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DP-300

Administering Microsoft Azure SQL Solutions

Acerca del Instructor

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- Certificaciones: OCP, ScrumMaster, RHCJA, RHCBPM, RHCBRMS, otros
- Oracle WDP Instructor/ Microsoft Azure Latam
- Red Hat Certified Instructor Latam/Spain
- NIIT India Instructor Spain
- NH Instructor
- iQuatro Bolivia
- Sonda Red Hat, Microsoft Chile
- IGP, New Horizons, Red Hat Perú
- Red Hat Consulting Arquitecto de Soluciones
 - RHPAM, Nginx, Kafka, MS Azure,AWS,Fuse, Camel
 - Red Hat Openshift, Kubernetes
 - Proyectos de Desarrollo e Implementación



Course Outline

- Introduction to Azure Database Administration
- Plan and implement data platform resources
- Implement a secure environment
- Monitor and optimize operational resources
- Optimize query performance
- Automate database tasks
- Plan and implement a high availability and disaster recovery environment



Introduction to Azure Database Administration

Introduction to Azure Data Platform

Objectives

- Understand the role of Azure Database Administrator as it fits in with other data platform roles
- Describe the key differences between the SQL Server-based database options in Azure
- Describe main features available on Azure SQL offerings

Prerequisites:

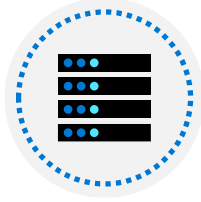


Students attending this course or taking this exam should have a solid understanding of the principals of SQL Server Database Administration, and a beginner level knowledge of the Azure Data Platform options, including Azure SQL Database, Azure SQL Managed Instance, and SQL Server on Azure Virtual Machines.

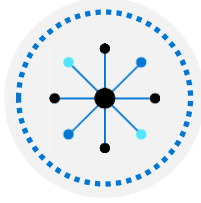
Prepare to Maintain SQL Databases on Azure



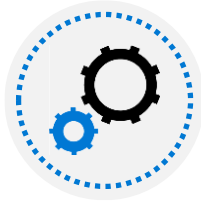
Objectives



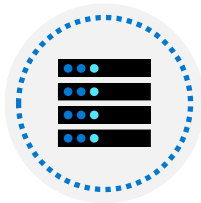
Describe Microsoft Intelligent Data Platform roles



Understand SQL Server in an Azure virtual machine



Design Azure SQL Database for cloud-native applications



Explore Azure SQL Managed Instance

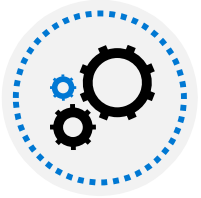
Azure Database Administrator



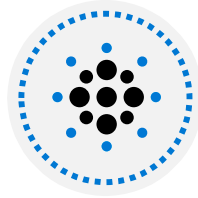
Azure Database Administrator:

The Azure Database Administrator implements and manages the operational aspects of cloud-native and hybrid data platform solutions built on Microsoft Azure data services and Microsoft SQL Server

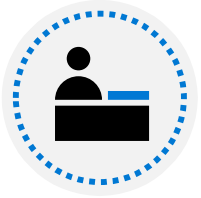
Other Azure Data Platform Roles



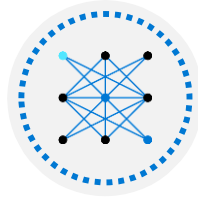
Azure Data Engineer



Azure Data Scientist

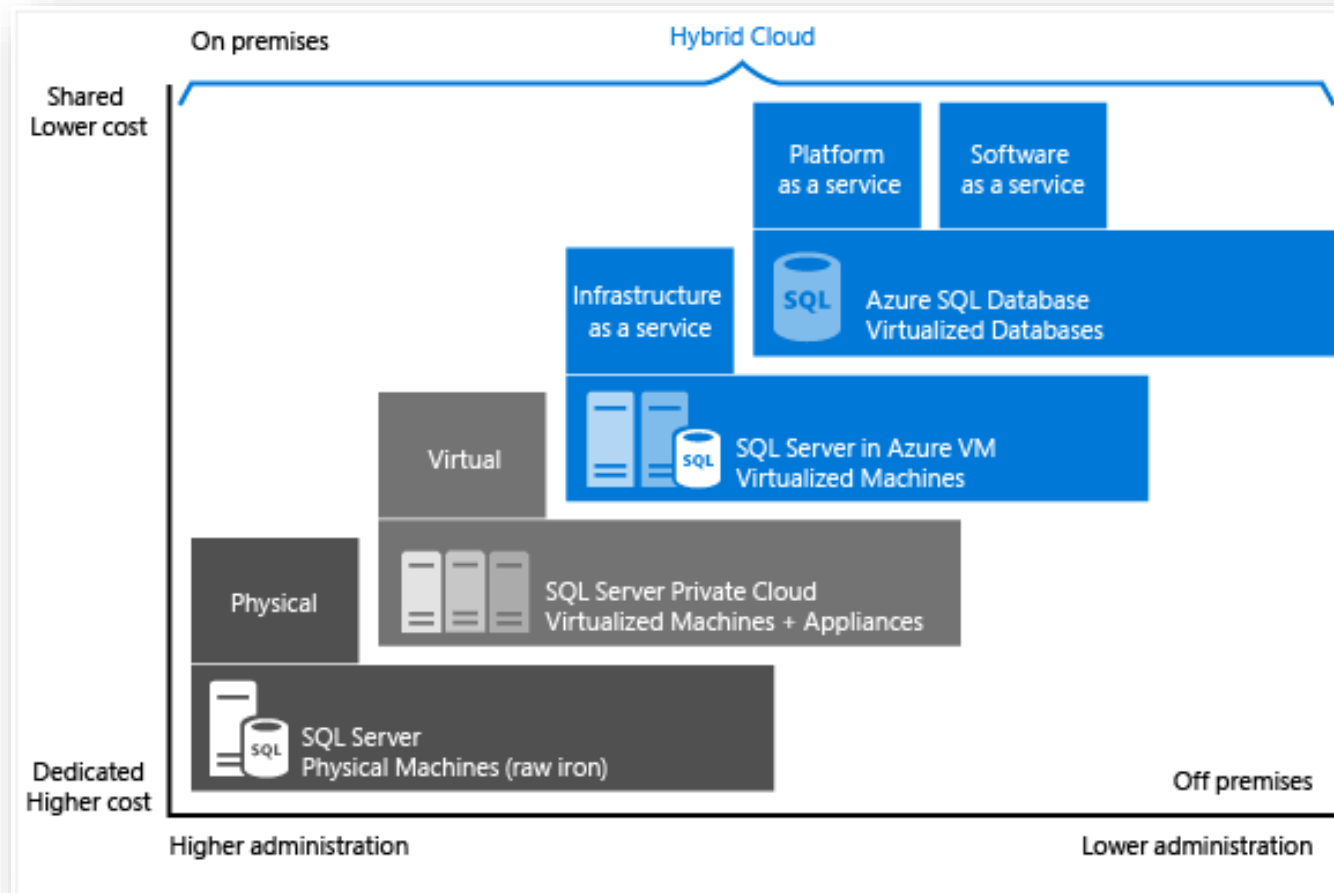


Azure Data Analyst



Azure Artificial Intelligence Engineer

Azure SQL platform



SQL Server on Azure Virtual Machine



SQL Server on Azure Virtual Machine

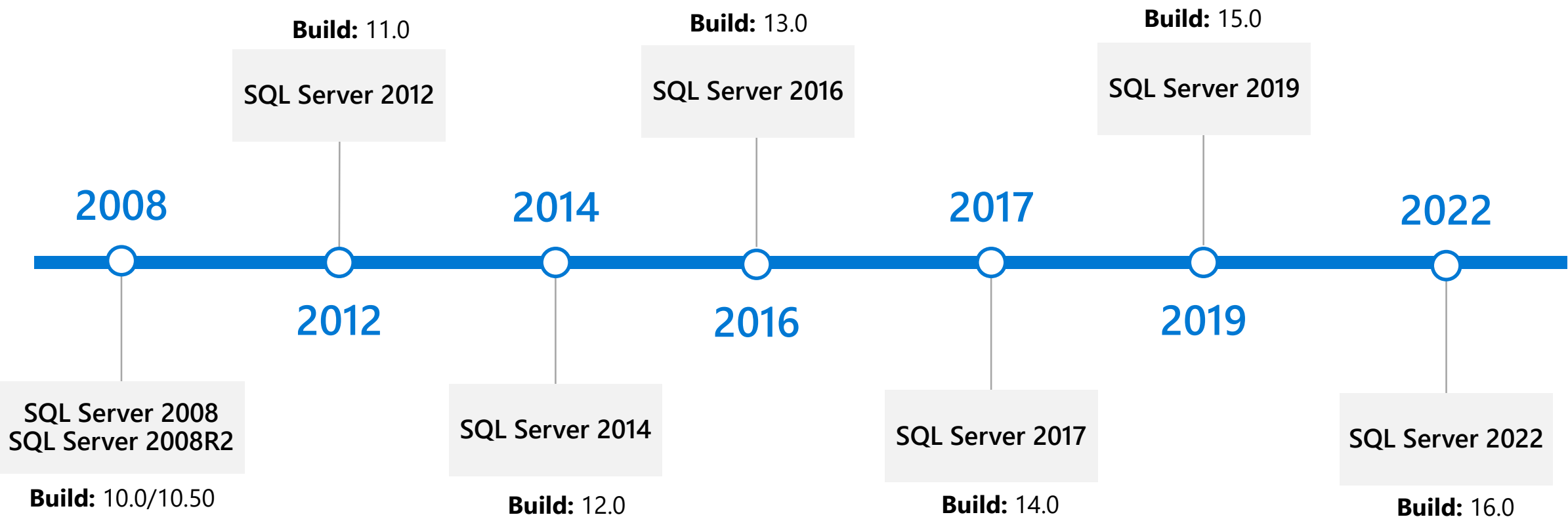
Gives you a wide range of computing power and RAM

Provides flexibility for applications that may have dependency on specific versions of SQL Server

Allows you to run additional SQL Server services like :

- Analysis Services
- Reporting Services
- Machine Learning Services
- Integration Services alongside database engine

SQL Server versions available



Backup solutions

In recent releases of SQL Server, Microsoft has introduced several features to support running SQL Server in an Azure virtual machine.

Back up to URL

Allows you to use standard backup syntax to back up your databases to Azure Blob Storage service

Azure Backup

Offers a complete enterprise backup solution that automatically handles your backups across your infrastructure

Deployment options

Azure Resource Manager (ARM)

Azure Resource Manager templates are a declarative deployment that describes the desired structure and state of the resources to be deployed

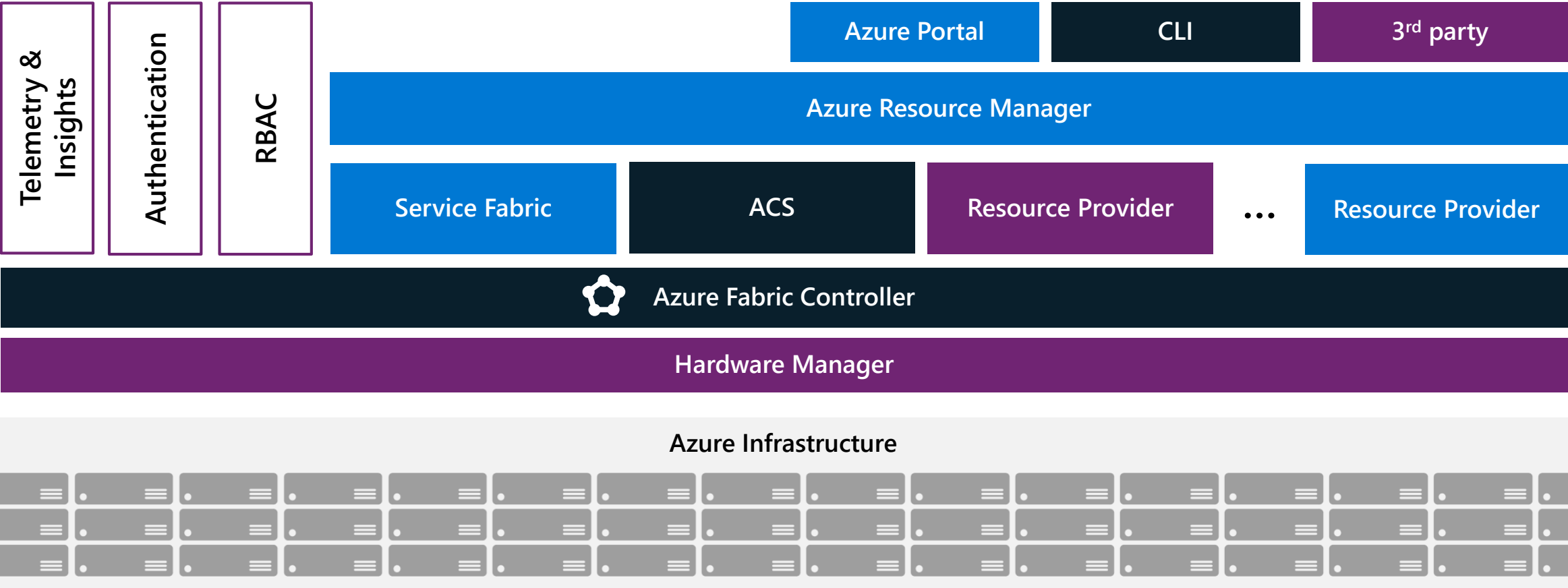
PowerShell / Azure CLI

Uses an imperative procedural model - to explicitly specify the process to be executed

Azure Bicep

Azure Bicep is a declarative language that allows you to deploy Azure resources

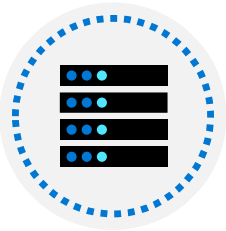
Azure Resource Manager templates



Azure storage

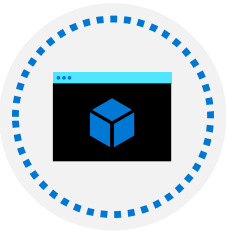


The Azure Storage platform provides several storage services to store files, tables, blobs, queues and VM disks



SQL Server uses two types of Azure storage:

- Managed Disks
 - Blob Storage
-



Heavy workloads typically use Premium SSD or Ultra Disk for database and transaction log files. Use Standard storage for your database backups

Azure infrastructure availability options



The Azure platform is built to be fault-tolerant



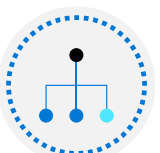
High availability is built into the platform at power, network, and compute layers



Default availability for a single Azure VM with premium managed disk is 99.9%



You can build further HA and DR solutions using SQL Server features like Always On Availability Group



To deploy Availability Groups in Azure, you need to deploy VMs into an Availability Zone or Availability Sets

Azure SQL Platform



Azure SQL platform as a service offerings

Azure SQL Database

Azure SQL Managed Instance

Use an evergreen version of SQL Server binaries

PaaS offerings allow customers to get more scalability and other benefits from cloud deployments

Azure SQL Database



Azure SQL Database

Azure SQL Database is a service offering aimed at new application development

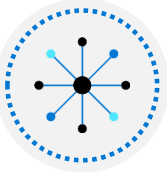
Deployment options

- Single Database
- Elastic Pools
- Hyperscale
- Serverless

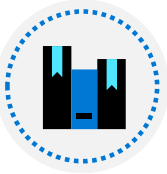
Azure SQL Database purchasing models

- **Database Transaction Unit (DTU)**
 - Basic
 - Standard
 - Premium
 - **vCore**
 - General Purpose
 - Hyperscale
 - Business Critical
-

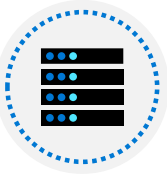
Single database deployment



Simplest approach to deploying Azure SQL Database



Each database has its own full set of resources



All databases are isolated from each other and are portable



Service level and costs are configured at the individual database level

Elastic Pools



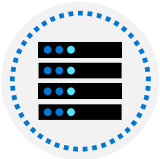
Designed for multi-tenant applications where each tenant has its own databases, or data is shared across databases



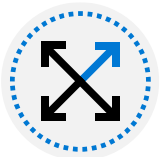
Allows you to pay one price for multiple databases that can be managed together on a single logical server



Can significantly reduce costs by configuring min/max DTU or vCore settings on a per database level to balance resource usage within an elastic pool

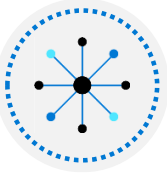


Best suited for databases that have similar performance requirements and non-concurrent spikes in utilization



Single databases can be added or removed from the elastic pool with brief downtime. Rescaling a pool has minimal downtime

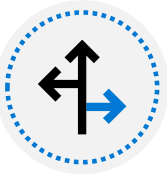
Scaling Elastic Pools



Resources in an elastic pool can be shared across all the databases in the pool



You can assign storage and compute resources to each of the databases in the pool or set default values across the pool



Scaling up and down will incur a small amount of downtime, and a brief interruption in the connections

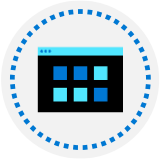


Available in DTU-based purchasing model or the vCore-based purchasing model

Hyperscale



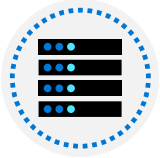
Supports up to 100 TB of database size



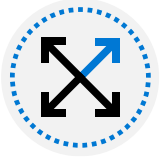
Nearly instantaneous backups using snapshot technologies



Fast database restores



Higher overall throughput because of distributed log writes

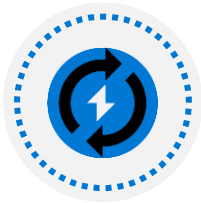


Horizontal scaling model

Compute tier offerings



Provisioned - provides a specific amount of compute resources



Serverless - auto-scales compute resources based on workload

Serverless



Requires a logical server



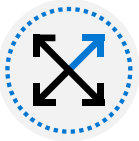
Like an auto-pause for Azure SQL Database



First connection to a paused database will receive an error, then the database service resumes



More expensive per minute than normal SQL Database, but can be much cheaper for databases that are largely idle like development and testing workloads



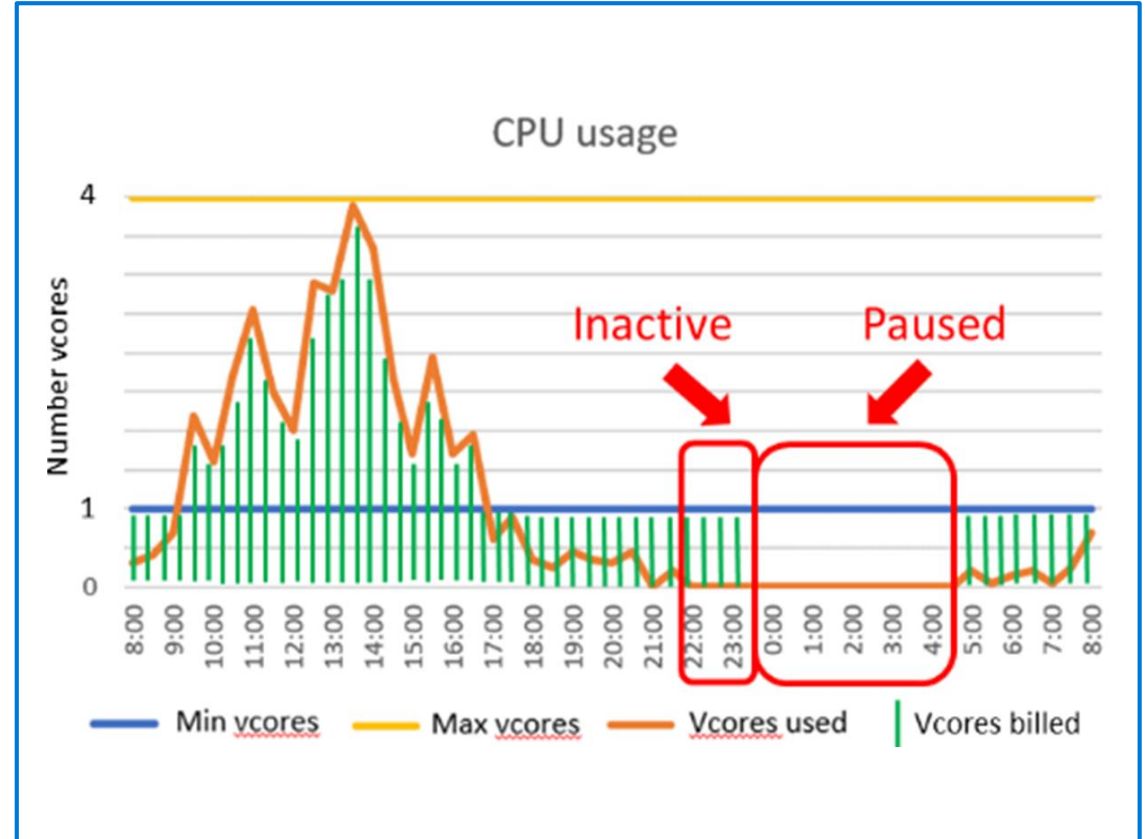
Allows for auto-scale as workloads increase by increasing the number of vCores allocated to the database

Azure SQL Database – Serverless

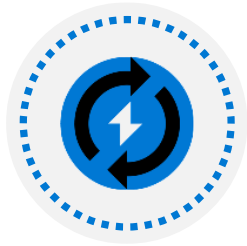
- Allows you to spend less for databases that do not need to be running 24x7
- Best suited for irregular workloads
- Only available in vCore model

Serverless incompatibility:

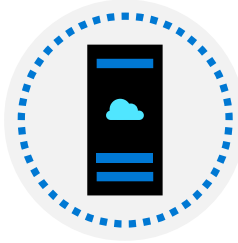
- Geo-replication
- Long-term backup retention
- A job database in elastic jobs
- The sync database in SQL Data Sync



Azure SQL Database backups and restore



Backups are performed automatically by the service



Backups are stored in geo-redundant storage accounts



Backup retention is **7** days by default, up to **35** days

Long-term retention (LTR)

- LTR allows you to restore an old version of the database by using the Azure portal, Azure CLI, or Azure PowerShell
- Read-access geo-redundant storage

Configure policies

SQL server

Point-in-time-restore

Specify how long you want to keep your point-in-time backups. [Learn more](#)

How many days would you like PITR backups to be kept?

Differential backup frequency

Specify how often you want differential backups to be taken. [Learn more](#)

Take a differential backup every:

Long-term retention

Specify how long you want to keep your long-term retention backups. You may choose to keep yearly backups for up to 10 years. [Learn more](#)

Weekly LTR Backups

Keep weekly backups for:

Monthly LTR Backups

Keep the first backup of each month for:

Yearly LTR Backups

Keep an annual backup for:

Which weekly backup of the year would you like to keep?

Elastic Jobs (preview) & Elastic Query (preview)

Elastic Jobs

You can create and schedule elastic jobs that could be periodically executed against one or many Azure SQL databases to run Transact-SQL (T-SQL) queries and perform maintenance tasks.

Elastic Query

- Allows you to run T-SQL queries that bridge multiple databases in SQL Database
- Increases portability for migration
- Partitioning strategies:
 - Vertical partitioning
 - Horizontal partitioning

SQL Data Sync

- Bi-directionally and incrementally synchronize data
- Good option for offloading intensive workloads in production
- Tracks changes using insert, update, and delete triggers

Scenarios

- Hybrid Data Synchronization
- Distributed Applications
- Globally Distributed Applications

Figure 1. Sync Between 2 Databases

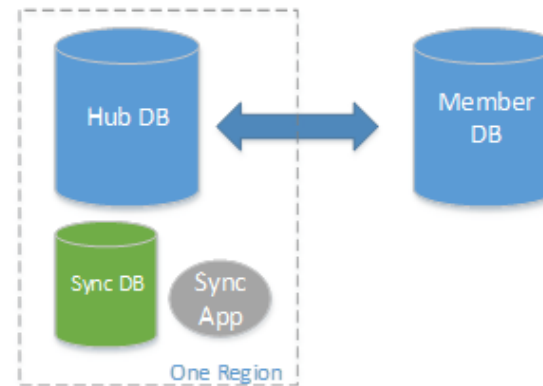
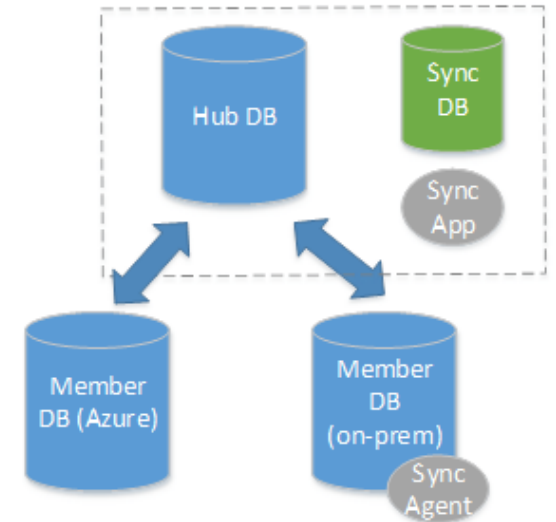


Figure 2. Sync Between 3 or more Databases



SQL Data Sync vs. Transactional Replication

	SQL Data Sync	Transactional Replication
Advantages	<ul style="list-style-type: none">• Active-active support• Bi-directional between on-premises and Azure SQL Database	<ul style="list-style-type: none">• Lower latency• Transactional consistency• Reuse existing topology after migration• Azure SQL Managed Instance support
Disadvantages	<ul style="list-style-type: none">• No transactional consistency• Higher performance impact	<ul style="list-style-type: none">• Can't publish from Azure SQL Database• High maintenance cost

Azure SQL Managed Instance



Azure SQL Managed Instance

Managed Instance is a PaaS offering that offers 99% of the functionality of SQL Server

Includes SQL Server Agent, Service Broker, and Common Language Runtime options

Allows for cross database queries

The Azure platform manages backups, patching, and high availability, embedded auditing, security and performance tools

Hybrid licensing for PaaS services

Both Azure SQL Database and Managed Instance support the hybrid licensing benefit:

Enterprise Edition

Each core entitles you to 8 cores of General Purpose, or 1 core of Business Critical

Standard Edition

Each core of entitles you to 1 core of General Purpose

Azure SQL Managed Instance service offerings

General purpose

- Uses Azure Premium storage
- Supports up to 16 TB of data
- Designed for applications with typical performance and I/O latency requirements

Business critical

- Supports readable secondary replicas of your database
- Direct attached storage (lower latency)
- Supports up to 4 TB of data

Azure SQL Database and Managed Instance have similar high availability architectures, which guarantee 99.99% percent uptime

Network connectivity architecture

Azure SQL Managed Instance is deployed within its own subnet in a virtual network

The Managed Instance service has a publicly accessible name, but is primarily accessible over a private IP address

Customers have to opt-in to having an open public IP endpoint

Azure platform does connect securely into managed instance to provide management activity

Backup and restore

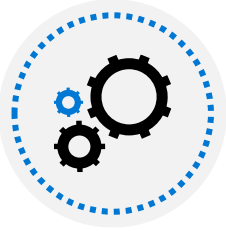


Backups are taken automatically



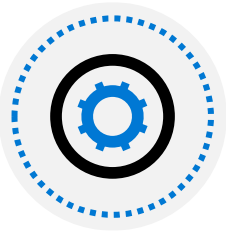
Can take an on-demand copy-only backup to Azure Blob Storage

Automatic Tuning



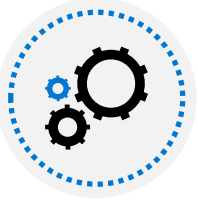
Provides the following features:

- Query Store/Query Performance Insight
- Identifying Expensive Queries
- Force Last Good Execution Plan
- Adding Indexes
- Removing Unused Indexes



All these features can be configured at the service level

Machine Learning Services



Provides machine learning operations within your relational database structure, by using Python and R packages

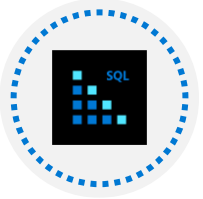


Provides high-performance capabilities:

- Train machine learning models based on either sampled dataset or population dataset
- Reduce complexity in security and compliance
- Deploy machine learning models using T-SQL stored procedures
- Use of open-source libraries like scikit-learn, PyTorch, and TensorFlow.

```
-- Enable Machine Learning Services feature  
EXEC sp_configure 'external scripts enabled', 1;  
RECONFIGURE WITH OVERRIDE;
```

Knowledge check



An Azure SQL Database Managed Instance represents what kind of cloud service?

- ☐ Software as a Service (SAAS)
 - ☐ Infrastructure as a Service (IAAS)
 - ☒ Platform as a Service (PAAS)
-



Which of the following is NOT a valid reason for migrating your database into an IaaS environment?

- ☐ Your applications need to run older versions of SQL Server, such as SQL Server 2016
 - ☒ You want Azure to manage all the upgrades, patching and server configuration
 - ☐ You need to use other SQL Server services with your application, such as SQL Server Analysis Services (SSAS), Integration Services (SSIS) and Reporting Services (SSRS)
-



Which of the following is NOT an Azure SQL Database deployment option?

- ☒ Availability Zones
- ☐ Serverless
- ☐ Elastic Pools

Summary

Prepare to maintain SQL databases on Azure:

- Understand the other Azure Data Platform roles
- Overview of the Azure service
- Understand Azure SQL Database service offerings
- Learn about the benefits of IaaS and PaaS database services

References

Frequently asked questions for SQL Server running on Windows virtual machines in Azure:

<https://docs.microsoft.com/azure/virtual-machines/windows/sql/virtual-machines-windows-sql-server-iaas-faq>

What is the Azure SQL Database service?

<https://docs.microsoft.com/azure/sql-database/sql-database-technical-overview>

What is Azure SQL Database managed instance?

<https://docs.microsoft.com/azure/sql-database/sql-database-managed-instance>

Thank you

