

Learn Azure SQL Database through customer use cases

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Instructions:

Please keep your microphones on mute during the entire session

Type in your questions in chat window, it will be answered towards the end of our session



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Section 4

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- Understanding SQL Security
- SQL DB Metrics and Auditing
- Backing up your database
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Single databases are optimized for modern application development of new cloud-born applications. Databases provide a fully managed SQL experience with extensive and easy to use manageability features.

It's based on the latest stable version of the [Microsoft SQL Server database engine](#). You can use advanced query processing features, such as [high-performance in-memory technologies](#) and [intelligent query processing](#). In fact, the newest capabilities of SQL Server are released first to SQL Database, and then to SQL Server itself.

The screenshot shows the 'How do you plan to use the service?' section in the Azure portal. It contains three cards:

- SQL databases:** Best for modern cloud applications. Hyperscale and serverless options are available. Resource type: Single database. Buttons: Create, Show details.
- SQL managed instances:** Best for most migrations to the cloud. Lift-and-shift ready. Resource type: Single instance. Buttons: Create, Show details.
- SQL virtual machines:** Best for migrations and applications requiring OS-level access. Lift-and-shift ready. Image: [Dropdown menu]. Buttons: Create, Show details.

In addition, SQL Database provides built-in [business continuity](#) and [global scalability](#) features. These include:

[Automatic backups](#), [Point-in-time restores](#), [Active geo-replication](#), [Auto-failover groups](#), [Zone-redundant databases](#):



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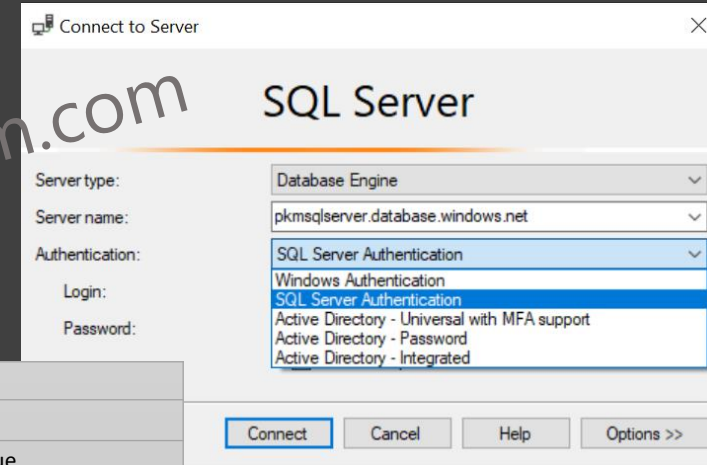
Section 4

- SQL Server Management Studio
- Azure Data studio
- Azure Portal
- Visual Studio Code

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TABLE 1

Setting	Suggested value	Description
Server type	Database engine	Required value.
Server name	The fully qualified server name	Something like: servername.database.windows.net.
Authentication	SQL Server Authentication	This tutorial uses SQL Authentication.
Login	Server admin account user ID	The user ID from the server admin account used to create the server.
Password	Server admin account password	The password from the server admin account used to create the server.





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As you prepare for migrating your database to the cloud, verify that your source environment is supported and that you have addressed any prerequisites. This will help to ensure an efficient and successful migration.

Offline versus online migrations

When you migrate SQL Server databases to Azure by using Azure Database Migration Service, you can perform an offline or an online migration. With an offline migration, application downtime begins when the migration starts. For an online migration, downtime is limited to the time required to cut over to the new environment when the migration completes. It's recommended to test an offline migration to determine whether the downtime is acceptable; if not, perform an online migration.

Phases:

- Pre-migration
- Migration
- Post-migration

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Network Security

- IP firewalls
- Virtual network firewall rules

Access Management

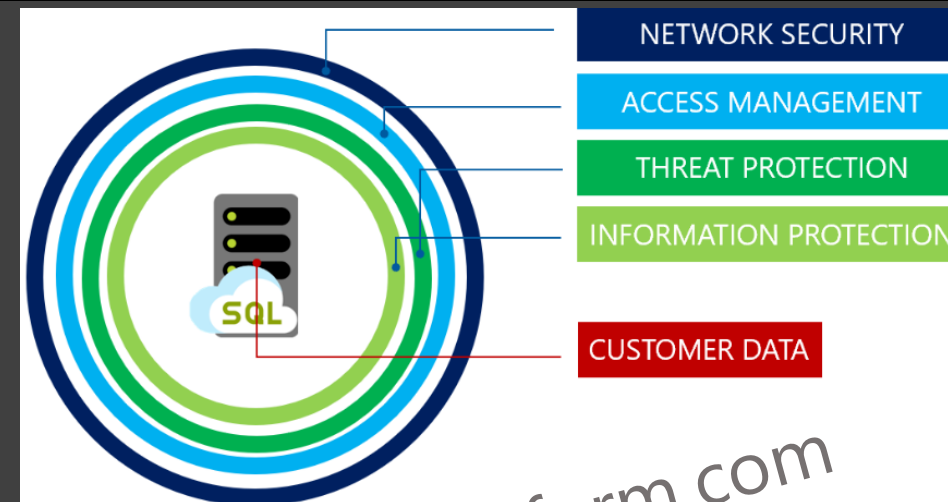
- Authentication
- Authorization
- Row-level security

Threat protection

- SQL auditing in Azure Monitor logs and Event Hubs
- Advanced Threat Protection

Information protection and encryption

- Transport Layer Security TLS (Encryption-in-transit)
- Transparent Data Encryption (Encryption-at-rest)
- Always Encrypted (Encryption-in-use)



NETWORK SECURITY

ACCESS MANAGEMENT

THREAT PROTECTION

INFORMATION PROTECTION

CUSTOMER DATA



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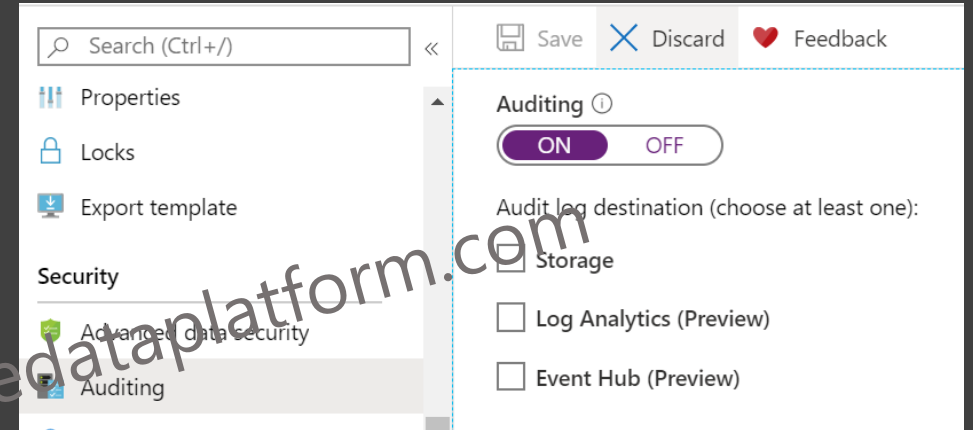
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- Storage
- Log Analytics
- Event hub



You can use SQL database auditing to:

- **Retain** an audit trail of selected events. You can define categories of database actions to be audited.
- **Report** on database activity. You can use pre-configured reports and a dashboard to get started quickly with activity and event reporting.
- **Analyze** reports. You can find suspicious events, unusual activity, and trends.



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SQL Database uses SQL Server technology to create full backups every week, differential backups every 12 hours, and transaction log backups every 5 to 10 minutes. The backups are stored in RA-GRS storage blobs that are replicated to a paired datacenter for protection against a datacenter outage. When you restore a database, the service determines which full, differential, and transaction log backups need to be restored.

You can use these backups to:

Restore an existing database to a point in time in the past

Restore a deleted database to the time of deletion

Restore a database to another geographic region.

Restore a database from a specific long-term backup

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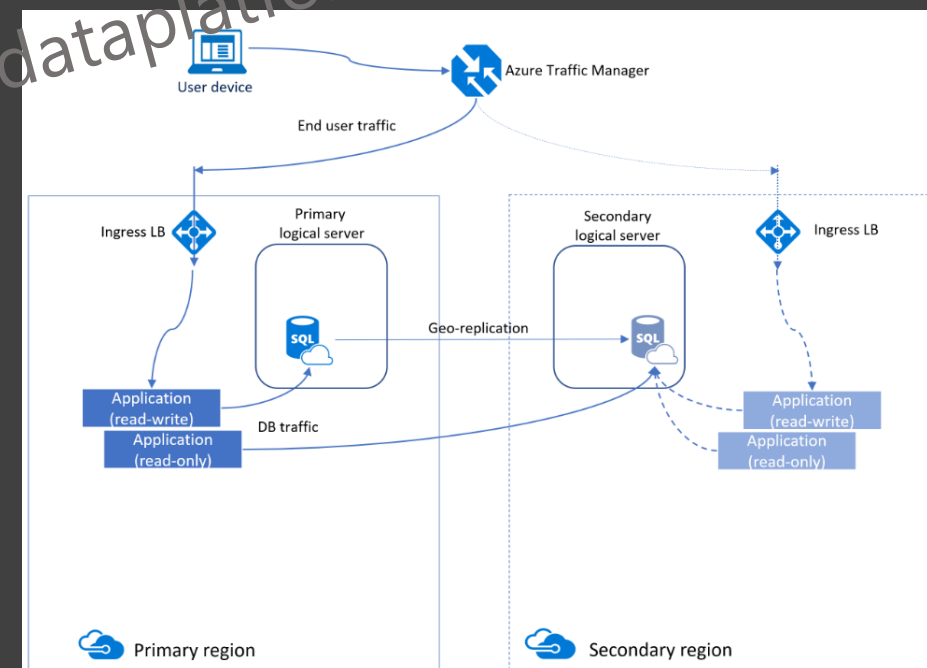
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Active geo-replication is designed as a business continuity solution that allows the application to perform quick disaster recovery of individual databases in case of a regional disaster or large scale outage. If geo-replication is enabled, the application can initiate failover to a secondary database in a different Azure region.





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Provisioning Elastic Pool

Choose the correct pool size

Elastic pool features

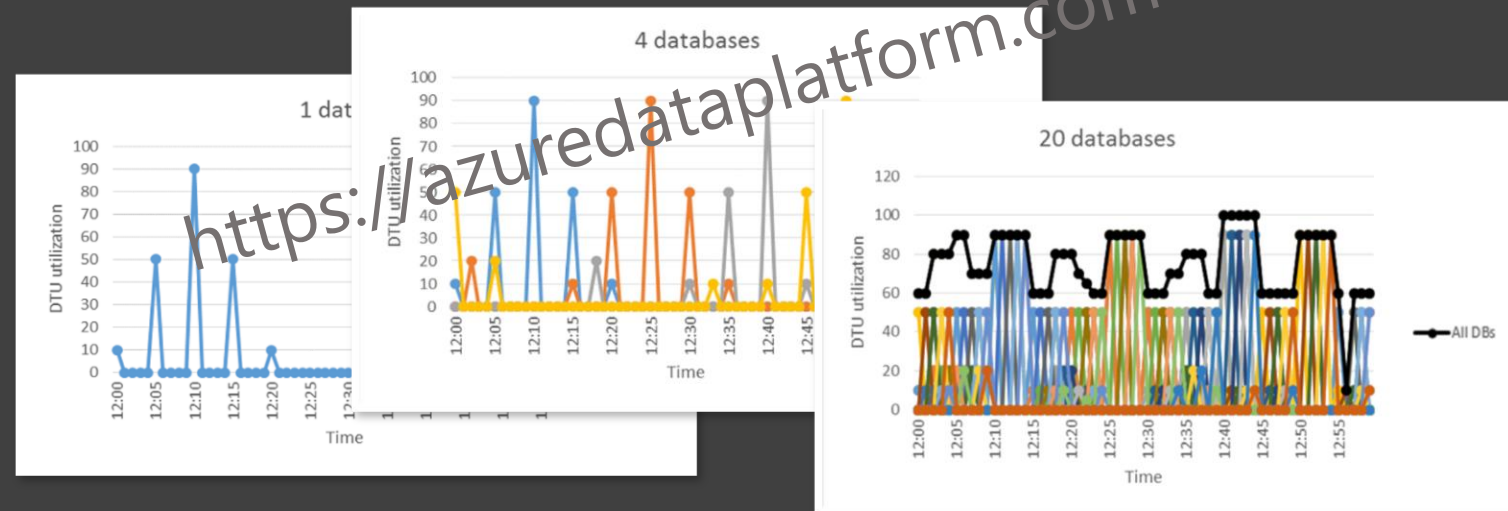
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Elastic pools enable the developer to purchase resources for a pool shared by multiple databases to accommodate unpredictable periods of usage by individual databases. You can configure resources for the pool based either on the DTU-based purchasing model or the vCore-based purchasing model.



There is no per-database charge for elastic pools. You are billed for each hour a pool exists at the highest eDTU or vCores, regardless of usage or whether the pool was active for less than an hour.



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1. Estimate the eDTUs or vCores needed for the pool as follows:
2. For DTU-based purchasing model: $\text{MAX}(\langle \text{Total number of DBs} \times \text{average DTU utilization per DB} \rangle, \langle \text{Number of concurrently peaking DBs} \times \text{Peak DTU utilization per DB} \rangle)$
3. For vCore-based purchasing model: $\text{MAX}(\langle \text{Total number of DBs} \times \text{average vCore utilization per DB} \rangle, \langle \text{Number of concurrently peaking DBs} \times \text{Peak vCore utilization per DB} \rangle)$
4. Estimate the storage space needed for the pool by adding the number of bytes needed for all the databases in the pool. Then determine the eDTU pool size that provides this amount of storage.
5. For the DTU-based purchasing model, take the larger of the eDTU estimates from Step 1 and Step 2. For the vCore-based purchasing model, take the vCore estimate from Step 1.
6. See the [SQL Database pricing page](#) and find the smallest pool size that is greater than the estimate from Step 3.
7. Compare the pool price from Step 5 to the price of using the appropriate compute sizes for single databases.



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Point-in-time restore

Point-in-time restore uses automatic database backups to recover a database in a pool to a specific point in time. See [Point-In-Time Restore](#)

Geo-restore

Geo-restore provides the default recovery option when a database is unavailable because of an incident in the region where the database is hosted. See [Restore an Azure SQL Database or failover to a secondary](#)

Active geo-replication

For applications that have more aggressive recovery requirements than geo-restore can offer, configure [Active geo-replication](#) or an [auto-failover group](#).

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SnelStart used elastic pools with Azure SQL Database to rapidly expand its business services at a rate of 1,000 new Azure SQL Databases per month.

Umbraco uses elastic pools with Azure SQL Database to quickly provision and scale services for thousands of tenants in the cloud.

Daxko/CSI uses elastic pools with Azure SQL Database to accelerate its development cycle and to enhance its customer services and performance.

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A managed instance in Azure SQL Database is a fully managed SQL Server Database Engine Instance hosted in Azure cloud. This is the best PaaS option for migrating your SQL Server database to the cloud.

PaaS benefits	Business continuity
No hardware purchasing and management No management overhead for managing underlying infrastructure Quick provisioning and service scaling Automated patching and version upgrade Integration with other PaaS data services	99.99% uptime SLA Built in <u>high-availability</u> Data protected with <u>automated backups</u> Customer configurable backup retention period User-initiated <u>backups</u> <u>Point in time database restore capability</u>
Security and compliance	Management
Isolated environment (<u>VNet integration</u> , single tenant service, dedicated compute and storage) <u>Transparent data encryption (TDE)</u> <u>Azure AD authentication</u> , single sign-on support <u>Azure AD server principals (logins)</u> Adheres to compliance standards same as Azure SQL database <u>SQL auditing</u> <u>Advanced Threat Protection</u>	Azure Resource Manager API for automating service provisioning and scaling Azure portal functionality for manual service provisioning and scaling Data Migration Service

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Azure SQL Database managed instance can be deployed on two hardware generations: Gen4 and Gen5. Hardware generations have different characteristics, as described in the following table:

	Gen4	Gen5
Hardware	Intel E5-2673 v3 (Haswell) 2.4-GHz processors, attached SSD vCore = 1 PP (physical core)	Intel E5-2673 v4 (Broadwell) 2.3-GHz and Intel SP-8160 (Skylake) processors, fast NVMe SSD, vCore=1 LP (hyper-thread)
Number of vCores	8, 16, 24 vCores	4, 8, 16, 24, 32, 40, 64, 80 vCores
Max memory (memory/core ratio)	7 GB per vCore Add more vCores to get more memory.	5.1 GB per vCore Add more vCores to get more memory.
Max In-Memory OLTP memory	Instance limit: 1-1.5 GB per vCore	Instance limit: 0.8 - 1.65 GB per vCore
Max instance reserved storage	General Purpose: 8 TB Business Critical: 1 TB	General Purpose: 8 TB Business Critical 1 TB, 2 TB, or 4 TB depending on the number of cores

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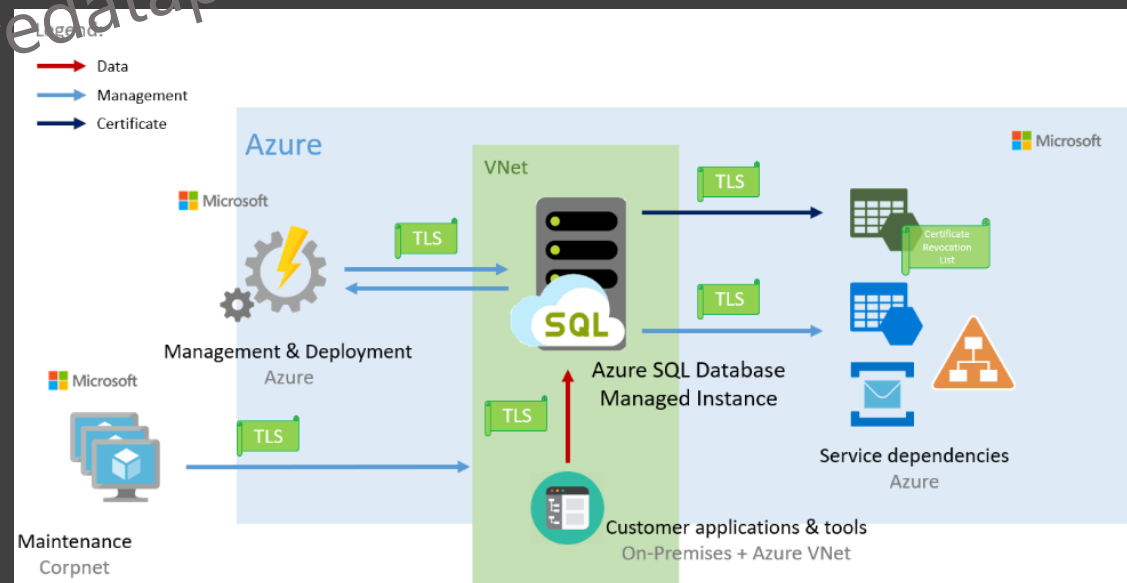
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The SQL Database managed instance is placed inside the Azure virtual network and the subnet that's dedicated to managed instances. This deployment provides:

- A secure private IP address.
- The ability to connect an on-premises network to a managed instance.
- The ability to connect a managed instance to a linked server or another on-premises data store.
- The ability to connect a managed instance to Azure resources.





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Point-in-time restore is useful in recovery scenarios, such as incidents caused by errors, incorrectly loaded data, or deletion of crucial data. You can also use it simply for testing or auditing. Backup files are kept for 7 to 35 days, depending on your database settings.

Point-in-time restore can restore a database:

- from an existing database.
- from a deleted database.
- to the same managed instance, or to another managed instance.

Limitations

Point in time restore to a managed instance has the following limitations:

- When you're restoring from one managed instance to another, both instances must be in the same subscription and region. Cross-region and cross-subscription restore aren't currently supported.
- Point-in-time restore of a whole managed instance is not possible.

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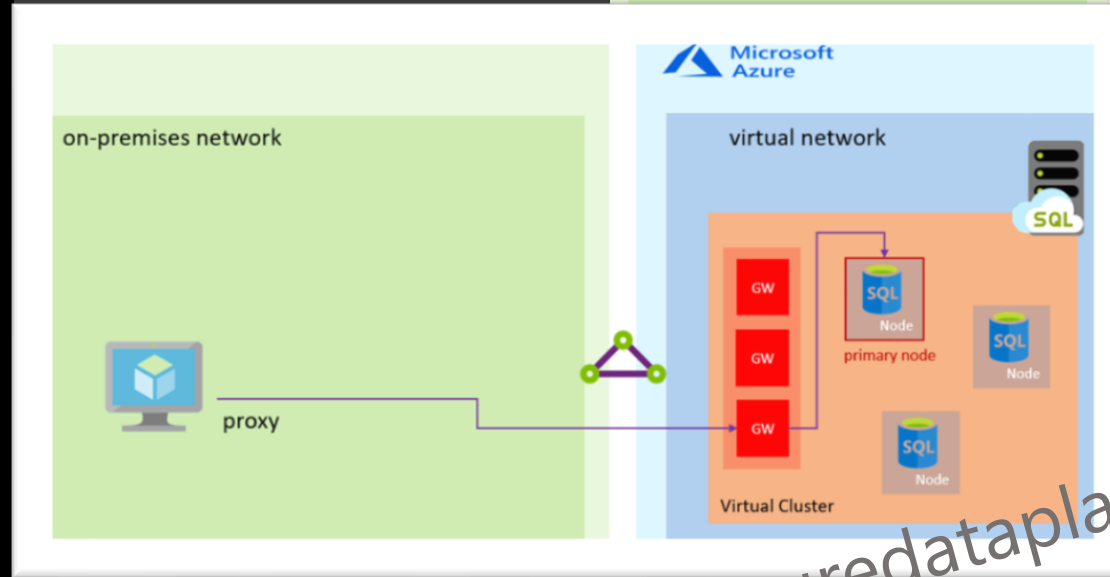
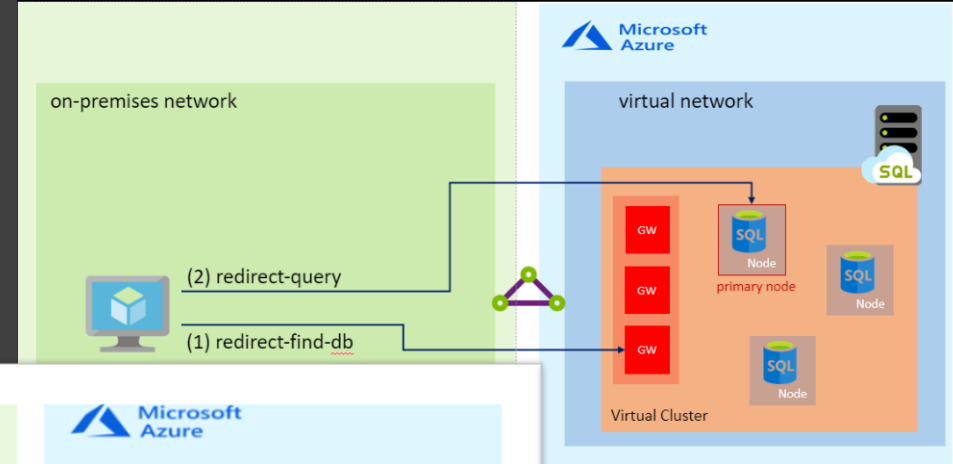
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Azure SQL Database managed instance supports the following two connection types:

- Redirect (recommended)
- Proxy (default)



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SQL Server on Azure virtual machines enables you to use full versions of SQL Server in the Cloud without having to manage any on-premises hardware. SQL Server VMs also simplify licensing costs when you pay as you go.

Azure virtual machines run in many different geographic regions around the world. They also offer a variety of machine sizes. The virtual machine image gallery allows you to create a SQL Server VM with the right version, edition, and operating system. This makes virtual machines a good option for a many different SQL Server workloads.

SQL Server Azure VMs can use Automated Patching to schedule a maintenance window for installing important windows and SQL Server updates automatically.

SQL Server Azure VMs can take advantage of Automated Backup, which regularly creates backups of your database to blob storage. You can also manually use this technique.

If you require high availability, consider configuring SQL Server Availability Groups. This involves multiple SQL Server Azure VMs in a virtual network. You can configure your high availability solution manually, or you can use templates in the Azure portal for automatic configuration.

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