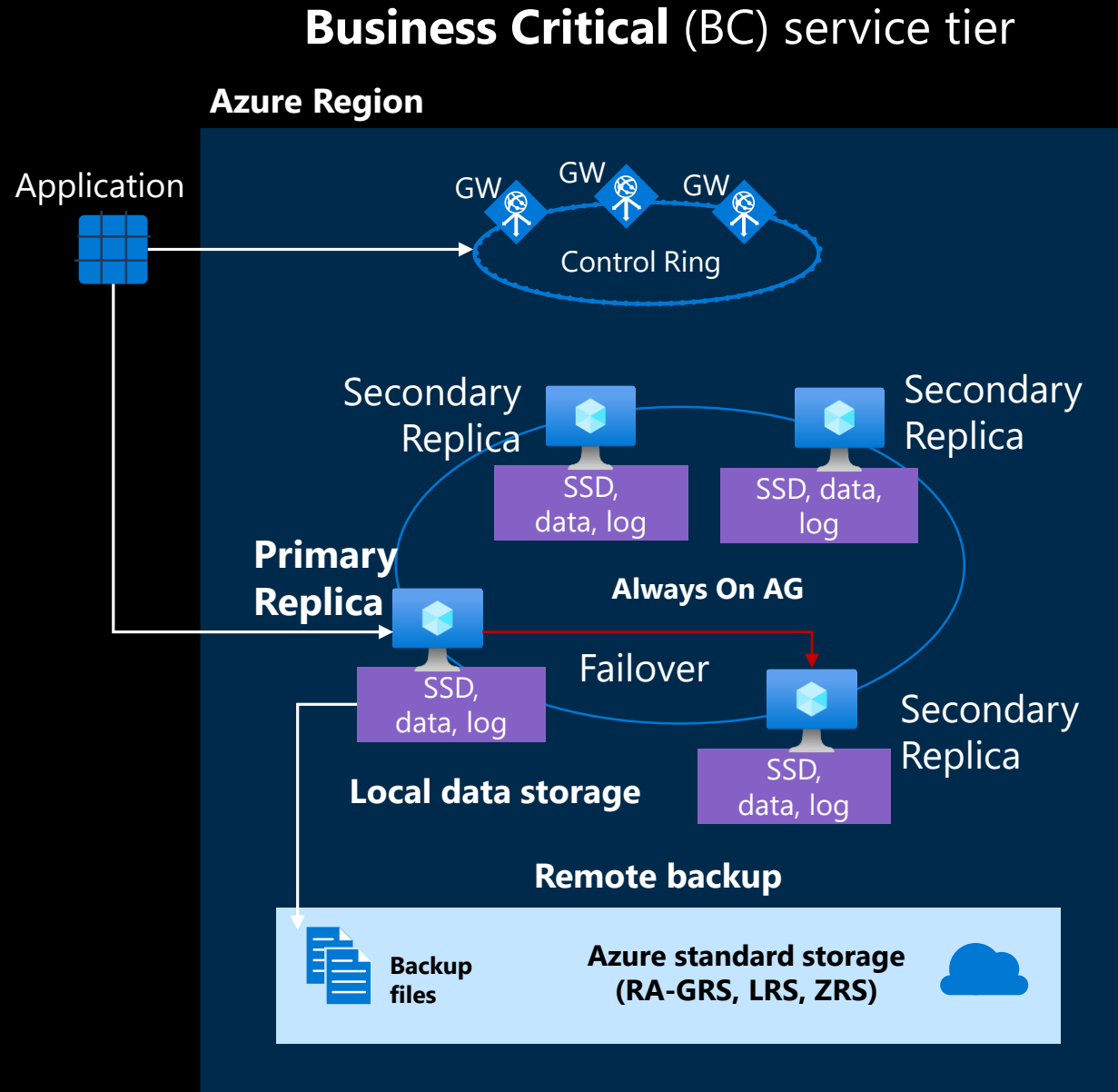
# General Purpose High Availability

- Behaves like Failover Cluster Instance (FCI)
- Remote storage provides data redundancy within a datacenter
- Backup files are in a different location with geo-redundancy
- Failover decisions based on SQL and Service Fabric
- Recovery time depends on spare capacity
- Connectivity redirection built-in



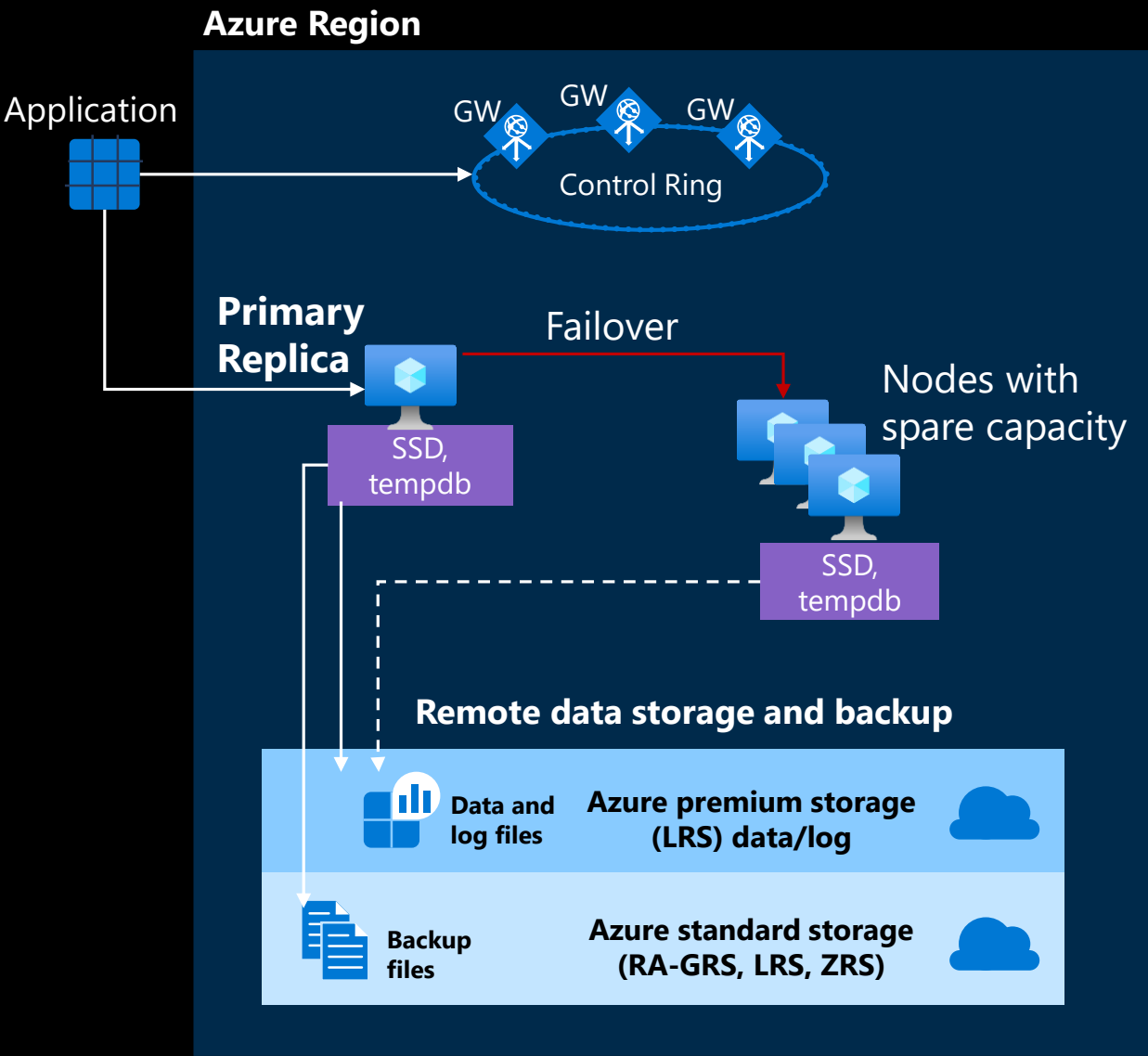
# Business Critical High Availability

- Based on Always On Availability Groups
- 3 secondary replicas automatically created
- Four replicas kept available
- Backup files in a different location with geo-redundancy
- At least one secondary must sync for commits
- Automatic failover based on SQL and Service Fabric
- Recovery time extremely fast
- Connectivity redirection built-in
- Read Scale-Out from one of the replicas

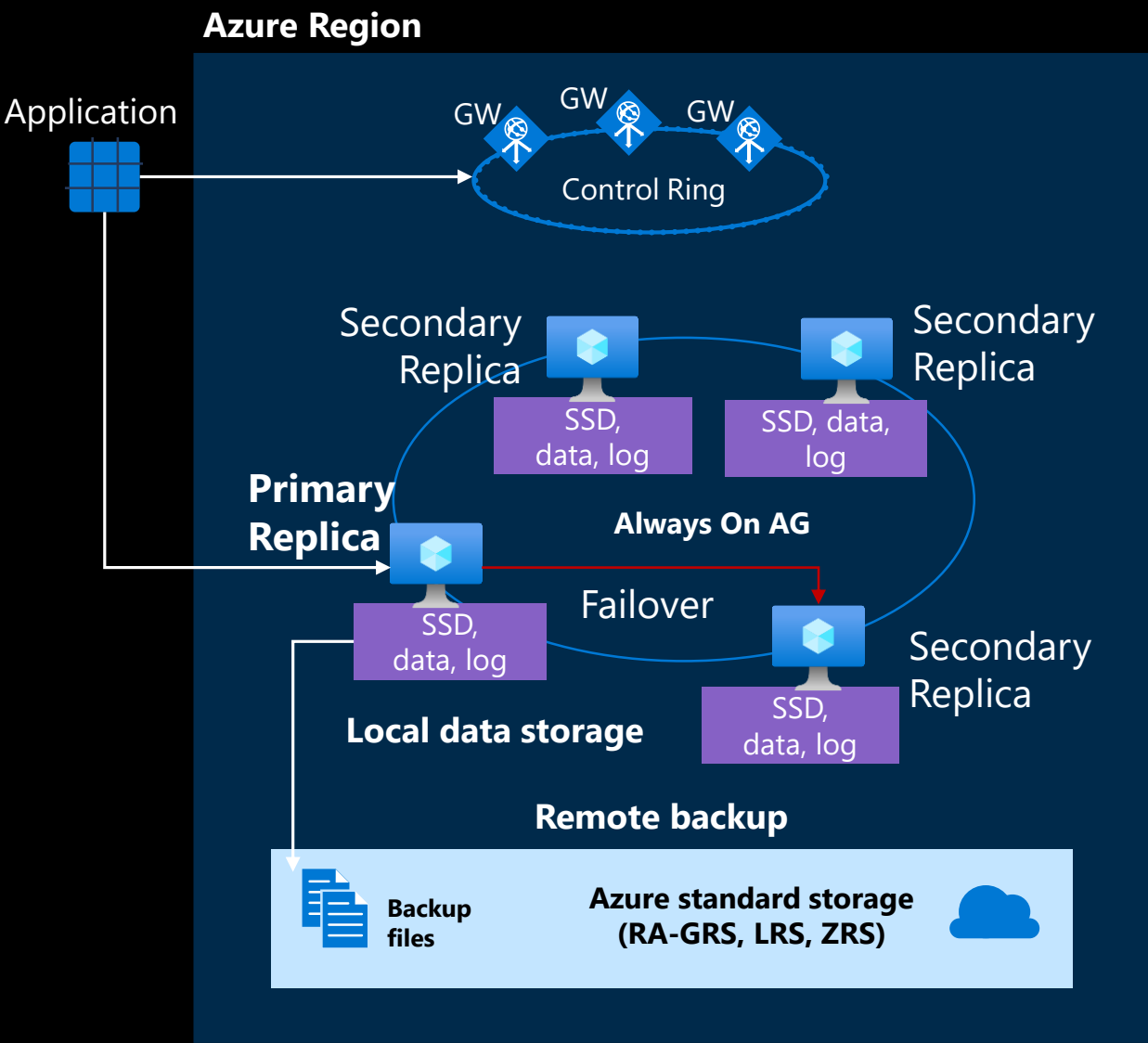


# Side by side comparison

## General Purpose (GP) service tier



## Business Critical (BC) service tier



# SQL MI New HW Generations

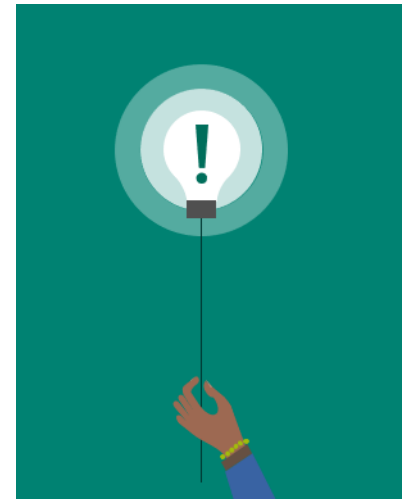
Standard-series (Gen 5)	Premium-series	Premium-series Mem Optimized
<ul style="list-style-type: none"><li>• CPU: Intel Broadwell, Skylake and Cascade Lake, 2.3-2.5 GHz</li><li>• vCore range: 4 – 80</li><li>• Memory / vCore: 5.1 GB</li><li>• Max instance memory: 408 GB</li><li>• Max instance storage<ul style="list-style-type: none"><li>• General Purpose: 16 TB</li><li>• Business Critical: 4 TB</li></ul></li></ul>	<ul style="list-style-type: none"><li>• CPU: <b>Latest 3<sup>rd</sup> Gen Intel 8370C (Ice Lake), 2.8 GHz</b></li><li>• vCore range: 4 – 80</li><li>• Memory / vCore: <b>7 GB</b></li><li>• Max instance memory: <b>560 GB</b></li><li>• Max instance storage<ul style="list-style-type: none"><li>• General Purpose: 16 TB</li><li>• Business Critical: <b>5.5 TB</b></li></ul></li></ul>	<ul style="list-style-type: none"><li>• CPU: <b>Latest 3<sup>rd</sup> Gen Intel 8370C (Ice Lake), 2.8 GHz</b></li><li>• vCore range: 4 - 64</li><li>• Memory / vCore: <b>13.6 GB</b></li><li>• Max instance memory: <b>870 GB</b></li><li>• Max instance storage<ul style="list-style-type: none"><li>• General Purpose: 16 TB</li><li>• Business Critical: <b>16 TB</b></li></ul></li></ul>

# Lesson 4: Introduction to Elastic Database Pools in Azure SQL Database

# Objectives

After completing this learning, you will be able to:

- Describe the Azure Elastic Database Pool



# What is an Azure SQL elastic pool?



Managing and scaling multiple databases that have varying and unpredictable usage demands.



A pool is shared by multiple databases to accommodate unpredictable periods of usage by individual databases.



Provisioning resources for the entire pool. It is a cost-effective solution for running multiple data bases with a fixed Budget.



Simply add and remove databases with downtime.



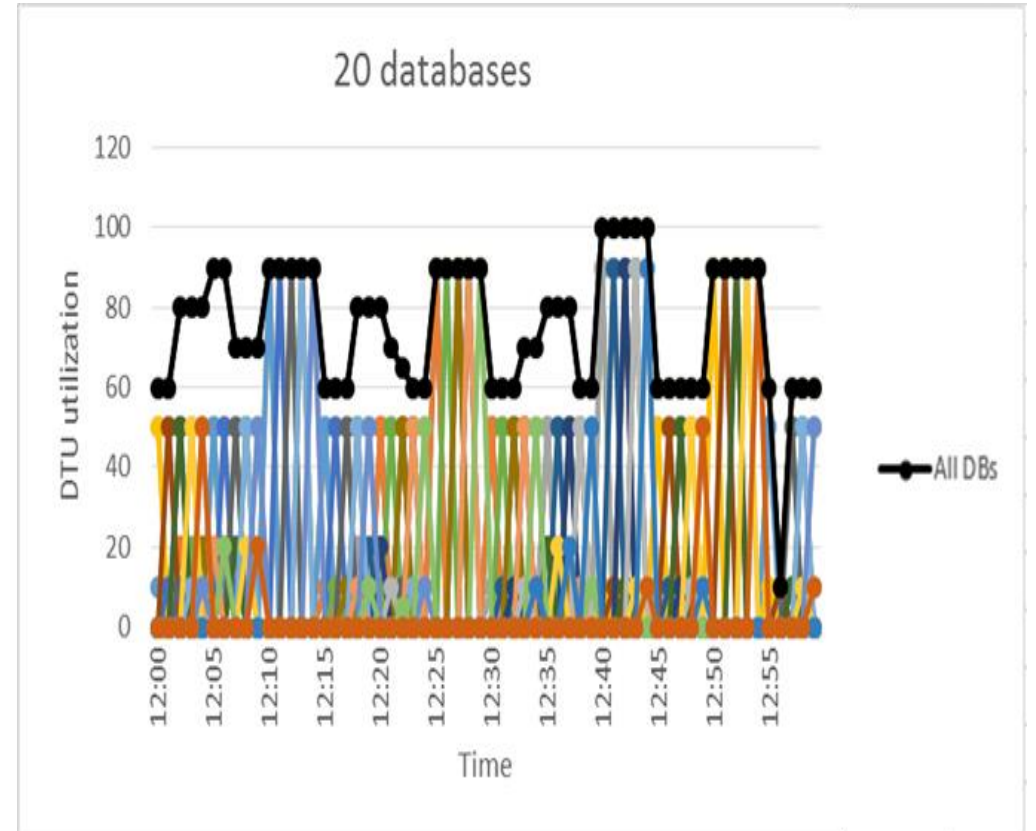
# When to consider a pool?

Assessing  
database  
utilization  
patterns.

There are large  
differences  
between peak  
utilization and  
average utilization  
per database.

The peak  
utilization for each  
database occurs at  
different points in  
time.

eDTUs are shared  
between many  
databases.



# DTU-based Elastic Pool service tiers

	Basic	Standard	Premium
Built for	Light transactional workloads	Medium transactional workloads	Heavy transactional workloads
Available SLA	99.99%		
eDTUs per pool	50-1,600	50-3,000	125-4,000
Max number of databases per pool	100-500	100-500	50-100
Max eDTUS choices per data bases	5	10-3000	25-4,000
Max storage per pool	5-156 GB	4 TB	4 TB
Max storage per database	2 GB	500 GB -1 TB	1 TB
Point-in-time restore (“oops” recovery)	Any point within 7 days	7-35 days (7 days by default)	
Business continuity	Active geo-replication, up to four readable secondary backups		
Security	Auditing, row-level security, dynamic data masking		
Performance objectives	Transactions per hour	Transactions per minute	Transactions per second

[Elastic pool: Storage sizes and compute sizes](#)

# vCore-based Elastic Pool service tiers - General Purpose

	Gen5	Fsv2-series
vCores	2 - 80	72
Memory (GB)	10.2 - 408	136
Max number of DBs per pool	100 - 500	500
Storage type	Premium (remote) storage	Premium (remote) storage
Max data size	512 GB – 4 TB	4 TB
Max log size	154 GB – 1229 GB	1 TB
Max tempdb size	64 GB - 384 GB	333 GB
Number of replicas	1	1

[Resource limits for elastic pools using the vCore-based purchasing model limits](#)

# vCore-based Elastic Pool service tiers - Business Critical

	Gen5	M-series
vCores	4 - 80	128
Memory (GB)	20.4 - 408	3767
Max number of DBs per pool	100	100
Storage type	Local SSD	Local SSD
Max data size	1 TB – 4 TB	4 TB
Max log size	307 GB – 1229 GB	2 TB
Max tempdb size	128 GB - 384 GB	4 TB
Number of replicas	4	4

[Resource limits for elastic pools using the vCore-based purchasing model limits](#)

# Impact of changing service tier or rescaling compute size

## Create new compute instance for the elastic pool

- A new compute instance for the elastic pool is created with the requested service tier and compute size.
- Regardless, the databases remain online during this step, and connections continue to be directed to the databases in the original compute instance.

## Switch routing of connections to new compute instance

- Existing connections to the databases in the original compute instance are dropped.
- Any new connections are established with the databases in the new compute instance. [Accelerated Database Recovery](#) can reduce the impact from aborting long running transactions.

No data is lost during any step in the workflow

# Demonstration

## Create an Elastic Pool

- Create an Elastic pool using the Azure portal



Questions?



# Knowledge Check

What is a SQL Elastic Pool?

When should you consider an elastic pool instead of a single database?

Which tools can help you to size your elastic pool?



