Introduction to Azure SQL

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SQL
SQL
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Azure SQL

Azure SQL

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

SQL Server on Azure Virtual Machines

Best for re-hosting and apps requiring OS-level access and control

Automated manageability features and OS-level access

Azure SQL Managed Instance

Best for modernizing existing apps

Offers high compatibility with SQL Server and native VNET support

Azure SQL Database

Best for building new apps in the cloud

Pre-provisioned or serverless compute and Hyperscale storage to meet demanding workload requirements

Infrastructure as a Service

Platform as a Service

IAAS vs PAAS

SQL Server in Azure VM

- It's a VM!
- Management of OS and SQL Server
- Select Version, OS, Edition
- Single VM availability SLA: 99.9%
  (<43 min downtime p/month)
  Multi-VM availability SLA: 99.95%
  (<21 min downtime p/month)

Azure SQL Database Managed Instance*

- Migrate Fleet of Databases
- Security Isolation with Azure VNet
- Application Surface Compatibility
  SQL Agent, Profiler
  Cross DB querying, CLR, Replication, CDC, Service Broker
- Database sizes up to 35TB
- Minimize Migration Downtime
- All Azure SQL Database features

Azure SQL Database

- Fully managed Database
- Active Learning and Optimization
- End to End Integration
- Intelligent Data Protection & Security
- Application & Data Modernization
- Up to 4 TB single Databases
  > using Elastic Scale
- Geo-DR
- Database availability SLA: 99.99%

IaaS vs PaaS

- Business continuity
- High availability
- Automated backups
- Long term backup retention
- Geo-replication
- Scale
- Advanced security
- Version-less
- Built-in monitoring
- Built-in intelligence

Focus on your business…

Your work so far	How PaaS helps?
Hardware purchasing and management	**Built-in** Scales on-demand
Protect data with backups (with health checks and retention)	**Built-in** Point-In-Time-Restore
High availability implementation	**Built-in** 99.99% SLA and auto-failover
Disaster recovery implementation	**Built-in** Geo-redundancy and geo-replication
Ensure compliance with standards on your own	**Built-in** / easy to use features
Secure your data from malicious users and mistakes	**Built-in** / easy to use features
Role out updates and upgrades	**Built-in**
Monitor, troubleshoot and manage at scale	**Built-in** / easy to use features
Tune and maintain for predictable performance	**Built-in**/ easy to use features

Migration Tools & Services

Data Migration Assistant

Rich assessments at scale

Feature recommendations

Schema conversions

Azure Database Migration Service

MS and non-MS source support

Built for scale and reliability

Built with enterprise security and privacy

SQL Server on Azure Virtual Machines

Deployment Choices

Marketplace pre-installed SQL Server on Windows or Linux
Install your own SQL Server
Lift and Shift with Azure Migrate (Azure Site Recovery)

Resource Provider

Unlock Licensing and Edition Flexibility
Automated Backups and Security Updates
Manage VMs through Azure SQL in portal

Sizes and Storage Performance

Memory or Storage optimized sizes for best performance
Data and log on Premium Storage Managed Disks
Azure Blob Read Caching for data disks

Tempdb on local SSD
Ultra disks for extremely low latency needs

Networking and Security

Virtual Networks to integrate with on-premises
Advanced Data Security services (Preview)

HADR

Azure VM built-in HA
Azure Storage built-in DR
Azure Backup and Automated backups to Azure Blob Storage
File-Snapshot Backups

Failover Cluster Instance with Azure Premium File Share
Always On Availability Groups with Cloud Witness
Hybrid Availability Group Secondary replicas
HADR on RedHat Linux with Pacemaker and fencing

Azure SQL managed instance eases cloud migration

Customer challenge

I want to migrate to the cloud, remove management overhead, but I need instance-scoped features (Service Broker, SQL Server Agent, CLR…)

Solution

Managed instance combines leading security features with SQL Server compatibility and business model designed for on-premises customers

Key features

Single instance or instance pool

SQL Server surface area (vast majority)

Native virtual network support

Fully managed service

On-premise identities enabled with Azure AD and AD Connect

Azure differentiators

Near zero downtime migration using log shipping

Fully managed business continuity with failover groups

Projected return on investment of 212 percent over three years[1]

The best of SQL Server with the benefits of a managed service

Azure SQL Database is built for modern cloud apps

Customer challenge

I want to build modern apps, potentially multi-tenanted, with the highest uptime and predictable performance

Solution

Azure SQL Database is a highly scalable cloud database service with built-in high availability and machine learning

Key features

Single database or elastic pool

Hyperscale storage (100TB+)

Serverless compute

Fully managed service

Private link support

High availability with AZ isolation

Azure differentiators

Industry highest availability SLA of 99.995%

Industry only business continuity SLA with 5 second RPO and 30 second RTO

Price-performance leader for mission-critical workloads while costing up to 86 percent less than AWS RDS (GigaOm)

Azure SQL MI or DB?

Azure SQL managed instance

Single instance

SQL Server surface area (vast majority)

Native virtual network support

Fully managed service

Instance pool

Pre-provision compute resources for migration

Enables cost-efficient migration.

Ability to host smaller instances (2Vcore)

Currently in public preview

Azure SQL Database

Single database

Hyperscale storage (up to 100TB)

Serverless compute

Fully managed service

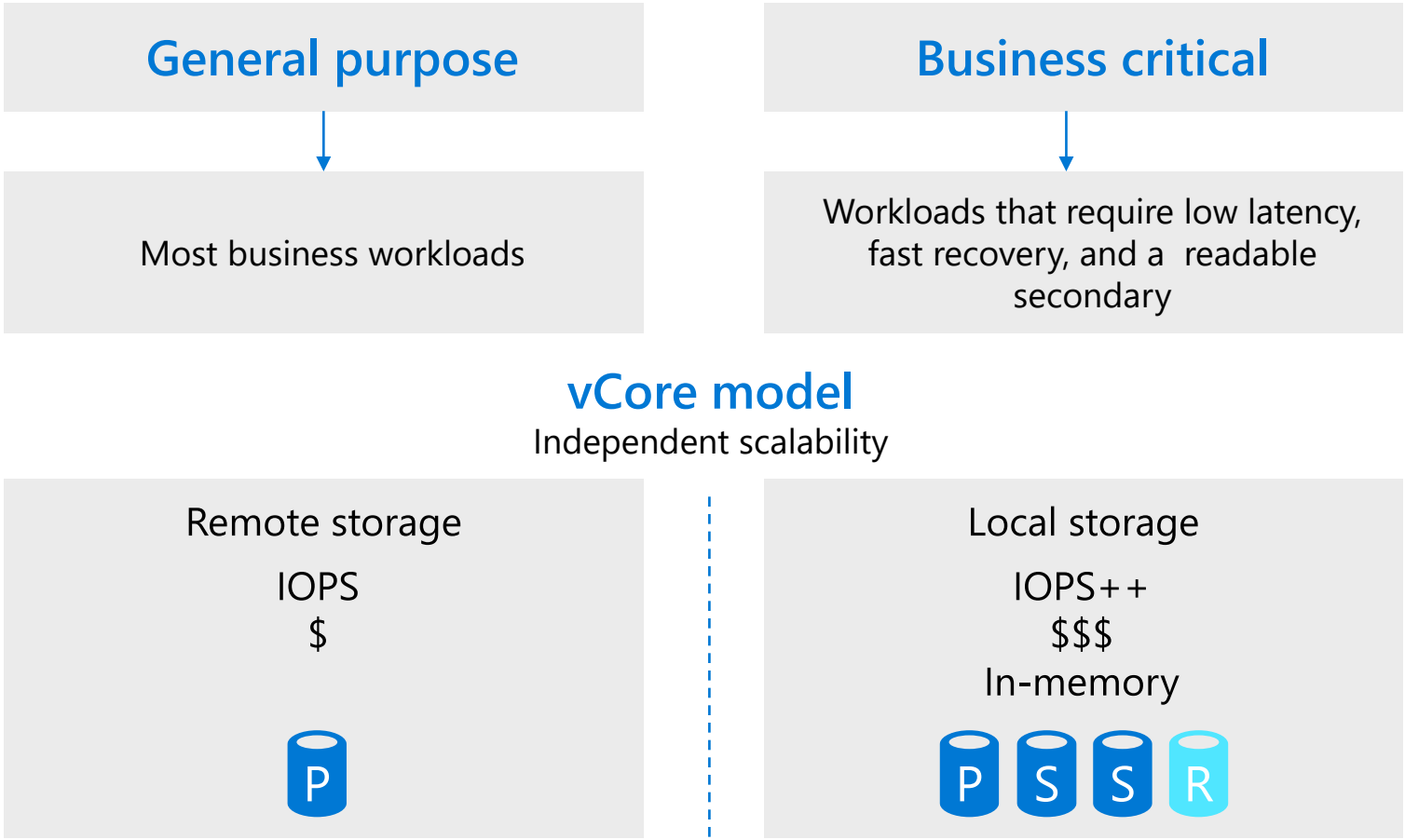
Elastic pool

Resource sharing between multiple databases to price optimize

Simplified performance management for multiple databases

Fully managed service

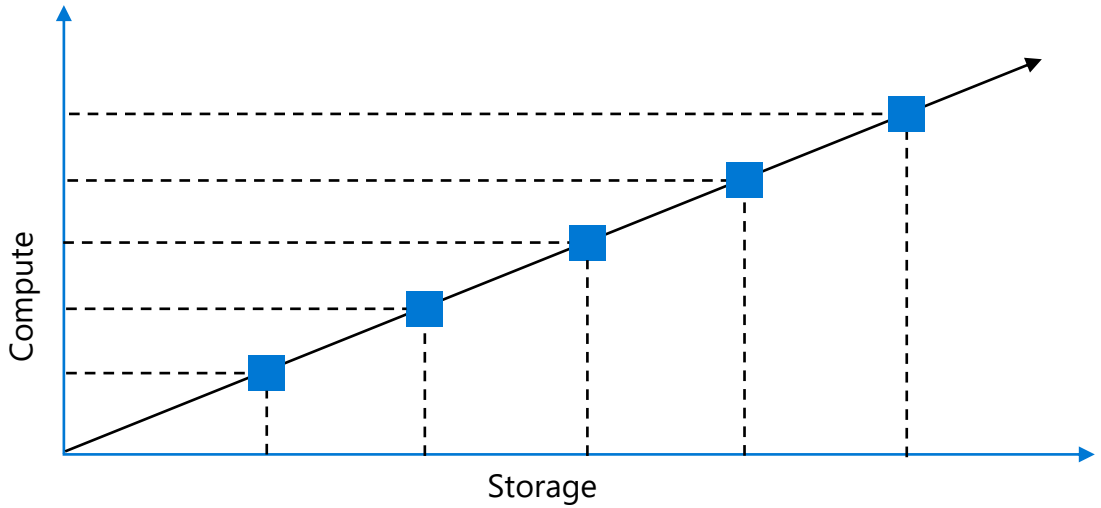
Service tiers – Managed Instance



Purchasing models - Single Database

DTU model

Simple, preconfigured



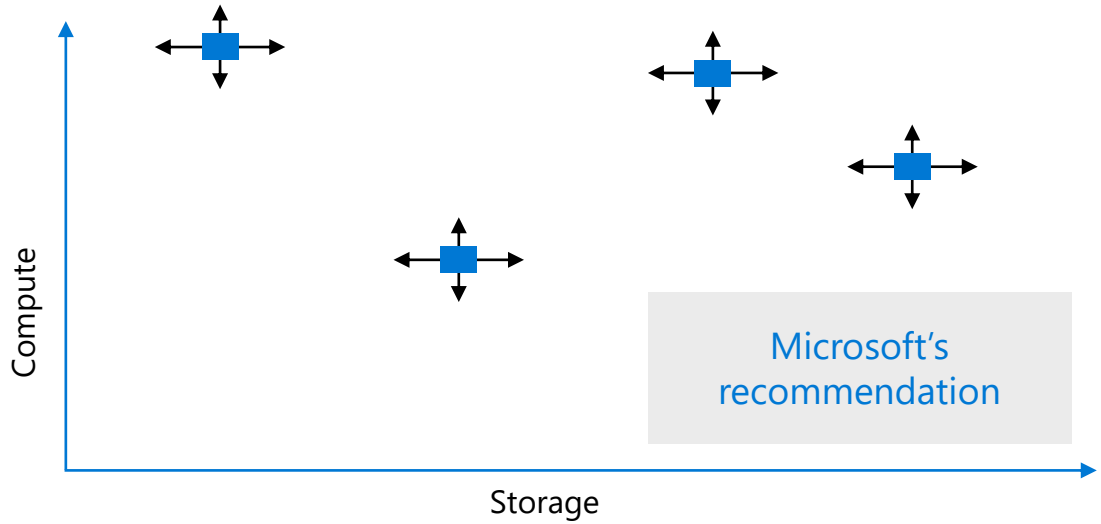
Pre-packaged, bundled unit that represents the database power

Designed for predictable performance, but somewhat inflexible and limited in options

DTU sizing offers simplicity of choice

vCore model

Independent scalability



This model allows you to independently choose compute and storage resources. It also allows you to use Azure Hybrid Benefit for SQL Server to gain cost savings.

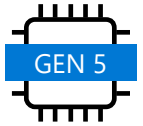
Best for customers who value flexibility, control and transparency

Service tiers – SQL Database

General purpose	Business critical	Hyperscale*
Most business workloads	Workloads that require low latency, fast recovery, and a readable secondary	Most business workloads with highly scalable storage and read-scale requirements
Remote storage IOPS $ Serverless* 	Local storage IOPS++ $$$ In-memory 	Local + remote storage IOPS+ $$ Unlimited storage

*Not in managed instance

Hardware

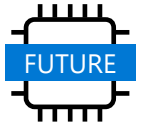


Gen5

80 vCore limit

Up to 4 TB of local storage

Accelerated Networking is guaranteed



Future

Future hardware generations

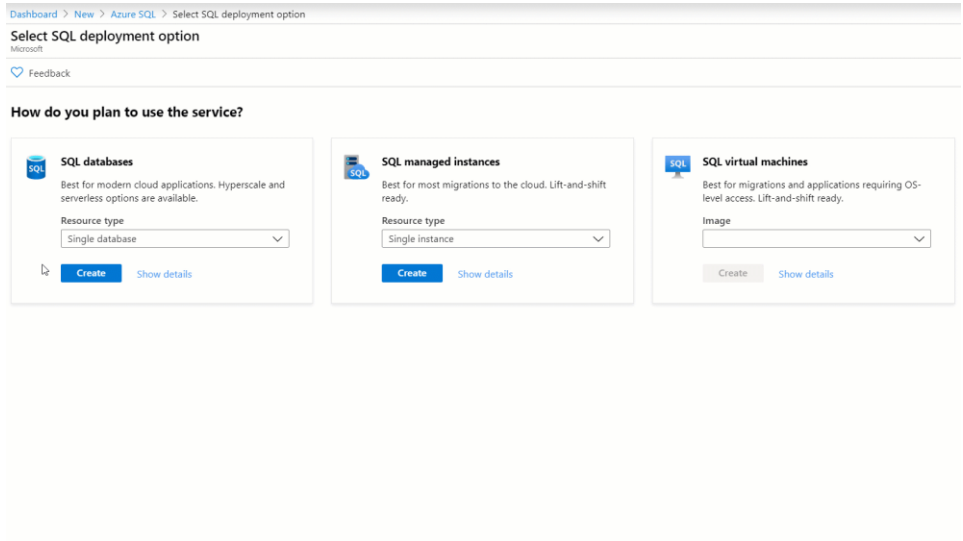
M-series (memory optimized)

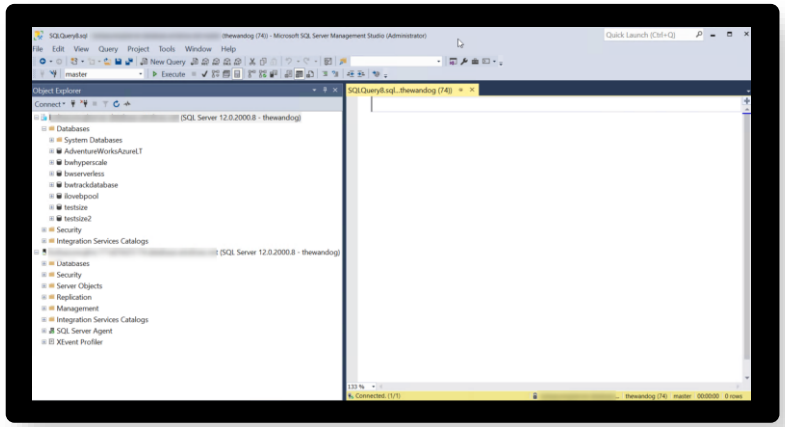
- 128 vCores (hyperthreaded)
- 3.8 TB memory
- Business critical (preview)

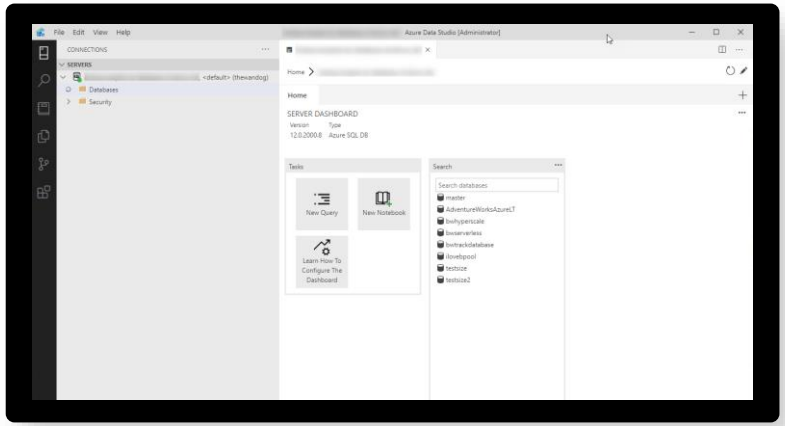
Fsv2-series (compute optimized)

- 72 vCores (hyperthreaded)
- 3.4 GHz sustained turbo clock speed
- General purpose (preview)

Interfaces for Azure SQL







T-SQL	Powershell	az cli
REST API	sqlcmd	bcp

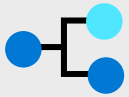
Summary

- Azure SQL has evolved into **the world's database**
- **Azure SQL includes** Virtual machine, Managed Instance, and Database
- **SQL Server on Azure Virtual Machines** is best for 100% lift and shift
- **Azure SQL Managed Instances:** Database engine instance + power of PaaS
- **Azure SQL Database** for modern cloud apps providing you the most PaaS capabilities

Azure SQL Enterprise-class security

Network security

- VNET
- Firewall Rules, NSG
- Private Link



Identity and access

- Authentication options: Azure AD, SQL Auth, Windows Auth
- Azure RBAC
- Roles & Permissions
- Row-level security

Data protection

- Encryption-in-use (Always Encrypted)
- Encryption-at-rest (TDE)
- Encryption-in-flight (TLS)
- User-managed keys
- Dynamic Data Masking

Security management

- Advanced Threat Detection
- SQL Audit
- Audit Integration with Log Analytics and Event Hubs
- Vulnerability Assessment
- Data Discovery & Classification
- Azure Security Center

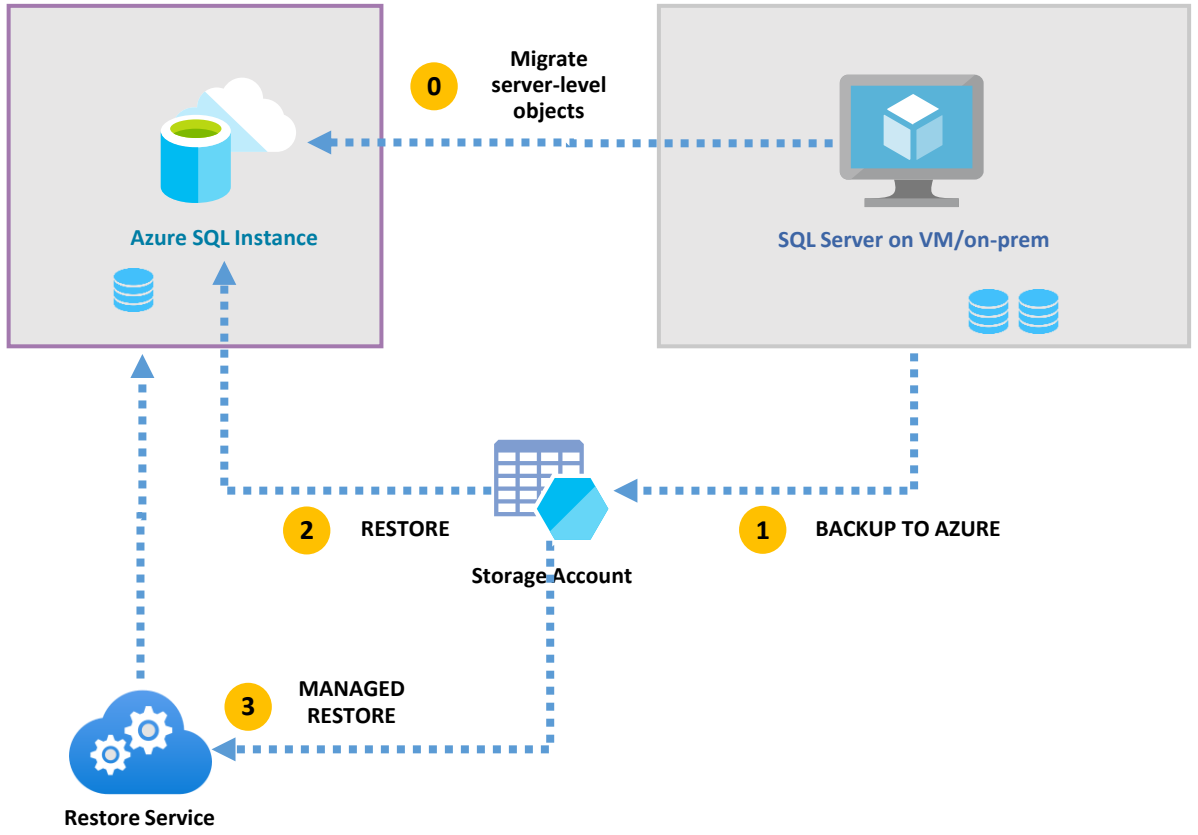
Easy Database Migration

Offline

- Native backup/restore
- BACKUP WITH CHECKSUM

Online

- Data Migration Service
- Replication
- Log shipping



Performance Capabilities and Tasks

Performance capabilities

- Memory, CPU, I/O capacities
- Indexes
- In-Memory OLTP
- Partitions
- Intelligent Performance

Performance tasks

- Configuring and Maintaining for Performance
- Monitoring and Troubleshooting Performance
- Performance Scenarios
- Accelerating and Tuning Performance

Azure SQL performance capabilities

Max capacities

- Azure SQL Database - Up to 128 vCores and 4TB Memory and 4TB Database (data)
- Hyperscale – 100TB Max Database Size
- Managed Instance – Up to 80 vCores, 400GB Memory, and 8TB Database (data)
- sys.dm_os_job_object for true capacities

Indexes

- All index types are supported
- Online and resumable indexes fully supported
- Columnstore Indexes available in almost all tiers

In-memory OLTP

- Available in Business Critical Tiers
- Memory Optimized FILEGROUP created with database creation
- Max memory a portion of overall memory limit

Partitions

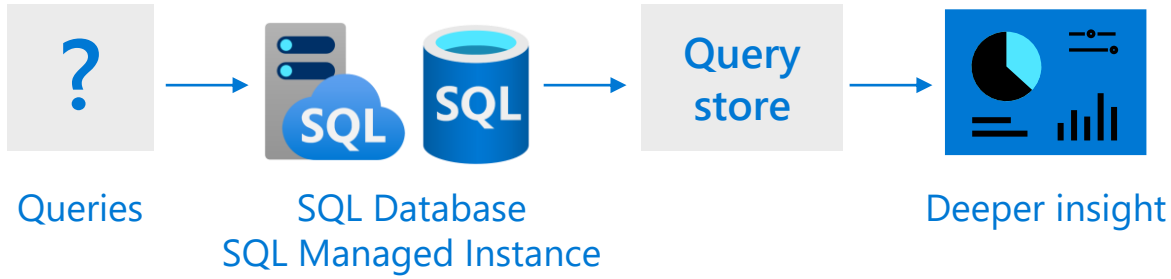
- Supported for both Azure SQL Database and Managed Instance
- Placement on filegroups only supported for Managed Instance

SQL Server 2019 performance enhancements

- Not 100% in Azure SQL (today)
- Intelligent Query Processing (except for Scalar UDF Inlining)

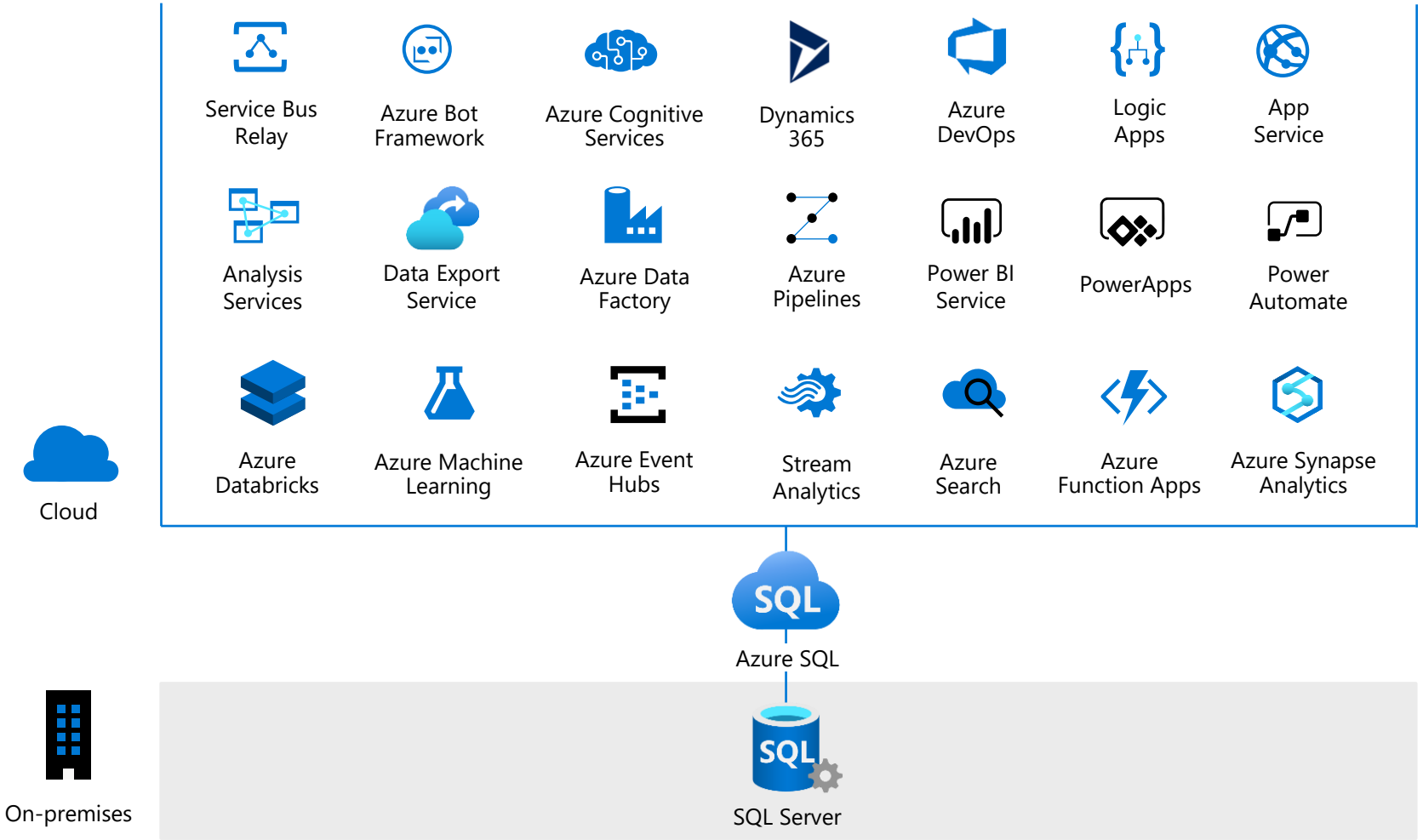
Monitoring and Troubleshooting Performance

- Azure Monitor Metrics, Alerts, and Logs
- Dynamic Management Views
- Extended Events
- Lightweight Query Profiling on by default
- Query Plan Debugging with SET statements
- Query Store on by default
- Performance Visualizations in portal



Building modern apps with Azure SQL

- IoT
- Analytics
- Streaming
- Visualizations
- Automation
- Notification
- Alerting
- Web/Mobile



Azure Updates

Managed Instance

- App compatibility:
  - AAD logins, Trace Flags
  - Distributed Transactions (preview), ML services (preview),
  - SSRS catalog in MI
- Network and connectivity:
  - Public Endpoint, Service Endpoints, Subnet Delegation, Inbound and outbound subnet lockdown
  - Global VNet peering
- PaaS features and manageability:
  - Failover Groups, TDE BYOK, Accelerated DB recovery, PITR (deleted DBs , cross subscriptions), AAD password hash/pass-through auth, SCOM MP
  - Testing application fault resiliency
  - Management operations progress indicator
  - Backups – compression, configurable retention, zone redundant storage
  - Long term retention (limited preview)
- Perf:
  - tempdb, log write throughput and IOPS improvements

Recent
New

Azure Updates

Hyperscale

- Change Tracking (GA)
- Geo DR (Preview)
- DB Copy (Preview)

Serverless

- Maximum vCore limit: 40 vCores
- Minimum auto-pause delay: 1 hour
- Broader API support including PS & CLI

Recent
New

Azure Updates

Platform

- Private Link
- PAUSED_RESUMABLE_INDEX_ABORT
- UTF-8 support
- New memory and compute optimized SKUs
- Backup storage redundancy options
- Zone redundancy for GP tier
- AAD Server Principals

Virtual Machines

- SQL VM Resource Provider
- Free DR replica for on-premises
- Free HA or DR Azure SQL Server
- Automated patching
- SQL 2019 Linux images
- SQL FCI using Azure Shared Disk
- Configure Always On AG through portal

Recent
New

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Get started today!

Web pages

Azure SQL family

- SQL Server on Azure Virtual Machines
- Azure SQL Managed Instance
- Azure SQL Database

Free SQL Server and Azure training

Choose Your Azure SQL database tool

Azure Hybrid Benefit for SQL Server

Azure SQL Blogs

Migration guide

Microsoft Learn: Azure SQL fundamentals

YouTube: Azure SQL for beginners

YouTube: Data Exposed

3rd party studies

GigaOM price-performance study

Forrester Consulting Total Economic Impact™ study

Resources

Azure SQL family

Azure SQL Database serverless

Azure SQL customer stories

Key takeaways

Azure SQL managed databases take your workloads and apps to the next level

- Evergreen SQL
- Industry's highest SLA on Azure SQL Database
- ML-based performance and security
- Streamlined app modernization
- Hyperscale demanding workloads
- Optimize price-performance with serverless compute
- Save with the best total cost of ownership

Keep Learning

Azure SQL fundamentals - Learn

QR: **https://cutt.ly/ngnX9ob**

Introduction to Azure SQL

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THANK YOU!!!
GRACIAS!!!