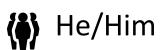




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Community Speaker

Blogger/Tweeter

Conference Organizer

MVP – Data Platform

Friend of Redgate

VMWare vExpert





Certified IT professionals to help achieve IT goals

Clients ranging from small business to Fortune 10 corporations

Help save on costs while improving IT reliability and solving challenges







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Agenda





- Defining a Disaster
- Levels of DR Solutions
- Manual Backups
- Availability Groups
- Log shipping
- Automated Databases Backups
- Azure Backup for SQL
- Azure Backup for VMs
- Demos
- Q&A



Disasters - What is thy name







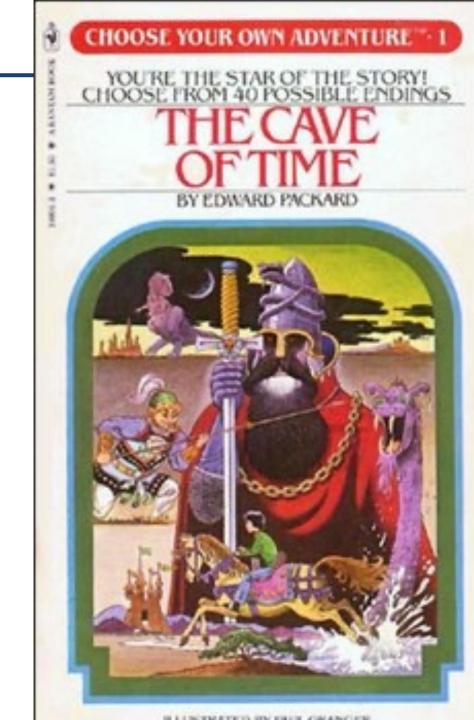
Choose Your Azure Outage

Power Surge

Snow in the data center

Fiber Cable Cut

Thunderstorms



Disasters





What are they?

When do you act on DR?

What is your recovery process?

What is your RPO/RTO?

Disaster Recovery Levels



Level 0: What's RPO/RTO?

Level 1: We have RPO/RTO defined, but nothing in place. We're in trouble.

Level 2: We have SOMETHING in place, but its outside RPO/RTO values.

Level 3: We have a defined response, but it's barely inside RPO/RTO values.

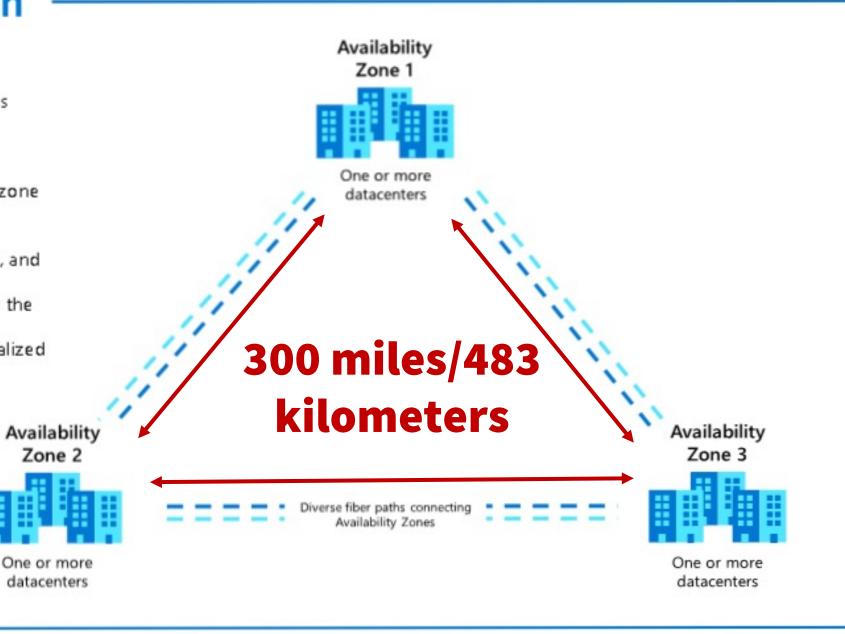
Level 4: We have a defined response, and it exceeds defined RPO/RTO values.



Disaster Recovery solutions should reside outside a radius of 150 miles (241 kilometers) or more from the primary data center

Azure Region

Composed of three distinct physical and logical locations within an Azure Region, Availability Zones provide synchronous replication of applications and data. Each zone is made up of one or more datacenters equipped with independent power, cooling, and networking. This construct eliminates the datacenter as the single point of failure and reduces the exposure to localized failure events.



Which tier?





DB

VM

DISK

Manual Database Backups





Native SQL backups

Utilize Azure Storage Account or attached disk

Fully managed by the DBA

Restores managed by the DBA



Using a Storage Account



Requires a SAS token to create a credential

Specify GRS or RA-GRS replication for redundancy

Make sure the storage account is within the same region as the VM for latency and egress data charges

Specify MAXTRANSFERSIZE and BLOCKSIZE

Can use Cool tier if costs are a concern

Using local disk





Make sure to evaluate IO requirements

Ensure the disk is protected as well

Can utilize azcopy to push to storage account

Limited on the number of disks that can be attached to the VM

Availability Groups



Utilizes native SQL Server Availability Groups

Azure infrastructure can be more complicated

Allows for out of region protection if replica exists in another region

Can utilize availability zones for both high availability and disaster recovery within a given region

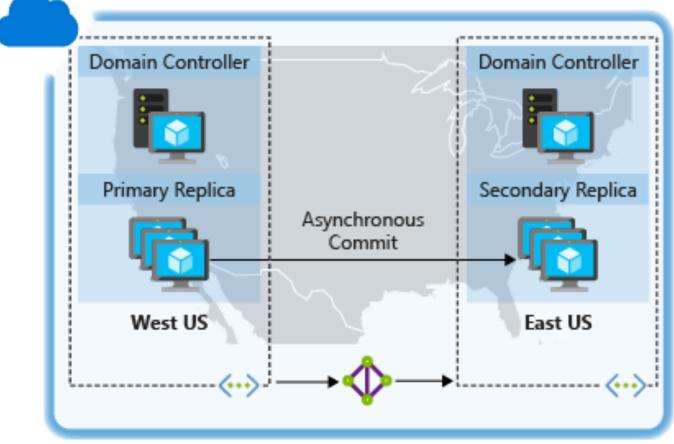
Availability Groups



Can facilitate automatic failover if necessary

Minimal RPO/RTO values

Pay for the secondary VM + storage



Log Shipping





Robust, tried and true

Works on SQL Server on Azure Virtual Machines

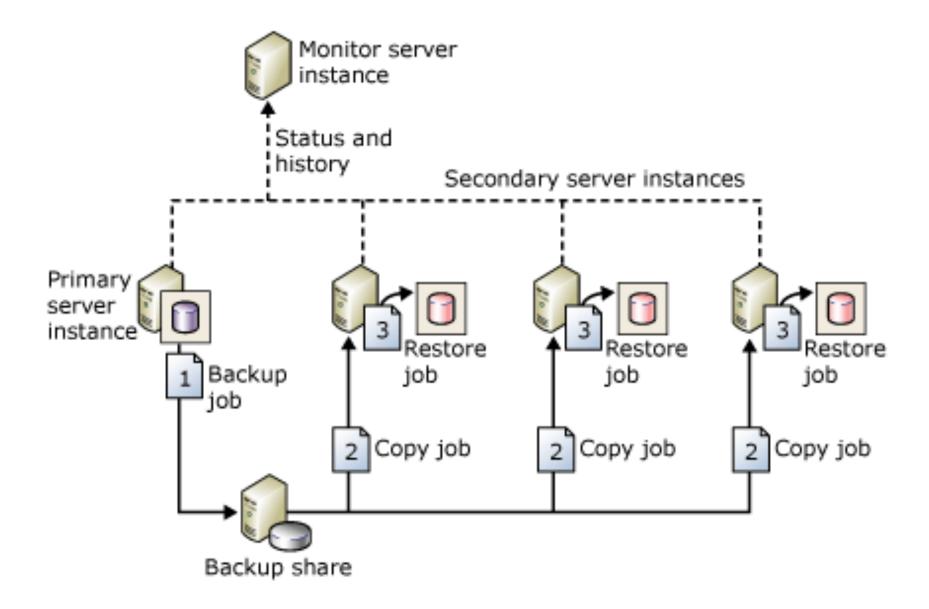
Third-party scripts that work with Azure blob storage

Manual recovery required

Log Shipping







The following solutions get confusing and change rapidly.



You have been warned



Automated Backup



Managed in the SQL Server Configuration blade in the portal

Superset for Managed Backup

Uses a customer managed storage account

Backups can be encrypted

Backups are retained for 90 days

Automated Backups





Restores are performed manually via TSQL

SQL Server 2016 or higher -

System database backups

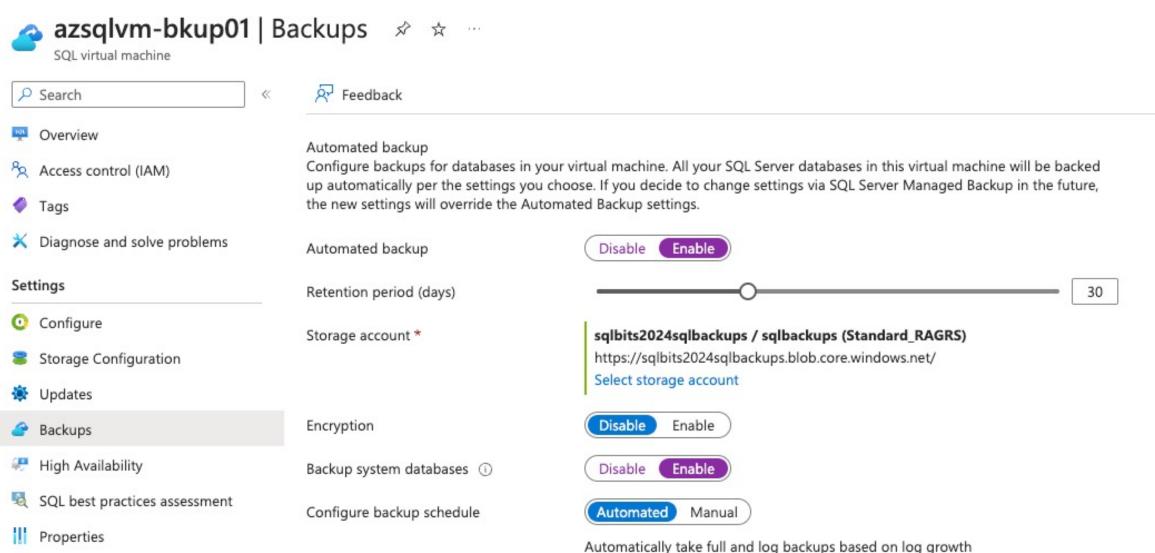
Manual backup schedules & time options

Defined full & transaction log backup frequency

Portal Blade Look







Managed Backup to Azure





Subset of Automated Backup solution

More complex than other solutions

Managed via T-SQL

Can be applied at the database level & will override instance defaults

New databases are backed up automatically

Managed Backup to Azure





System Object	Description	
MSDB	Stores the metadata, backup history for all the backups created by SQL Server Managed Backup to Microsoft Azure.	
managed_backup.sp_backup_config_basic (Transact- SQL)	Enables SQL Server Managed Backup to Microsoft Azure.	
managed_backup.sp_backup_config_advanced (Transact-SQL)	Configures advanced settings for SQL Server Managed Backup to Microsoft Azure, such as encryption.	
managed_backup.sp_backup_config_schedule (Transact-SQL)	Creates a custom schedule for SQL Server Managed Backup to Microsoft Azure.	
managed_backup.sp_ backup_master_switch (Transact- SQL)	Pauses and resumes SQL Server Managed Backup to Microsoft Azure.	
managed_backup.sp_set_parameter (Transact-SQL)	Enables and configures monitoring for SQL Server Managed Backup to Microsoft Azure. Examples: enabling extended events, mail settings for notifications.	
managed_backup.sp_backup_on_demand (Transact- SQL)	Performs an ad hoc backup for a database that is enabled to use SQL Server Managed Backup to Microsoft Azure without breaking the log chain.	

Gotchas





Backups are grouped together

Poor file naming conventions in the storage account

Split multiple instances into different containers

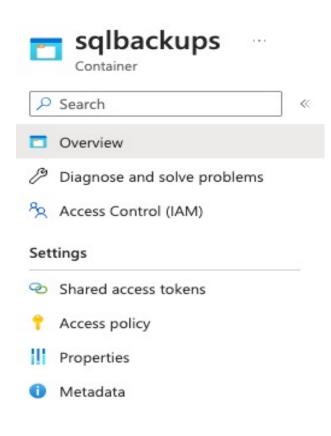
master_234c3f4c53ac45f28329615c2f5ddaba_20240224193746+00.bak
model_ebd0fe66f91f43f199c3b52d803bb136_20240224193746+00.bak
model_ebd0fe66f91f43f199c3b52d803bb136_20240224194256+00.log
model_ebd0fe66f91f43f199c3b52d803bb136_20240224214656+00.log
model_ebd0fe66f91f43f199c3b52d803bb136_20240224235057+00.log
model_ebd0fe66f91f43f199c3b52d803bb136_20240225015457+00.log
model_ebd0fe66f91f43f199c3b52d803bb136_20240225035857+00.log
model_ebd0fe66f91f43f199c3b52d803bb136_20240225060257+00.log
model_ebd0fe66f91f43f199c3b52d803bb136_20240225080657+00.log

Gotchas





2/25/2024, 3:06:58 AM



Authentication method: Access key (Switch to Microsoft Entra user account) Location: sqlbackups						
Search blobs by prefix (case-sensitive)						
† _▽ Add filter						
Name	Modified					
master_234c3f4c53ac45f28329615c2f5ddaba_20240224193746+00.bak	2/24/2024, 2:37:48 PM					
model_ebd0fe66f91f43f199c3b52d803bb136_20240224193746+00.bak	2/24/2024, 2:37:47 PM					
model_ebd0fe66f91f43f199c3b52d803bb136_20240224194256+00.log	2/24/2024, 2:42:57 PM					
model_ebd0fe66f91f43f199c3b52d803bb136_20240224214656+00.log	2/24/2024, 4:46:57 PM					
model_ebd0fe66f91f43f199c3b52d803bb136_20240224235057+00.log	2/24/2024, 6:50:57 PM					
model_ebd0fe66f91f43f199c3b52d803bb136_20240225015457+00.log	2/24/2024, 8:54:57 PM					
model_ebd0fe66f91f43f199c3b52d803bb136_20240225035857+00.log	2/24/2024, 10:58:58 PM					
model_ebd0fe66f91f43f199c3b52d803bb136_20240225060257+00.log	2/25/2024, 1:02:58 AM					

model_ebd0fe66f91f43f199c3b52d803bb136_20240225080657+00.log

Azure Backup for SQL



Utilizes a Recovery Services Vault

Provides single pane of glass for management across multiple VMs running SQL Server

Restores are managed from the portal

Features





RPO is limited to 15-minutes minimum

Honors Availability Group backup preferences

Able to define custom policies

Settings



Specify the vault

Specify the policy

Home > Virtual machines > azsqlvm-b	kup01 Backup >
Backup azsqlvm-bkup01	
Simple and reliable SQL backup	
Review the following information and click	on 'Enable backup' to start protecting your SQL server.
Recovery Services vault ①	Create new Select existing
Vault *	SQLBackups
Choose backup policy * ③	HourlyLogBackup \checkmark
Policy Details	
Full backup	Backup frequency Daily at 7:30 AM UTC
	Retention of daily backup point Retain backup taken every day at 7:30 AM for 30 Day(s)
Log Backup	Backup frequency Every 1 hour(s)
	Retained for 30 days



Policies





Policy name ①	JohnsTest
Full backup	Backup frequency Weekly on Sunday at 7:30 PM Eastern Standard Time
	Retention of weekly backup point Retain backup taken every week on Sunday at 7:30 PM for 104 Week(s)
	Retention of monthly backup point Retain backup taken every month on First Sunday at 7:30 PM for 60 Month(s)
	Retention of yearly backup point Retain backup taken every year in January on First Sunday at 7:30 PM for 10 Year(s)
Differential Backup	Backup frequency Weekly on Monday, Tuesday, Wednesday, Thursday, Friday, Saturday at 2:00 AM Eastern Standard Time
	Retained for 30 days
Log Backup	Backup frequency Every 15 minutes
	Retained for
	15 days

1 Log backup for DBs in simple recovery model will be skipped.



Snapshots Types

Crash Consistent Application Consistent

Crash Consistent





Synonymous to pulling the power plug on the VM

Contains on-disk data

Anything in memory is not included

Taken every 5 minutes

Application Consistent





Both on-disk data and memory data is included

Utilizes the Volume Shadow Copy Service (VSS)

Takes longer to generate the snapshot

Potentially affects performance

Frozen I/O



Can cause issues with heavy workloads

Monitor accordingly

1_	L/ E-7/ E-0E-7 1T-030 1 191	apidoz	разаране почен опункциу вывретием гот втиратот раскир ит везают од виссеватину гезинтем ит везают од.
Ŀ	2/24/2024 1:45:36 PM	spid60	I/O was resumed on database master. No user action is required.
Ŀ	2/24/2024 1:45:36 PM	spid63	I/O was resumed on database msdb. No user action is required.
Ŀ	2/24/2024 1:45:36 PM	spid62	I/O was resumed on database model. No user action is required.
Ŀ	2/24/2024 1:45:35 PM	spid60	I/O is frozen on database master. No user action is required. However, if I/O is not resumed promptly, you could cancel the backup.
E	2/24/2024 1:45:35 PM	spid63	I/O is frozen on database msdb. No user action is required. However, if I/O is not resumed promptly, you could cancel the backup.
E	2/24/2024 1:45:35 PM	spid62	I/O is frozen on database model. No user action is required. However, if I/O is not resumed promptly, you could cancel the backup.
-	1		

Azure Backup for VMs





Provides backup at the VMs level

Requires recovery services vault

Allows for individual disk protection

Utilizes application consistent snapshots

Does not require the VM to be shut down

Pricing





Pricing based on VM size

Size of each instance	Azure Backup price per month
Instance < or = 50 GB	\$5 + storage consumed
Instance is > 50 GB but < or = 500 GB	\$10 + storage consumed
Instance is > 500 GB	\$10 for each 500 GB increment + storage consumed

Policies



Defined policies for flexibility

Create your own policy to match organizational requirements

Enhanced

- Multiple backups per day
- Up to 30 days operational tier retention
- Support for Trusted Launch Azure VM
 - Support for VMs with Ultra Disks and
- Premium SSD v2

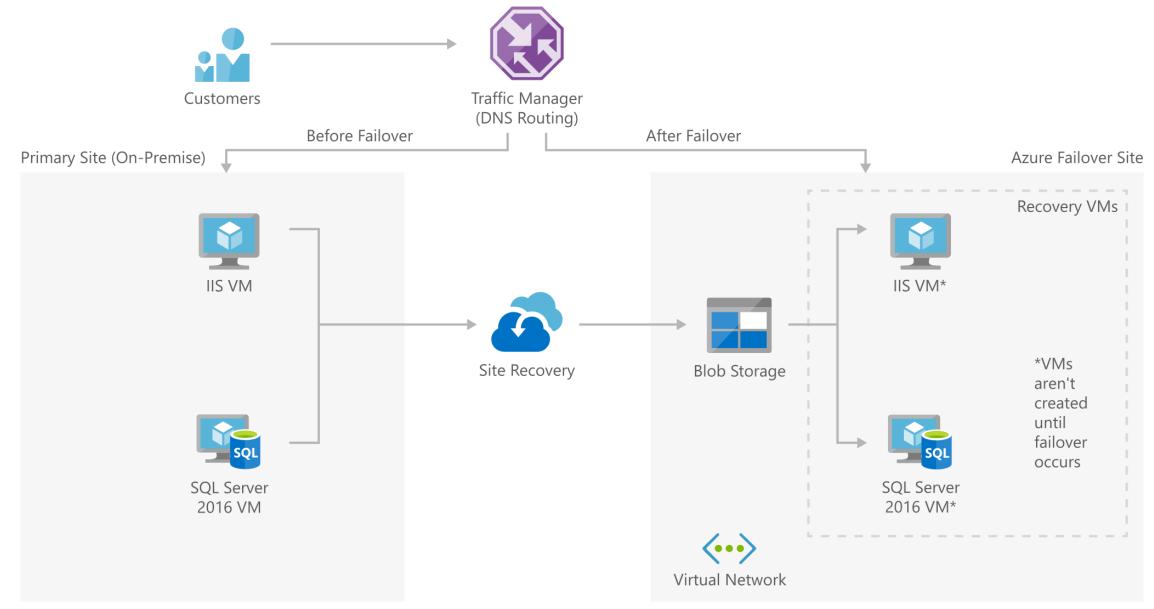
Standard

- Once-a-day backup
- Up to 5 days operational tier retention

Azure Site Recovery







Azure Site Recovery





\$25 + storage costs per instance

Requires storage account vault

Need to consider additional components like domain controllers & network topology

Allows for non-destructive test failovers

High-churn availability ———



Plan Accordingly



-			
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Taru	eι	settir	IUS
	-		_

General settings	Source	Target	Info
Subscription	Microsoft Azure Sponsorship (Microsoft Azure Sponsorship (af11 ∨	
VM resource group	SQLBIts2024	(new) SQLBIts2024-asr-1	
Virtual network	az-vnet-sqlbits2024	(new) az-vnet-sqlbits2024-asr	
Availability	Single instance	Single instance Availability set Availability zone Not Applicable	
Proximity placeme	Not Applicable	Select	

Blade Level Control





Create a virtual machine

Login with Azure AD ①		
⚠ This image does not support Login w	vith Azure AD.	
Auto-shutdown Enable auto-shutdown ①		
Site Recovery		
Enable Disaster Recovery ①		
Secondary region * ①	(US) East US	~
Secondary subscription ①	Microsoft Azure Sponsorship (af11b486-3e53-4077-b62e-f08f0e83ff65)	~
Recovery Services vault * ①	SQLBackups Create new	~
Site Recovery policy * ①	(new) 24-hour-retention-policy Create new	~
Availability options ①	No infrastructure redundancy required	~
Update settings	Allow ASR to manage	~
Automation account *	(new) SQLBackup-gci-asr-automationaccount	~

DEMO

Matrix of Decision



Solution	RPO
Manual Backups	Varies
Availability Groups	Seconds
Log Shipping	Varies
Automated Backups	5 mins
Azure Backup for SQL	15 mins
Azure Backup for VMs	24 hrs/4 hrs
Azure Site Recovery	Varies

Restore Matrix of Decision



Solution	Method
Manual Backups	TSQL
Availability Groups	Failover
Log Shipping	TSQL
Automated Backups	TSQL
Azure Backup for SQL	Portal
Azure Backup for VMs	Portal
Azure Site Recovery	Portal

Uncommon Scenarios





Azure Storage Database file residency using file-snapshots

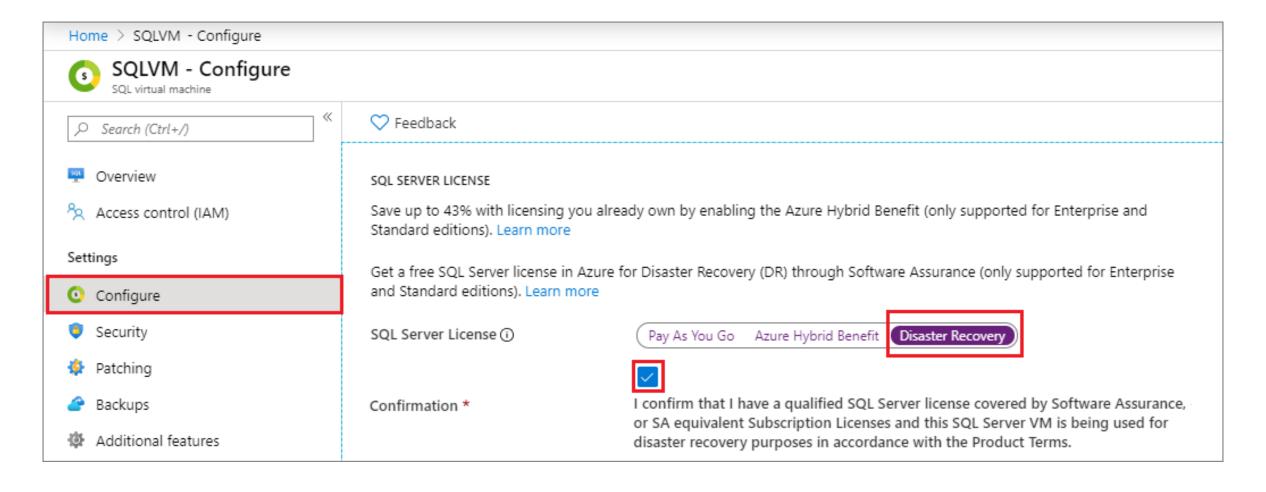
Azure disk snapshots

Free DR License





If you have software assurance...



Summary





Level up beyond Level 0

Multiple options are available

Not exhaustive list, scripting can be your friend

Something is better than nothing

Test thoroughly



Questions? Answers!



Please provide feedback!!



Feedback





Got Questions?

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Denny Cherry & Associates Consulting

DCAC*

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john@dcac.com



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Slides & Demos



/in/johnmorehouse =

