

This Online Webinar is organized by Scholar IT Solutions

 Scholar IT is IT Solutions provider Scholar IT is a group of Professionals with Technical and Domain Expertise and now an experienced and robust team of efficient people are serving its clients(entire USA) It is one of the best company in US.
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EXPERIENCE

Over 11 years of experience SQL Server 2000 to now

- PostgreSQL
- MySQL
- MongoDB
- Cassandra
- Azure (Azure SQL)
- AWS RDS

CERTIFICATIONS

- Microsoft Certified Trainer
- MCSA
- Azure Solution Architect
- Azure Administrator
- Azure Database Administrator
- AWS CCP
- Cassandra Administrator

ROHIT KUMAR (database operation manager)

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/ Azure SQL

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Introduction to Azure SQL

- No Physical hardware
- Flexible deployment models
 - Single Database, Elastic Pool, Serverless, Managed Instance, Instance Pool

Supports variety in Data

- Graphs, JSON, spatial, XML
- Affordable
- Scalable
- Reliable and Highly Available
- Intelligent Protection

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History of Azure SQL



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INTRODUCTION TO AZURE SQL

Azure SQL Deployment Options

Azure SQL

SQL virtual machines Best for migrations and applications requiring OS- level access	Best for most lift- th	ed instances and-shift migrations to e cloud	Data Best for modern cloud a serverless opt	abases opplications. Hyperscale and ions are available
SQL	SQL	SQL	SQL	
SQL virtual machine	Single instance	Instance pool	Single database	Elastic pool
 SQL Server and OS server access Expansive SQL And OS version support Automated manageability features for SQL Server 	 SQL Server surface area (vast majority) Native virtual network support Fully managed service 	 Pre-provision compute resources for migration Enables cost-efficient migration. Ability to host smaller instances (2Vcore) Fully managed service In public preview 	 Hyperscale storage (up to 100TB) Serverless compute Fully managed service 	 Resource sharing between multiple databases to price optimize Simplified performance management for multiple databases Fully managed service
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- Purchasing Models, Service tiers
 - DTU Based
 - vCore Based



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



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

Best for customers who value flexibility, control and transparency

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Purchasing Models, Service tiers

DTU Based

	Basic	Standard	Premium
Max Storage Size	2 GB	1 TB	4 TB
Max DTUs	5	3000	4000

	Basic	Standard	Premium
Target workload	Development and production	Development and production	Development and production
Uptime SLA	99.99%	99.99%	99.99%
Maximum backup retention	7 days	35 days	35 days
IOPS (approximate)*	1-4 IOPS per DTU	1-4 IOPS per DTU	>25 IOPS per DTU
IO latency (approximate)	5 ms (read), 10 ms (write	5 ms (read), 10 ms (write	2 ms (read/write)
Columnstore indexing	N/A	S3 and above	Supported
In-memory OLTP	N/A	N/A	Supported

	Basic	Standard	Premium
Max Storage Per Database	2 GB	1 TB	4 TB
Max Storage Per Pool	156GB	4TB	4TB
Max eDTU per DB	5	3000	4000
Max eDTU per pool	1600	3000	4000
Max no of DBs per pool	500	500	100

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- Purchasing Models, Service tiers
 - vCore Based
 - Service tier in vCore purchase model include
 - General Purpose
 - Provisioned
 - Billed per hour based on vCores configured (2-80 vCores, 1-408GB RAM)
 - Serverless
 - Billed per second based on vCores used (1-40 vCores, 3-120GB RAM)
 - Minimum auto-pause time is 1 hour and max is 7 days.
 - Business Critical
 - Hyperscale
 - 2-80 vCores
 - Up-to 408 GB RAM

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- Azure SQL VMs
 - IaaS option to deploy SQL Server in Azure.
 - Hardware is managed by MS.
 - SQL can be installed after creating VM or can be installed while creating VM using an Image which comes with pre-installed SQL Server.
 - BYOL can be used for license cost savings.
 - Best option for On-Prem SQL Server life and shift.
 - Automated Patching and Automated Backups are supported.
 - Read caching can be enabled for data disks for better performance
 - Ad-hoc backups can be taken to Azure storage account.
 - Always on Failover cluster instance can be created by using "Premium file share" as clustered storage.
 - Always on Availability Groups can be created by adding replicas to same availability sets.

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TDE is not default but supported.

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- Azure SQL Single Database
 - DB size is based on service tier (P15 supports up-to 4TB)
 - Azure SQL Hyperscale supports up-to 100TB
 - Databases per logical server are 5000
 - Max DTU or eDTU is 54000 per server.
 - Multiple log files are not supported.
 - Uses AG in background to support promised SLA
 - Data is stored on RA-GRS storage blobs that is replicated to paired region.
 - Supports Geo-Replication and PITR
 - Supports auto-patching.
 - Built-in license (Pay-as-you-go)
 - No SQL agent, DB mail or Linked Servers
 - TDE enabled by default.
 - Restores or PITR only possible using portal as we don't have access to backups.

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- Only Full recovery model supported
- Can be a subscriber for transactional/snapshot replication

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- Azure SQL Elastic Pool
 - Best suited for DBs of varying and unpredictable usage demands.
 - The databases in an elastic pool are on a single server and share a set number of resources at a set price.
 - Minimum and maximum DTUs or minimum or maximum vCores are set for each DB in a pool.
 - Supports PITR, Geo-restore and active geo-replication.









Azure SQL Elastic Pool



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- Azure SQL Database Serverless
 - Serverless is a compute tier for single databases in Azure SQL Database that automatically scales compute based on workload demand and bills for the amount of compute used per second.
 - serverless compute tier also automatically pauses databases during inactive periods when only storage is billed and automatically resumes databases when activity returns.
 - The serverless compute tier for single databases in Azure SQL Database is parameterized by a compute autoscaling range and an auto-pause delay.
- Single databases with intermittent, unpredictable usage patterns interspersed with periods of inactivity and lower average compute utilization over time.
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- Azure SQL Hyperscale service tier
 - Supports vCore based purchasing model.
 - Supports up-to 100 TB of database size.
 - Nearly instantaneous database backups (based on file snapshots stored in Azure Blob storage) regardless
 of size with no IO impact on compute resources.
 - Fast database restores (based on file snapshots) in minutes rather than hours or days (not a size of data
 operation).
 - Higher overall performance due to higher transaction log throughput and faster transaction commit times regardless of data volumes
 - Rapid scale out you can provision one or more <u>read-only replicas</u> for offloading your read workload and for use as hot-standbys

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- Rapid Scale up you can, in constant time, scale up your compute resources to accommodate heavy workloads when needed, and then scale the compute resources back down when not needed.
- Two replicas are created by default but can be upgraded to 4.
- Pricing:
 - Compute : Compute unit price per replica.
 - Storage: Pay-as-you-use. Auto-growth is 10GB per growth event.
- Azure SQL Database can be moved to Hyperscale but not vice-versa.

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INTRODUCTION TO AZURE SQL

Azure SQL Hyperscale service tier

- Azure SQL Managed Instance
 - Fully managed PaaS offering with broadest SQL Server database engine compatibility
 - SQL Managed Instance has near 100% compatibility with the latest SQL Server (Enterprise Edition) database engine.
 - No support for DTU purchasing model.
 - Supports General Purpose and Business Critical service tiers
 - Support of vNet to address common security concerns.
 - Best PaaS service to life and shift with minimal application and database changes while providing all PaaS capabilities like automatic patching, version updates, automated backup and high availability).

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- Supports BYOL using Azure Hybrid Benefit for SQL Server.
- Supports TDE, Azure AD authentication, SSO, Auditing, ATP etc...

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- Azure SQL Managed Instance Pool
 - Instance pools allow you to pre-provision compute resources according to your total migration requirements. You
 can then deploy several individual managed instances up to your pre-provisioned compute level.
 - Ability to host 2-vCore instances.
 - Total storage per pool is 8TB.
 - 2 vCore instance 32 GB 640 GB
 - 4 vCore instance 32 GB 2 TB
 - Max supported DBs
 - 8 vCores : 200 DBs for entire pool
 - 100 DBs per instance, 50 DBs for 2 vCore instance
 - 16 vCore: 400 DBs
 - 24+ vCores : 500 DBs
 - AAD admin cannot be set for instances deployed inside instance pool so only SQL logins are supported.
 - Only General Purpose service tier is supported (Public Preview)
 - Cannot be scaled so planning before deployment is important (PP)
 - Cannot be created using portal, only PS deployement is supported. (PP)
 - Instance cannot be taken outside of pool or outside instance cannot be brought into the pool (PP)
 - Pricing: vCore price is charged on Pool level. Compute and storage are charged independently. (first 32 GB is free)

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- HA/DR Options in Azure SQL (VM)
 - Disks:
 - Azure keeps 3 copies (locally) of each disk in azure blob storage (Eligible for VM)
 - Storage has built-in durability with RAID levels

• HA

- Always On FCI Supported with Azure Shared disks (Premium SSD and Ultra Disks)
- Always On AG (Same Region)
- SQL Server data files in Azure
- DR

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- Log Shipping On Prem also supported
- Database Mirroring Authenticate via DC or Server certificates
- Always on AG (Different Region) Or on PREM
- Backup to Azure
- Azure Site Recovery: Replicate and failover SQL Server to Azure with ASR
- Geo-Replication Support for VM Disks: Must place all data and log files of a database on one disk due to async nature of data replication in Geo-Replication.

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HA/DR Options in Azure SQL (VM)

- Free DR Replica in Azure VMs (Via Software Assurance) where we can have two free passive secondaries when all three replicas are hosted in Azure.
- While setting up VM HA, make sure to put them all in same Availability set. It meets at least 99.95% SLA.

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HA/DR Options in Azure SQL (VM)

 With a licensed primary on-premises, one free passive for HA, one free passive for DR onpremises, and one free passive for DR in Azure.

Hybrid failover with primary on-prem

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- Built-in HA/DR Options in Azure SQL Database and MI
 - Azure SQL DB and MI provides 99.99% SLA.
 - There are two high availability architectural models:
 - Standard availability model that is based on a separation of compute and storage. It relies on high availability and reliability of the remote storage tier. This architecture targets budgetoriented business applications that can tolerate some performance degradation during maintenance activities.
 - The Basic, Standard, and General Purpose service tiers leverage the standard availability architecture for both serverless and provisioned compute.
 - Premium availability model that is based on a cluster of database engine processes. It relies on the fact that there is always a quorum of available database engine nodes. This architecture targets mission critical applications with high IO performance, high transaction rate and guarantees minimal performance impact to your workload during maintenance activities.

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Premium and Business Critical service tiers leverage the Premium availability model

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INTRODUCTION TO AZURE SQL

- Built-in HA/DR Options in Azure SQL Database and MI
 - Standard availability model Azure Region

- Built-in HA/DR Options in Azure SQL Database and MI
 - Premium availability model

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- Zone Redundancy HA/DR Options in Azure SQL Database and MI
 - Azure SQL DB General Purpose (Serverless, Provisioned compute), Premium and Business Critical service tier can be Zone redundant to sustain catastrophic datacenter outages.
 - MI does not support Zone redundancy.

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- Standard Geo replication
 - Here, a copy of your data is being constantly, asynchronously written to a secondary database on a server in another region. It's a non-readable copy, though, so you can't use it for queries or reporting. In the event of a disaster, however, you can fail over to the secondary.
- Active Geo Replication is supported by Azure SQL Database (DB Level) (Hyperscale in PP).
 - Active geo-replication is an Azure SQL Database feature that allows you to create readable secondary databases of individual databases on a server in the same or different data center (region).
 - Active geo-replication replicates changes by streaming database transaction log. It is unrelated to <u>transactional replication</u>, which replicates changes by executing DML (INSERT, UPDATE, DELETE) commands.
 - Up to four secondaries are supported in the same or different regions, and the secondaries can also be used for read-only access queries.
 - The failover must be initiated manually by the application or the user. After failover, the new primary has a different connection end point.
- MI does not support Active Geo Replication

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- Auto-failover Groups
 - Multiple DBs can be clubbed together into a group which needs to be failed over together.
 - Only one secondary server or instance in a different region
 - Secondaries can be used for RO workload
 - Listener end-points remain unchanged during failovers
 - FailoverGroupName.Database.Windows.Net (RW)
 - FailoverGroupName.Secondary.Database.Windows.Net (RO)
 - Default configuration is automatic-failover.
 - Default grace period for auto-failover is 1 hour, max to 24 hours.

	Geo-Replication	Auto-Failover Group
Auto-Failover	No	Yes
Failover multiple DBs	No	Yes
Change in Connection string after failover	Yes	No
MI Support	No	Yes
Can be in same region as Primary	Yes	No
Multiple Replicas	Yes	No
Supports read-scale	Yes	Yes

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- Backup/Restore in Azure SQL
 - VMs
 - Automated Backup using SQL Server IaaS Extension.
 - Max retention is 30 days using this method.
 - Ad-hoc to local disk or Azure Blob Storage
 - Azure Backup for IaaS VM (Minimum 24 hours RPO, No support for AG,
 - Azure Backup for SQLVMs (Policy Driven backup and retention, Support for AG, 15-minutes RPO).
 - Azure SQL Database and MI
 - Full-Weekly
 - Diff Every 12 hours*
 - Log every 5-10 minutes*.
 - Backup Retention: 7-35 Days (Basic Tier is only 7 Days)
 - PITR is directly dependent on Backup retention
 - Long Term Backup Retention
 - Leverage automatic backups
 - Up-to 10 years
 - Stored in RA-GRS storage account (LRS and ZRS in PP)

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Backup/Restore in Azure SQL

- A new DB can be restored on same logical server.
- A deleted database can be recovered on same logical server
- A DB can be recovered in a different region using RA-GRS backups but restoration point depends on latest backup availability in storage account.

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- Cannot overwrite an existing database during a restore
- Deleting a logical server will delete all backups of that server.
- DB cannot be restored over on-prem.

- Security in Azure SQL
 - Network security
 - IP Firewall Rules
 - vNet Firewall Rules
 - Access Management
 - Authentication
 - SOL Authentication
 - AAD Authentication
 - Authorization
 - Row-Level Security
 - Threat Protection
 - SQL Auditing
 - ATP

Security in Azure SQL

- Information Protection
 - TDE (Encryption at rest)
 - TLS (Encryption in transit)
 - Always Encrypted
 - Dynamic Data Masking
- Security Management
 - Vulnerability Assessment
 - Data Discovery and classification
 - Compliance

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- Monitoring Azure SQL
 - Azure Monitor SQL insights
 - Can monitor DB, MI and VMs as well
 - Uses a remote agent to capture data using DMVs and routes data into Azure Log analytics.
 - Monitoring resources using Metrics
 - CPU monitoring
 - Memory Monitoring
 - IO Monitoring
 - Database Advisor for Azure SQL DB
 - Single DB
 - Elastic Pool
 - Monitoring using Query Performance Insights
 - Uses Query Store to analyze query performance
 - Monitoring using Intelligent Insights for DB and MI

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- How to learn Azure SQL?
 - MS Learn
 - https://docs.microsoft.com/en-us/learn/paths/azure-sql-fundamentals/
 - YouTube
 - https://www.youtube.com/playlist?list=PL3EZ3A8mHh0wcu2J115yHfkIsT-oVagf1
 - https://www.youtube.com/playlist?list=PLlrxD0HtieHi5c9-i Dnxw9vxBY-TgaeN
 - https://www.youtube.com/watch?v=P3qmqUZJ710
 - Certification
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