

Azure SQL Database



Considerations before beginning



A bad query is always worth tuning



SLAs

- Uptime and connectivity are very different things!
- "We guarantee at least 99.99% of the time customers will have connectivity between their Basic, Standard, or Premium Microsoft Azure SQL Database and our Internet gateway."
- The longer connectivity is out, the bigger credit you get.
- SLA for SQL Database: https://azure.microsoft.com/en-us/support/legal/sla/sql-database/v1_0/

How HA works

- All writes are replicated to two or more nodes
- All clients need to implement transient connection handling!
- Reference: Azure Business Continuity Technical Guidance <https://msdn.microsoft.com/library/azure/hh873027.aspx>
- Reference: Using the Transient Fault Handling Application Block with SQL Azure [https://msdn.microsoft.com/library/hh680899\(v=pandp.50\).aspx](https://msdn.microsoft.com/library/hh680899(v=pandp.50).aspx)

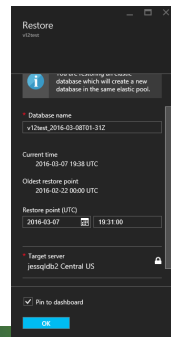
DR choices

- DR is based on your service tier
- Reference: Cloud business continuity and database disaster recovery with SQL Database <https://azure.microsoft.com/en-us/documentation/articles/sql-database-business-continuity/>

	Point in time restore	Geo-restore	Standard geo-replication	Active Geo-replication
Basic	Any restore point in last 7 days	Yes		
Standard	Any restore point in last 14 days	Yes	Yes	
Premium	Any restore point in last 25 days	Yes	Yes	Yes

Point in time restore

- Always restores a new database with a different name
- How far back you can go depends on the tier



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Geo-Restore

- Your backups are geo-replicated
 - Can have up to 1 hour data loss
- Used when there is an outage in a region
- Restore database to a new name
- Update connection strings
- Verify firewall rules
- Verify logins and users
- Reference: Azure SQL Database Geo-Restore
<https://azure.microsoft.com/en-us/blog/azure-sql-database-geo-restore/>

Cold standby

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Standard Geo-replication

- You define region to async write database to
 - Requires "paired" regions
- Secondary database is offline, not readable
- In case of outage, fail over to secondary database
- Update connection strings
- Verify firewall rules
- Verify logins and users
- Reference: Azure SQL Database Standard Geo-Replication
<https://azure.microsoft.com/en-us/blog/azure-sql-database-standard-geo-replication/>

Warm standby

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Active Geo-replication

- Like Standard, data is async written to a secondary region
- Can have up to four secondaries
- Secondaries are online, readable
- In case of primary region outage, terminate the relationship with a secondary and make that secondary the primary
- Update connection strings
- Verify firewall rules
- Verify logins and users
- Reference: Spotlight on SQL Database Active Geo-Replication
<https://azure.microsoft.com/en-us/blog/spotlight-on-sql-database-active-geo-replication/>

Hot standby

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Differences between on-prem and Azure product

Partially supported

- CREATE/ALTER DATABASE
- CREATE/ALTER USER
- CREATE/ALTER LOGIN
- CREATE/ALTER PROCEDURE
- CREATE/ALTER FUNCTION
- CREATE/ALTER TABLE
- CREATE/ALTER VIEW
- CREATE TYPE
- KILL

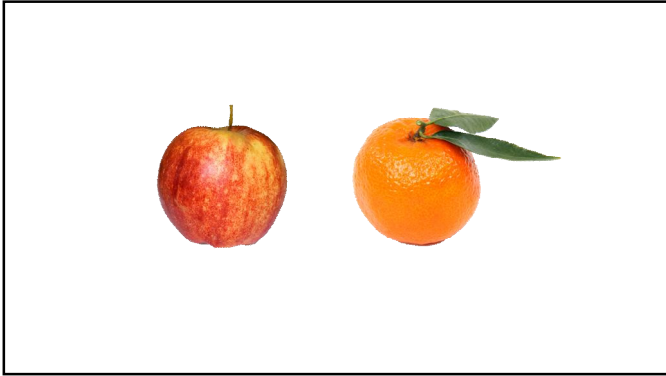
Not supported

- INSERT, UPDATE, DELETE cross-database queries
- Linked servers, OPENQUERY, OPENROWSET, etc
- Data Collector
- Database Mail
- Replication
- Change Data Capture
- Agent anything
- FILESTREAM
- Resource Governor
- Service Broker
- Profiler/trace (HOORAY!)
- ..and more

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Pricing & Performance

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Tiers

- Based on DTUs - Database Throughput Units
 - "How many transactions could be completed per second under fully loaded conditions"
- Combo of CPU, memory, reads, writes
- Benchmark: <https://azure.microsoft.com/en-us/documentation/articles/sql-database-benchmark-overview/>
- DTU calculator: <http://dtucalculator.azurewebsites.net/> (Reviews are mixed.)

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One database or many?

- Recently introduced: elastic pools
- Up to X number of databases can share Y DTUs
- Regular databases - DTUs
 - 5 - 1,750 DTUs
- Elastic database pools - eDTUs
 - 100 - 1,500 DTUs per pool

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Do I want a single database or an elastic pool?

Characteristic	Single DB	Elastic Pool
Number of databases	One	Many, with same schema
Performance	Predictable	Each DB is varied
Cross-DB queries	Few to none	Many
Jobs	Use another tool	Use Elastic Jobs

Creating the DB

You will have to select

- Database name
- Server (existing or new) (No, this is *not* the same as a VM)
 - Name
 - Admin account
 - Location
 - Version
- Source
 - Blank
 - Backup - from your other Azure SQL Databases. Last full daily. Data up to 24 hours old. No, can't use a .bak.
 - Sample - you can run from AdventureWorks but it will find you.
- Tier
- Collation
- Resource group (Tied to that server you selected or created)

Demo

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PowerShell

- Create Azure SQL Database.ps1

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Creating a pool

- Go to your SQL server
- + New pool
- Name
- Pricing tier
- Configure - add database

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PowerShell

- Create Azure elastic database pool.ps1

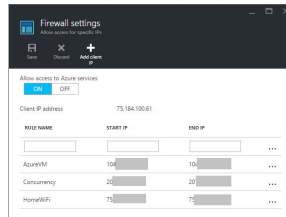
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Configuring the DB

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Firewall

- The SQL server is where you set your firewall rules
 - To make it easy, "Add client IP"
 - To all range of address, set up rule
- Can also use PowerShell, T-SQL
- I forget this frequently!
- Reference: Configure firewall settings on SQL Database using the Azure Portal <https://azure.microsoft.com/en-us/documentation/articles/sql-database-configure-firewall-settings/>



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Connecting from SSMS/VS

- Portal > Database > Tools -> Open in Visual Studio
- Connect to the Server name in Visual Studio
 - View > SQL Server Object Explorer
 - Right-click > Add SQL Server
 - Download Visual Studio Community Free <https://www.visualstudio.com/post-download-vs?sku=community&clid=0x409>
- Connect to the server name in SSMS
 - Download the latest release: <https://msdn.microsoft.com/en-us/library/mt238290.aspx>

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Users

- You're going to add these with T-SQL
- Reference: Manage database access and login security <https://azure.microsoft.com/en-us/documentation/articles/sql-database-manage-logins/>
- Reference: Connecting to SQL Database by Using Azure AD Authentication <https://azure.microsoft.com/en-us/documentation/articles/sql-database-aad-authentication/>
 - Requires Azure Active Directory
 - You really want Azure AD. Really.

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Connecting the app

- Portal -> Database connection strings
 - ADO.NET
 - ODBC
 - PHP
 - JDBC
- Remember what I said earlier about "transient fault handling"

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Moving data into the database

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First things first - can it be migrated?

- Review the list of unsupported features

Methods for migrating

- SQL Migration Wizard
- Deploy Database to Microsoft Azure Database Wizard
- BACPAC
- Transactional replication
- Reference: SQL Server database migration to SQL Database in the cloud <https://azure.microsoft.com/en-us/documentation/articles/sql-database-cloud-migrate/>

SQL Migration Wizard

- Select objects in the database to migrate
- T-SQL and BCP scripts are created
- Scripts can be modified to fix incompatibilities
- It can create a new SQL Database and import the data into it
- Get it: <http://sqlazuremw.codeplex.com/>
- Demo: <https://channel9.msdn.com/Shows/Data-Exposed/SQL-Database-Migration-Wizard>

Maintenance

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Maintenance

- Backups
 - This is determined by your tier
 - But...are they transactionally consistent?
 - <https://www.youtube.com/watch?v=sF10wAgrmbI>
- Restore
 - You can restore, but it's always to a different name
- CHECKDB
 - How will you schedule it?
- Indexes
 - You can REORGANIZE and REBUILD
 - How will you schedule it?

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No SQL Server Agent! Oh noes!

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Executing jobs

- Use SQL Server Agent
 - ...from an earthed or cloud VM.
 - Yep, you're paying for licensing.
- Azure Automation
 - Requires .NET and PowerShell - and you thought you weren't a developer!
 - You pay for it if jobs run for more than 500 minutes in a month
 - Reference: Azure Automation: Your SQL Agent in the Cloud <https://azure.microsoft.com/en-us/blog/azure-automation-your-sql-agent-in-the-cloud/>
- Elastic Database Jobs
 - Jobs are T-SQL
 - Scheduled with PowerShell
 - Logged
 - Reference: Elastic Database Jobs Overview <https://azure.microsoft.com/en-us/documentation/articles/sql-database-elastic-jobs-overview/>

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Azure Automation

- Set up an Automation Account
 - Can have multiple – one for Web Apps and one for SQL Database; one for dev and one for prod
- Add a Runbook
 - Test it!
- Publish Runbook
- Schedule Runbook
 - Run once, daily, or hourly

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Elastic Database Jobs

- Install services (Portal or PowerShell)
 - A resource group is created that contains a SQL Server and control SQL Database
- Create Job
 - MOAR POWERSHELL!
 - New-AzureSqlJobSchedule
 - New-AzureSqlJobTrigger
 - Reference: Azure Elastic Database Jobs <https://www.pythian.com/blog/sql-edge-3-azure-elastic-database-jobs/>
 - Reference: Azure Elastic Database Jobs Cmdlets <https://msdn.microsoft.com/en-us/library/mt346080.aspx>
 - Reference: Create and manage a SQL Database elastic database jobs using PowerShell <https://azure.microsoft.com/en-us/documentation/articles/sql-database-elastic-jobs-powershell/>

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Monitoring & alerting

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What

- Usage - DTUs, processor, memory, read/writes
- Connectivity - what connectivity % did you have?
- Performance - top queries, worst queries

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How

- DMVs
 - Commands with *os* or *server* in the name now have *database* in the name
 - Examples: <https://azure.microsoft.com/en-us/documentation/articles/sql-database-monitoring-with-dmvs/>
- Portal
 - Add Tiles
 - Resource Utilization, Database Connections, Storage
- Alert Rules
 - Not very fine-grained
- SCOM
 - Windows Azure SQL Database Management Pack for System Center 2012
- 3rd party tools
 - SQL Sentry Performance Advisor
 - Dell Software Spotlight on SQL Server Enterprise

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Troubleshooting

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Tools

- DMVs
- Extended Events
 - There is a limited sub-set of events available – 46
 - Syntax change: CREATE EVENT SESSION <name> ON DATABASE

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Changing tiers

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FAQ

- Can I upgrade or downgrade?
 - Yes!
- Is it an online operation?
 - Yes!
- How long does it take?
 - It depends
- How?
 - Portal
 - PowerShell

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PowerShell

- Change Azure SQL Database service tier.ps1

Stopping the Database

When do you get charged?

- You're only charged for usage. No throughput for an hour, no charge for that hour.
- Want to get rid of the database? Delete from Portal or with PowerShell.
- Backups still exist and can be restored.
 - Retained according to service tier the database was in.
