Azure SQL Database Business Continuity

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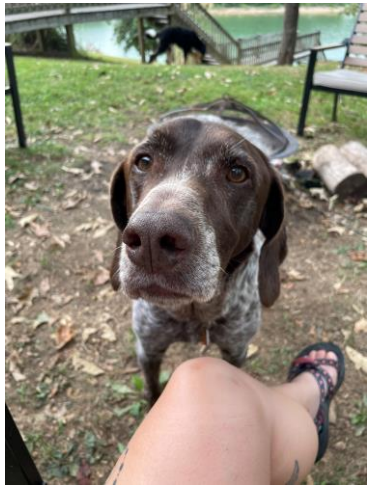
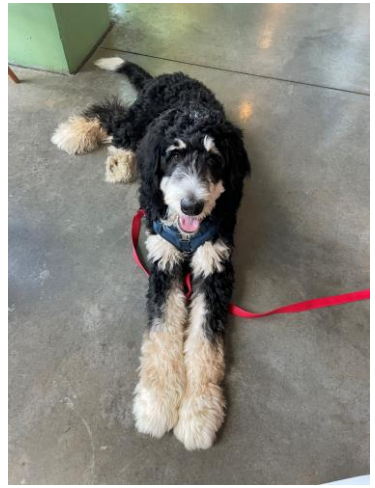
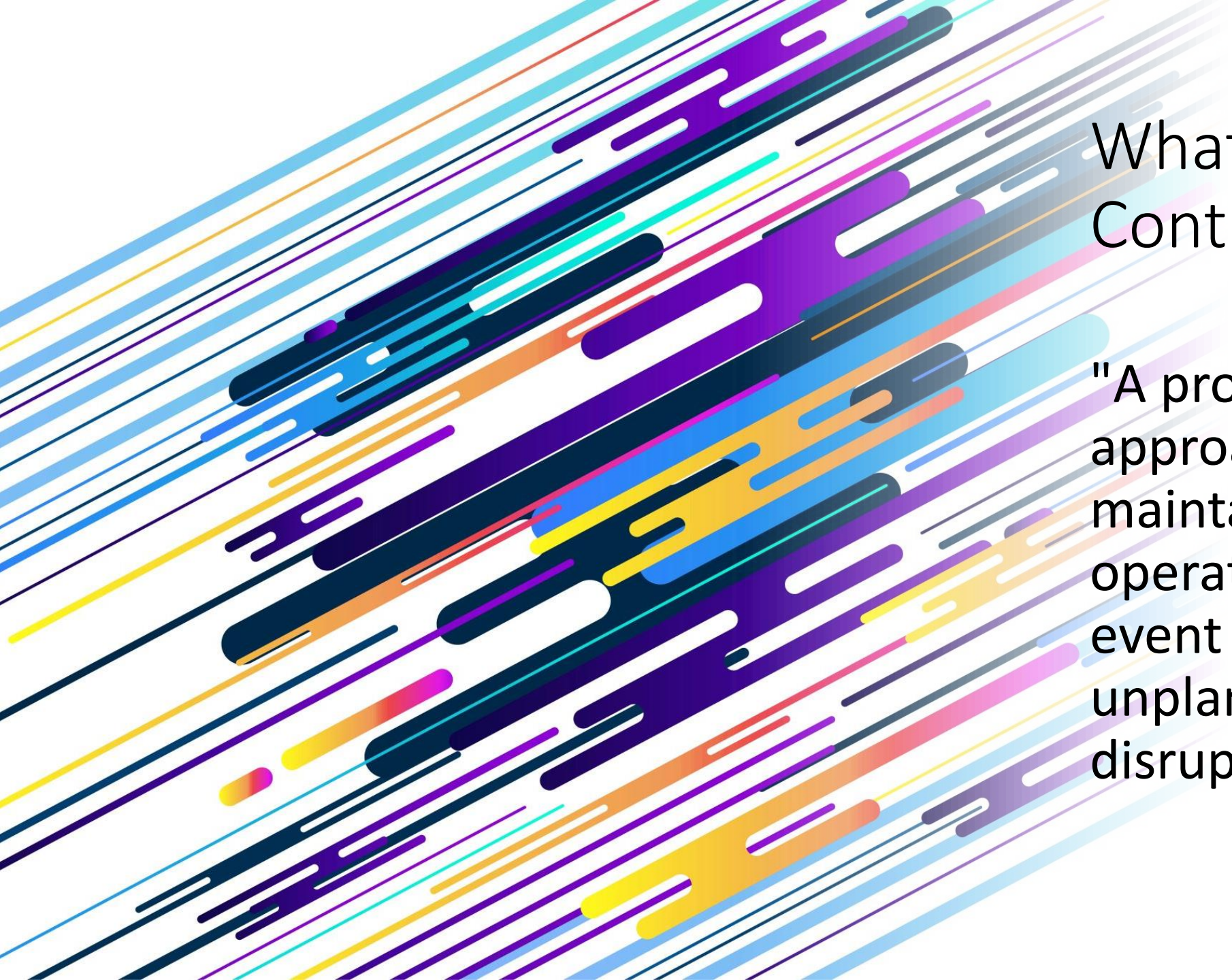




@grrl_geek
Jes Schultz
grrlgeek

Data is the most important asset for most organizations.

- If they lose access to their data, or the data itself, they lose business.
- One way to mitigate this threat is through a business continuity plan



What's Business Continuity?

"A process-driven approach to maintaining operations in the event of an unplanned disruption."

Core concepts

Backups

- A database backup is a transactionally-consistent record of the database at a point in time

Restores

- A database restore takes a backup and recreates the database as of a point in time

HA (High Availability)

- Recovering data within the same data center or region

DR (Disaster Recovery)

- Recovering data in a secondary data center or region

In the on-premises SQL Server world…

- DBAs set up backup jobs
- Hopefully they test restores
- They may set up Windows Server Failover Clustering (WSFC) with SQL Server Failover Cluster Instances (FCI) (shared storage), or Always On Availability Groups (AGs) (separate storage) for HA.
- They may set up Availability Groups or Log Shipping for DR.

That's a lot of work

...especially when a company has hundreds of SQL Server instances.

Azure makes it easier!

Azure SQL Database does heavy lifting for the DBA

Backups

Taken regularly

Full backup every week

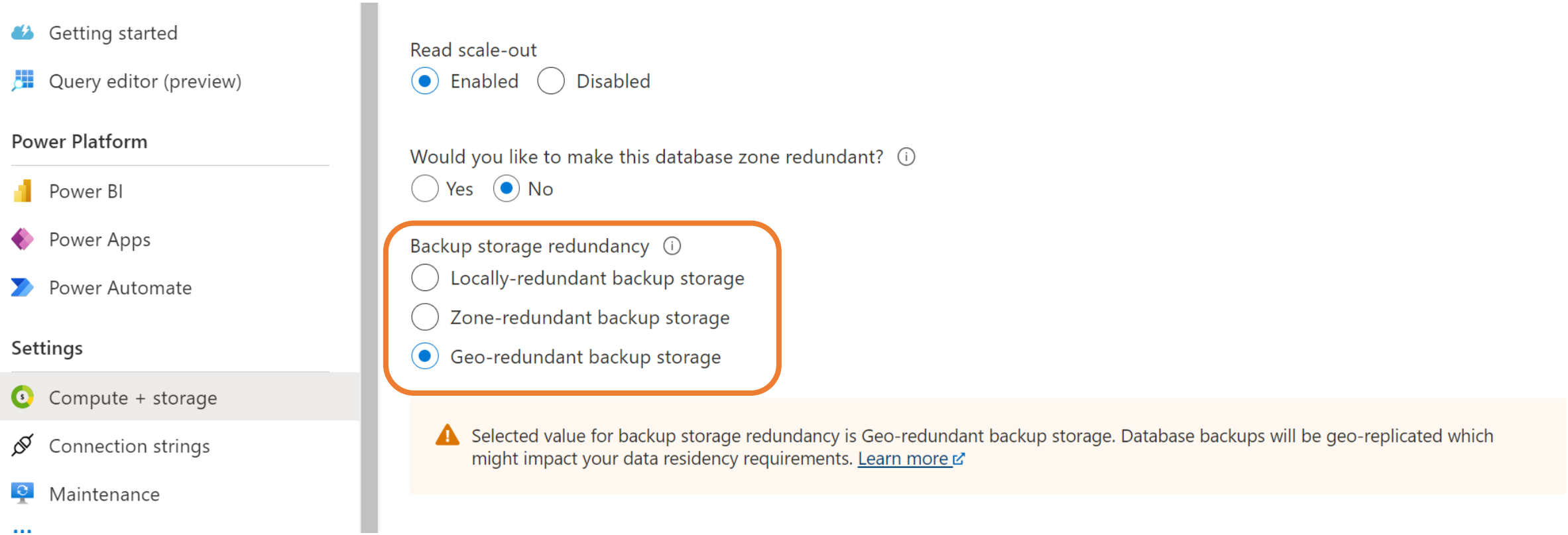
Differential backups every 12 or 24 hours

Transaction log backups approximately every 10 minutes - based on compute size and database activity

*Hyperscale uses storage snapshots

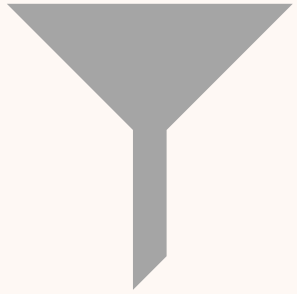
Redundant

By default, backups are stored in blob storage in the database region and replicated to a paired region


Getting started
Query editor (preview)
Power Platform
Power BI
Power Apps
Power Automate
Settings
Compute + storage
Connection strings
Maintenance
Read scale-out
Enabled
Disabled
Would you like to make this database zone redundant?
Yes
No
Backup storage redundancy
Locally-redundant backup storage
Zone-redundant backup storage
Geo-redundant backup storage
Selected value for backup storage redundancy is Geo-redundant backup storage. Database backups will be geo-replicated which might impact your data residency requirements. Learn more

Restores

Easy button - no more figuring out which series of backups to restore



Go to portal, PowerShell, or CLI and specify the name of the database and the day and time to restore to

Demo

Point-in-time restore

High Availability

Built in – customers don’t get to customize in Azure

ap1 (ap1/ap1) | Compute + storage

SQL database

Search (Ctrl+/)

Feedback

- Overview
- Activity log
- Tags
- Diagnose and solve problems
- Getting started
- Query editor (preview)

Power Platform

- Power BI
- Power Apps
- Power Automate

Settings

- Compute + storage
- Connection strings

Service and compute tier

Select from the available tiers based on the needs of your workload. The vCore model provides a wide range of configuration controls and offers Hyperscale and Serverless to automatically scale your database based on your workload needs. Alternately, the DTU model provides set price/performance packages to choose from for easy configuration. Learn more

Service tier: General Purpose (Scalable compute and storage options)

Compute tier

vCore-based purchasing model

General Purpose (Scalable compute and storage options)

Hyperscale (On-demand scalable storage)

Business Critical (High transaction rate and high resiliency)

DTU-based purchasing model

Basic (For less demanding workloads)

Standard (For workloads with typical performance requirements)

Premium (For IO-intensive workloads)

Compute Hardware

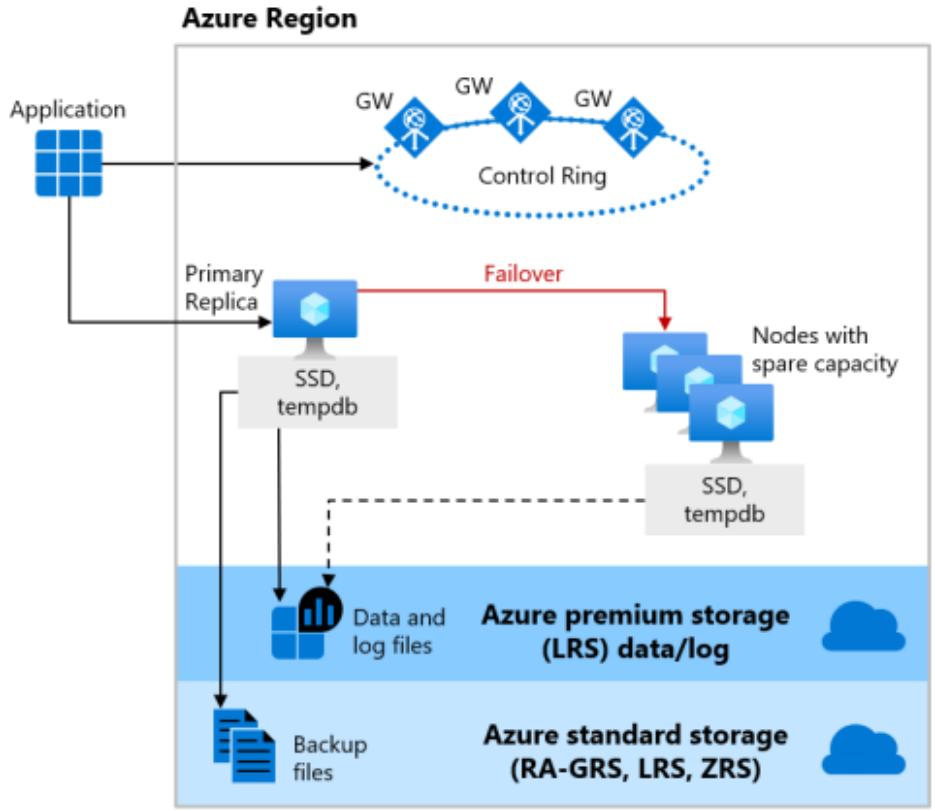
Select the hardware configuration based on
confidential computing hardware depends

Hardware Configuration

up to 80 vCores, up to 408 GB memory

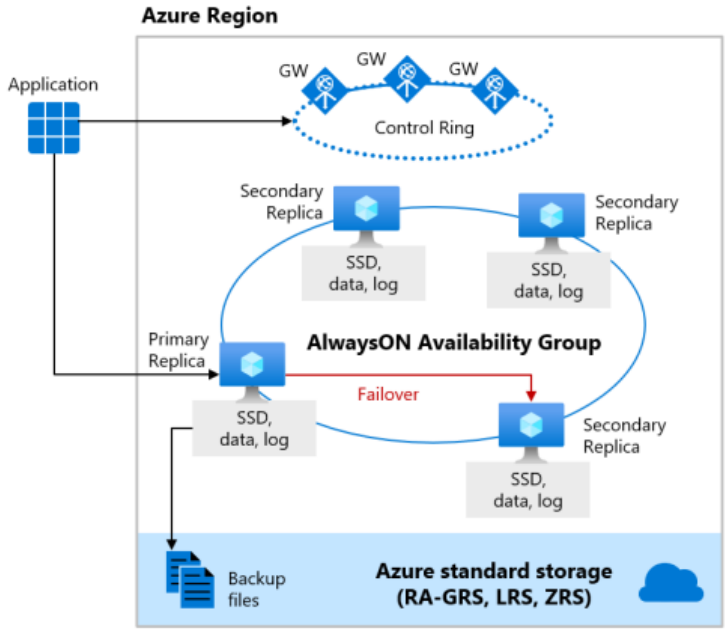
Change configuration

General Purpose (Basic, Standard)



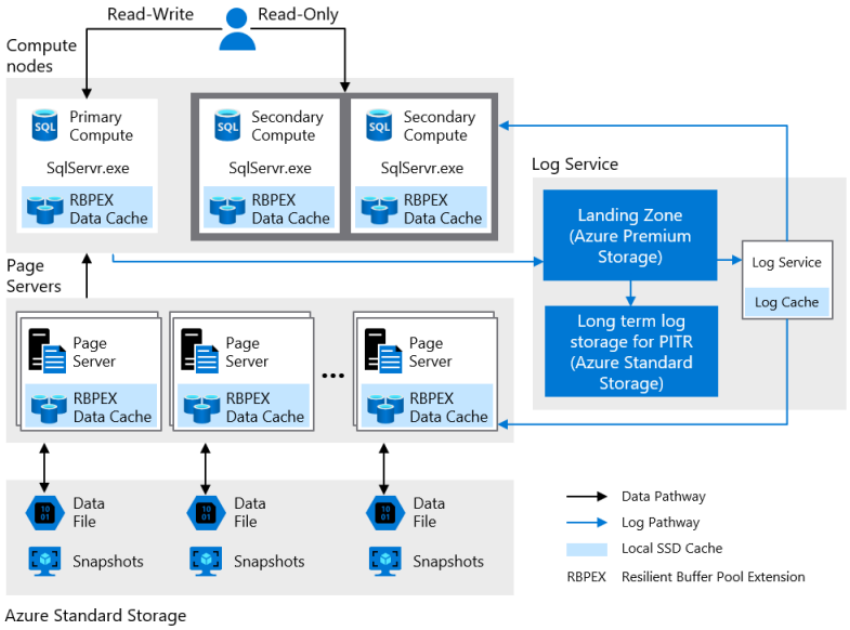
- Separate compute and storage
- The high availability is at the storage level
- During failover, a new stateless compute replica is created and data and log files are attached to it
- Slower failover because the new compute node must start the sqlservr.exe process with a cold cache

Business Critical (Premium)



- Integrated compute and local SSD storage in a cluster
- At least three nodes exist in the same region
- During failover, primary fails over to a fully-synchronized secondary
- Faster failover because compute is already provisioned, and data is in sync

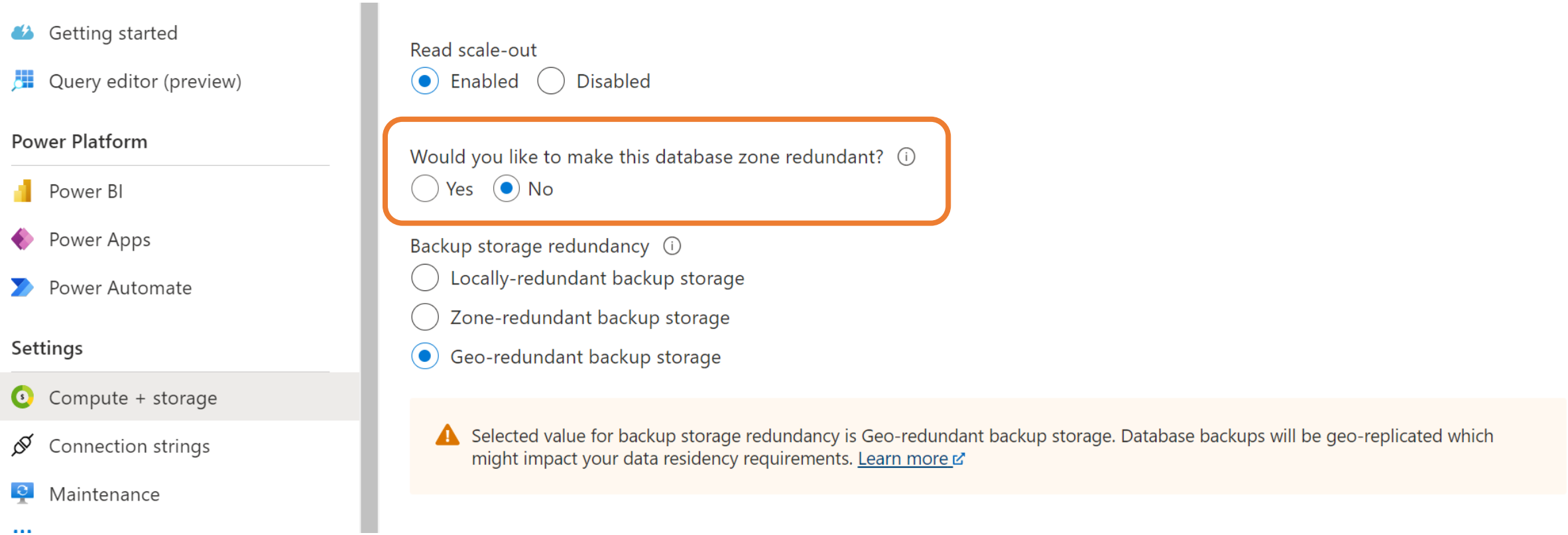
Hyperscale



- 4 layers of redundancy
- Compute
  - Can have multiple as failover targets
- Page Server storage
  - Every page server has an active-active paired server
- Transaction Log storage
  - Uses Azure Storage for availability and redundancy
- Database file storage
  - Uses Azure Storage for availability and redundancy

Availability Zones

- By default, all compute nodes and data storage are provisioned in the same datacenter in one region
- Availability Zones (new, still in preview for Hyperscale) allow the compute and storage to be provisioned across multiple data centers in the same region
  - Reduces single point of failure during an outage or disaster
  - Helps companies that need to follow data residency laws achieve HA and some level of DR without going outside of their boundaries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What else DBAs and devs need to know

The database **can** and **will be** failed over automatically between HA replicas for patching and maintenance.

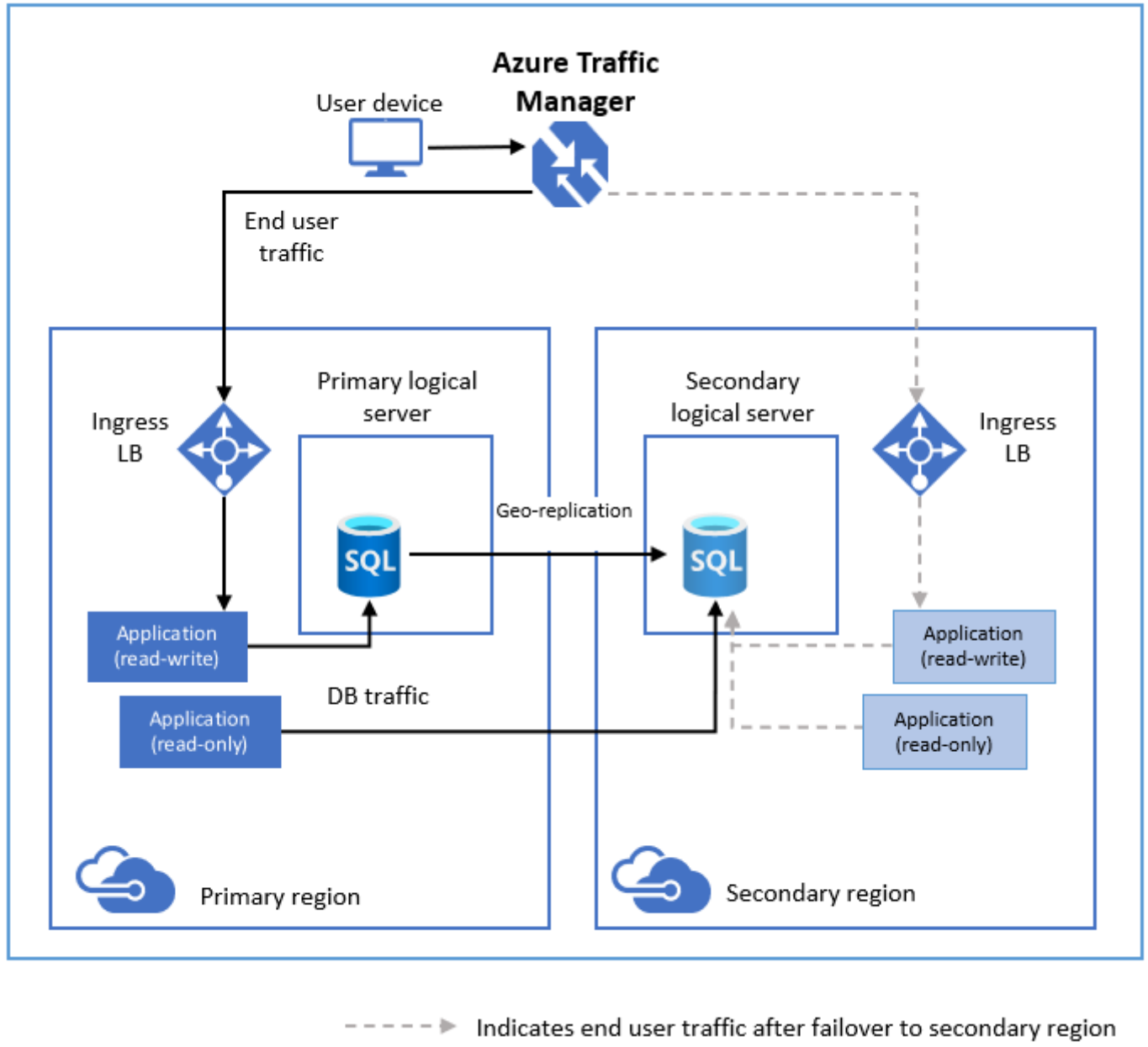
All apps need to have retry logic built in.

Disaster Recovery

Customers can configure this!

Active geo-replication

- Set up at SQL Database level – one database at a time
- Create up to four readable secondary databases in different region(s)
- Asynchronous replication from primary to secondaries
- Failover: manual
- On failover, update application connection string to new server name


Azure Traffic Manager
User device
End user traffic
Ingress LB
Primary logical server
SQL
Geo-replication
Secondary logical server
SQL
Ingress LB
Application (read-write)
Application (read-only)
DB traffic
Application (read-write)
Application (read-only)
Primary region
Secondary region
Indicates end user traffic after failover to secondary region

Search (Ctrl+/)

Data management

Replicas

Sync to other databases

Integrations

Create replica | Refresh | Feedback

Geo replicas for your database[illegible] listed
center outage. Learn more

Name | Server | [illegible]te

No replicas found

Database details

Enter required settings for this database, including picking a logical server and configuring the compute and storage resources

Database name: ap1

Server *: testsyncserver (Japan East)
Create new

Region: Japan East

Want to use SQL elastic pool? Yes / No

Compute + storage *:
General Purpose
Gen5, 2 vCores, 32 GB storage, zone redundant disabled
Configure database

Backup storage redundancy

Choose how your PITR and LTR backups are replicated. Geo restore or ability to recover from regional outage is only available when geo-redundant storage is selected.

The default backup storage redundancy setting is taken from the setting of the source.

Backup storage redundancy:
- Locally-redundant backup storage
- Zone-redundant backup storage
- Geo-redundant backup storage

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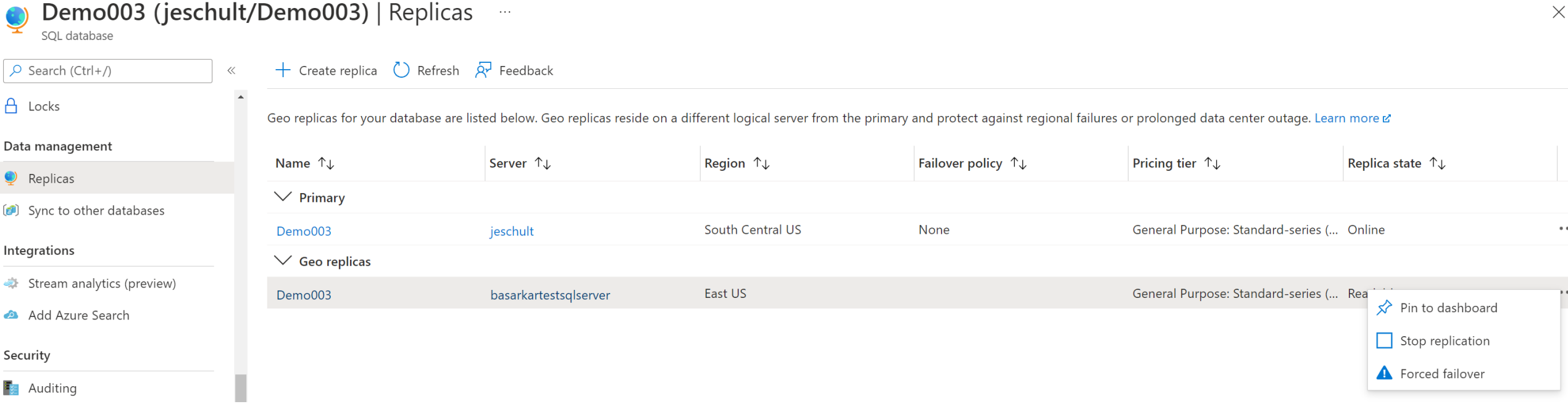

Demo003 (jeschult/Demo003) | Replicas
SQL database
Search (Ctrl+/)
Locks
Data management
Replicas
Sync to other databases
Integrations
Stream analytics (preview)
Add Azure Search
Security
Auditing
Create replica
Refresh
Feedback
Geo replicas for your database are listed below. Geo replicas reside on a different logical server from the primary and protect against regional failures or prolonged data center outage. Learn more
Name
Server
Region
Failover policy
Pricing tier
Replica state
Primary
Demo003
jeschult
South Central US
None
General Purpose: Standard-series (...
Online
Geo replicas
Demo003
basarkartestsqlserver
East US
General Purpose: Standard-series (...
Pin to dashboard
Stop replication
Forced failover

Demo

Active geo-replication

Why choose active geo-replication?

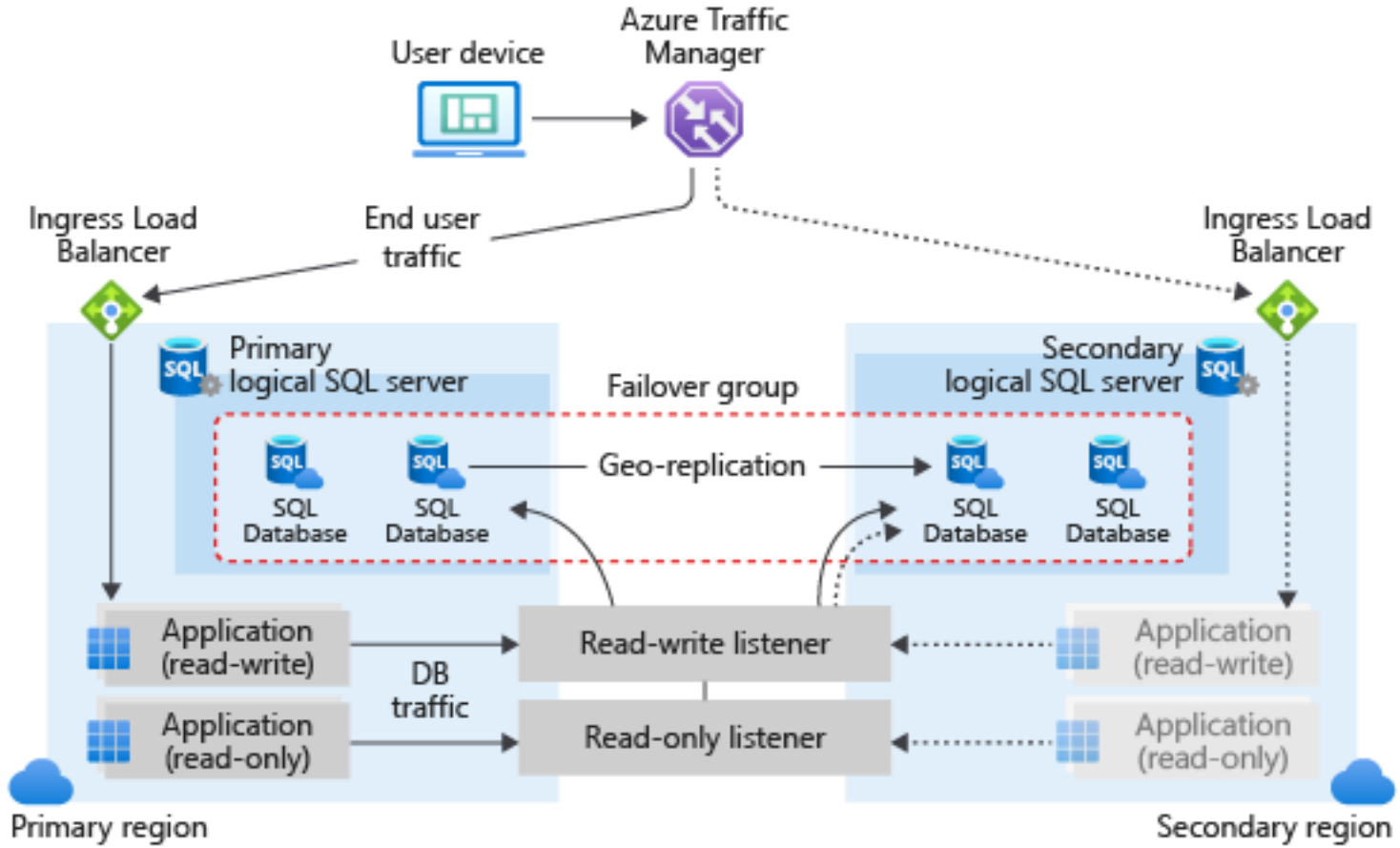
The app has one database

The app can benefit from one or more readable secondary replicas

The RTO is high enough to allow for manual failover to the replica and time to update the connection string

Failover groups

- Abstraction of geo-replication
- Set up at SQL *server* level!
- One or more databases in a group
- Readable secondaries behind a load balancer with a listener
- Can have a read-write listener or read-only listener
- Failover: automatic or manual
- On failover, if application is directed to listener name, no need to update connection string
- If automatic is chosen, you can set a "grace period", which determines how long the system waits before initiating failover. This potentially reduces data loss.


User device
Azure Traffic Manager
Ingress Load Balancer
End user traffic
Ingress Load Balancer
Primary logical SQL server
Failover group
Secondary logical SQL server
Geo-replication
SQL Database
SQL Database
SQL Database
SQL Database
Application (read-write)
Application (read-only)
DB traffic
Read-write listener
Read-only listener
Application (read-write)
Application (read-only)
Primary region
Secondary region

jeschult | Failover groups

SQL server

Search (Ctrl+/)

- SQL elastic pools
- DTU quota
- Properties
- Locks

Data management

- Backups
- Deleted databases
- Failover groups

Add group | Refresh

Failover group are a SQL server feature designed to automatically manage replication, connectivity and failover of a set of databases.

Name	Primary server	Secondary server	Read/Write failover poli...	Grace Period (minutes)	Database count

Failover group

Create a failover group to automatically failover databases in it.

Failover group name *

fogdemo001

.database.windows.net

Server *

basarkartestsqlserver

Create new

Read/Write failover policy

Automatic

Read/Write grace period (hours)

1 hours

Database within the group

2 databases selected

4 databases eligible

Configure database

fogdemo001

jeschult

Save | Discard | Add databases | Edit configuration | Remove databases | Failover | Forced Failover | Delete

Configuration details | Databases within group | Databases selected to be added (0) | Databases selected for removal (0)

	Server	Role	Read/Write failover policy	Grace period
	jeschult (South Central US)	Primary	Automatic	1 hours
	basarkartestsqlserver (East US)	Secondary		

Read/write listener endpoint

fogdemo001.database.windows.net

Read-only listener endpoint

fogdemo001.secondary.database.windows.net

Demo

Failover groups

Why choose failover groups?

App has multiple databases that need to fail over together

The RTO is low enough that failover must be automatic and the connection string can’t be updated manually

Recap

Backups

- Azure SQL Database automatically takes backups
- Backups are stored in multiple regions

Restores

- Azure SQL Database restores are simple – provide the date and time you want to restore to

HA (High Availability)

- HA is built into every tier of Azure SQL Database

DR (Disaster Recovery)

- Active geo-replication for a single database
- Failover groups at the SQL server level for multiple databases

Questions?

Resources

- Automatic, geo-redundant backups - Azure SQL Database | Microsoft Learn
- Restore a database from a backup - Azure SQL Database | Microsoft Learn
- Active geo-replication - Azure SQL Database | Microsoft Learn
- Auto-failover groups overview & best practices - Azure SQL Database | Microsoft Learn
- Disaster recovery drills - Azure SQL Database | Microsoft Learn