SQL Server in Azure

Managed Instance Experience

Hubert Kobierzewski

Warszawa, 5th March 2020

Hubert K. Kobierzewski

- BI Practice Lead at Codec (over 12 years)
- Trainer at Sages, Comarch
- College Lecturer at ALK, WUT
- Specialized in: Data Warehousing, ETL processes and Business Intelligence
- MS SQL Server certified (MCDBA, MCTS, MCITP, MCSE – BI, MCT)
- Co-leader of Warsaw Data Community Chapter
- Co-leader of Warsaw Power BI User Group

CODEC | EMPOWERING BUSINESS

Azure SQL Database resource types

Azure SQL Database

Single

Database-scoped deployment option with predictable workload performance

Best for apps that require resource guarantee at database level

Elastic Pool

Shared resource model optimized for greater efficiency of multi-tenant applications

Best for SaaS apps with multiple databases that can share resources at database level, achieving better cost efficiency

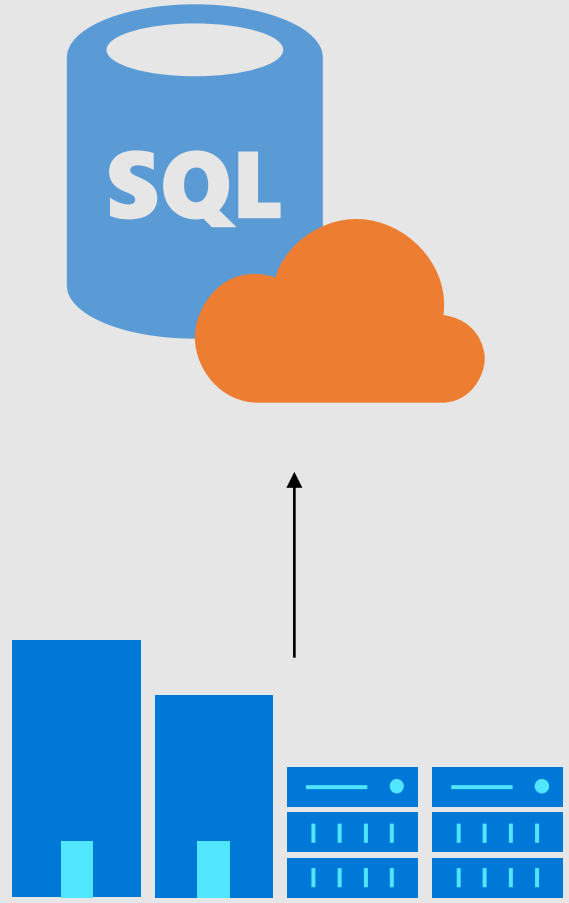
Managed Instance

Instance-scoped deployment option with high compatibility with SQL Server and full PaaS benefits

Best for modernization at scale with low friction and effort

Azure SQL DB managed Instance

Customers looking to **migrate a large number of apps** from on-premise or IaaS, self-built or ISV provided, with as **low migration effort as possible** & **cost being a crucial factor**



Dedicated resources and familiar tools

Enable full isolation from other tenants without resource sharing

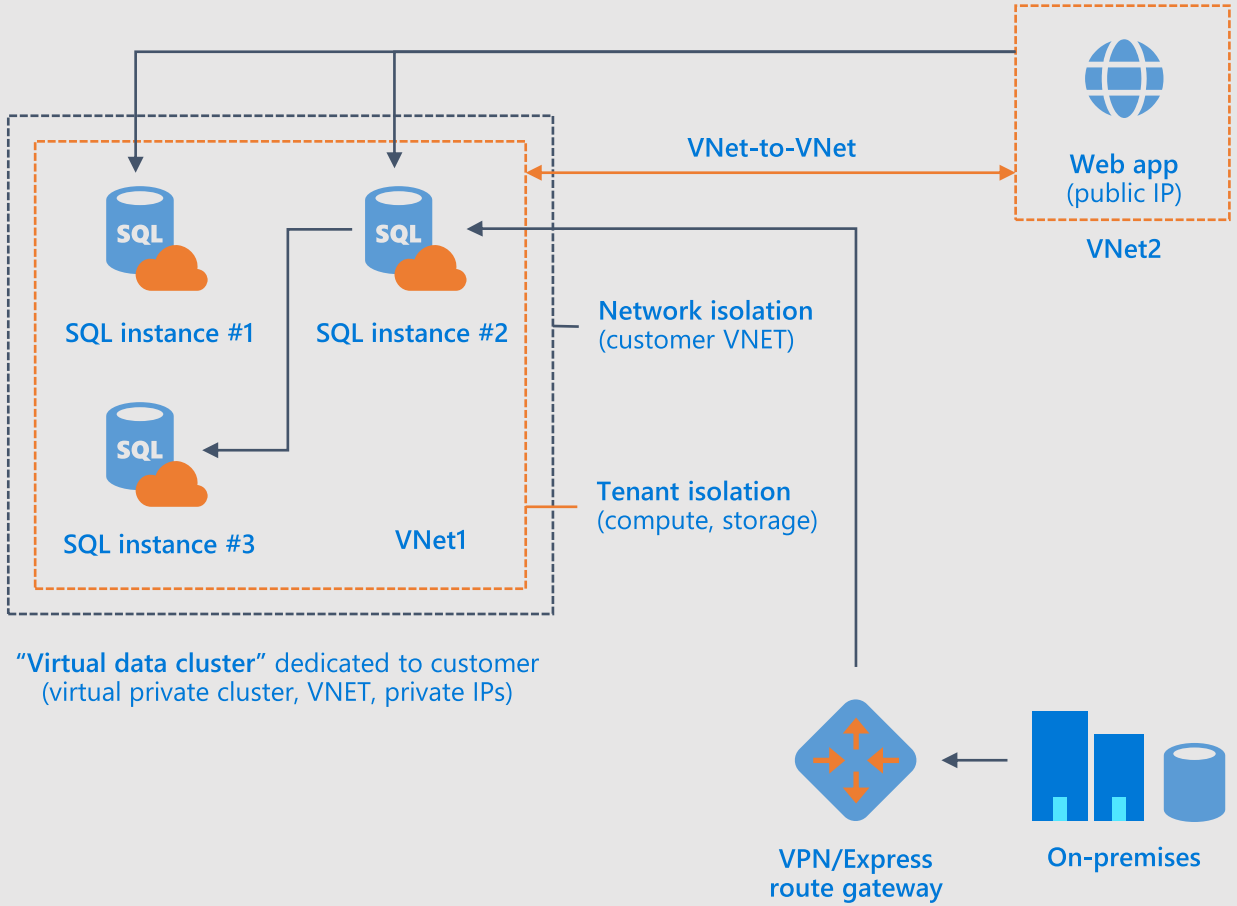
Promote secure communication over private IP addresses with native VNET integration

Enable your on-premise identities on cloud instances, through integration with Azure Active Directory and AD Connect

Combine the best of SQL Server with the benefits of a fully-managed service

Use familiar SQL Server features in SQL Database Managed Instance

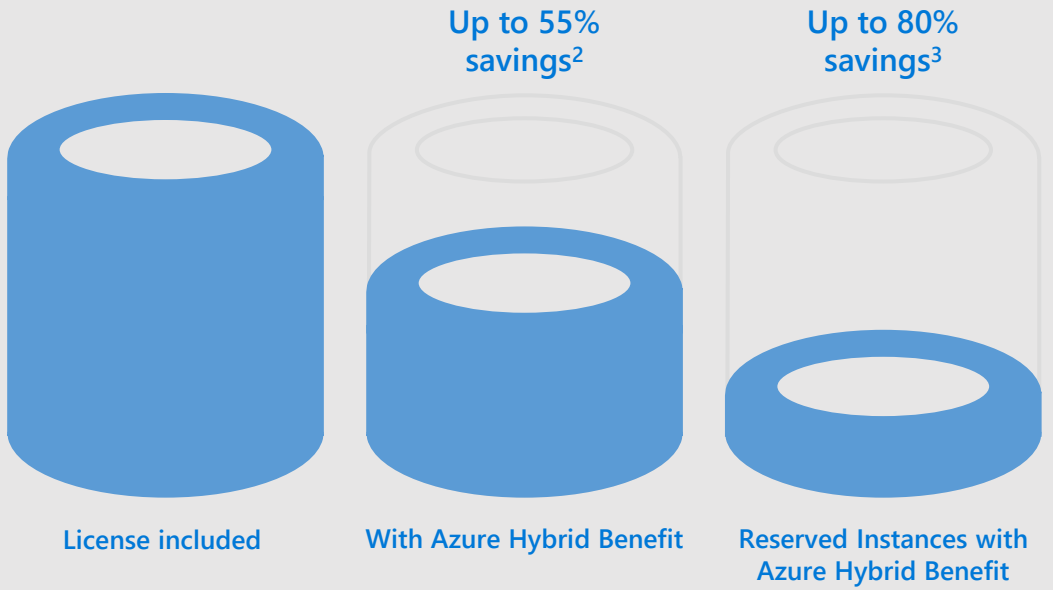
VNET support in SQL Database Managed Instance



Reserved Capacity for Azure SQL Database

Reserve Azure SQL Database resources in advance and save up to 33%[1]

- Budget and forecast better with upfront payment for one-year or three-year terms
- Get prioritized compute capacity in Azure regions
- Exchange or cancel reservations as your needs evolve
- Scale up or down within a performance tier and region with auto-fit
- Move SaaS apps between elastic pools and single databases and keep your reserved instance benefit



[1] Savings based on eight vCore Managed Instance Business Critical in East US Region, running 730 hours per month. Savings are calculated from full price (license included) against base rate (applying Azure Hybrid Benefit for SQL Server), which excludes Software Assurance cost for SQL Server Enterprise edition, which may vary based on EA agreement. Actual savings may vary based on region, instance size and performance tier. Prices as of May 2018, subject to change.

[2] Savings based on eight vCore SQL Database Managed Instance Business Critical in West 2 US Region, running 730 hours per month. Savings are calculated from on demand full price (license included) against base rate with Azure Hybrid Benefit plus 3-year reserved capacity commitment. Savings excludes Software Assurance cost for SQL Server Enterprise edition, which may vary based on EA agreement. Actual savings may vary based on region, instance size and performance tier. Prices as of May 2018, subject to change.

Put your DBs on autopilot and focus on your business...

Tired of managing hardware, software & business continuity?

You can stop doing it, Managed Instance has it built-in	
✓	Compute & storage provisioned on demand Fast & online scaling Full stack updates and patches
✓	Backups with health checks Point-in-time restore
✓	99.99% availability with automatic failover Disaster recovery with single geo secondary (multiple*)

* - features coming soon

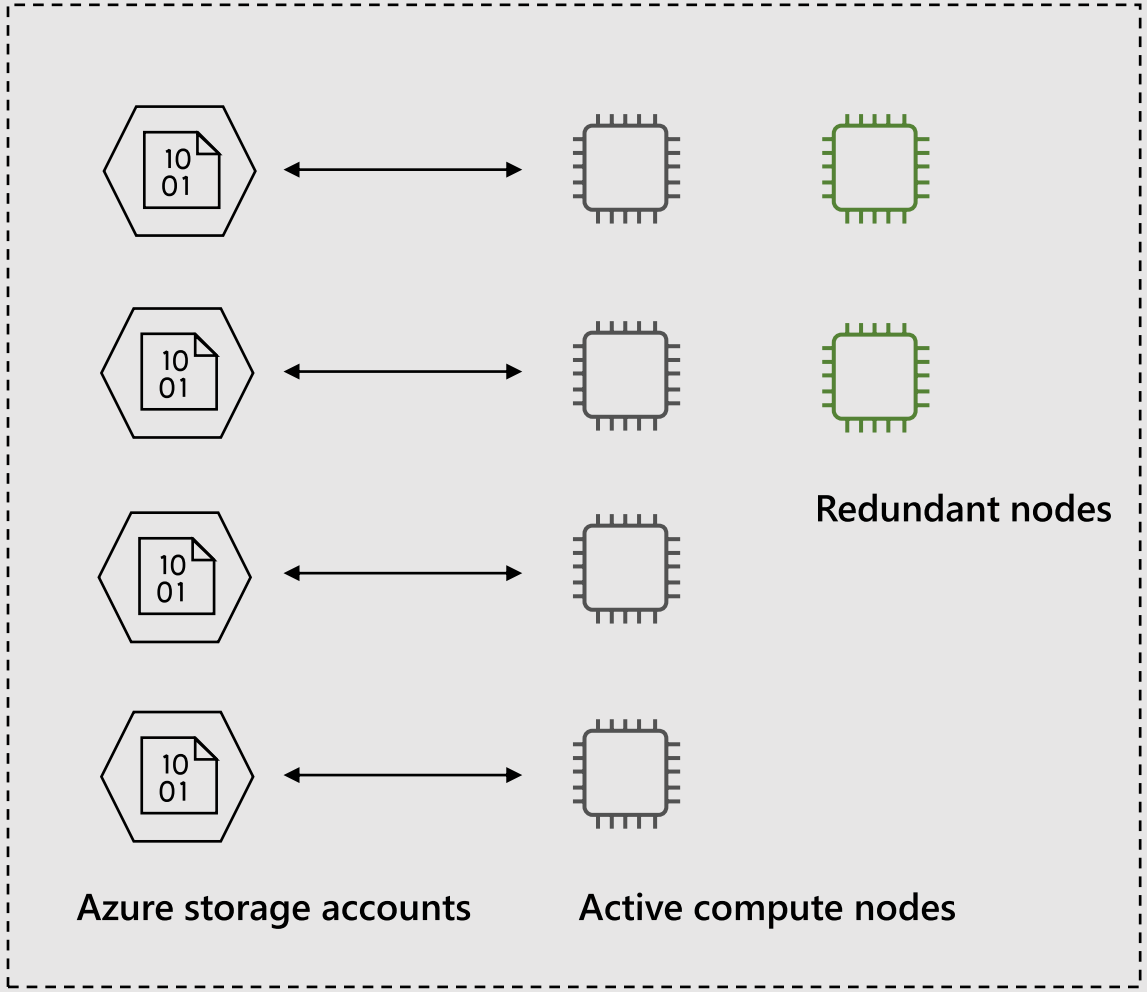
Managed Instance: Service Tiers

Capability \ Service tier	General Purpose (GA)	Business Critical (Public Preview)
Best for	Apps with typical availability and common IO latency requirements	Apps with highest availability and lowest IO latency requirements.
Compute (vCores)	4, 8, 16, 24, 32, 40, 64, 80	8, 16, 24, 32, 40, 64, 80
HA / Recovery Time Objective	Remote storage based / Good	Always On AG based / Better
Storage type / size	Fast remote (Azure Premium) / Up to 8 TB	Super-fast local SSD / Up to 4 TB
Read scale out (read-only replica)	No	Yes
In-Memory OLTP	No	Yes

Note: pricing for an Azure SQL DB Managed Instance on US East price, under fully priced model (license included), on Sept 14, 2018. Comparable AWS RDS SQL is db.r3.2xlarge. AWS prices based on US East (N. Virginia). SE single AZ in AWS RDS compared to SQL MI General Purpose. EE multi-AZ in AWS RDS compared to SQL MI Business Critical.

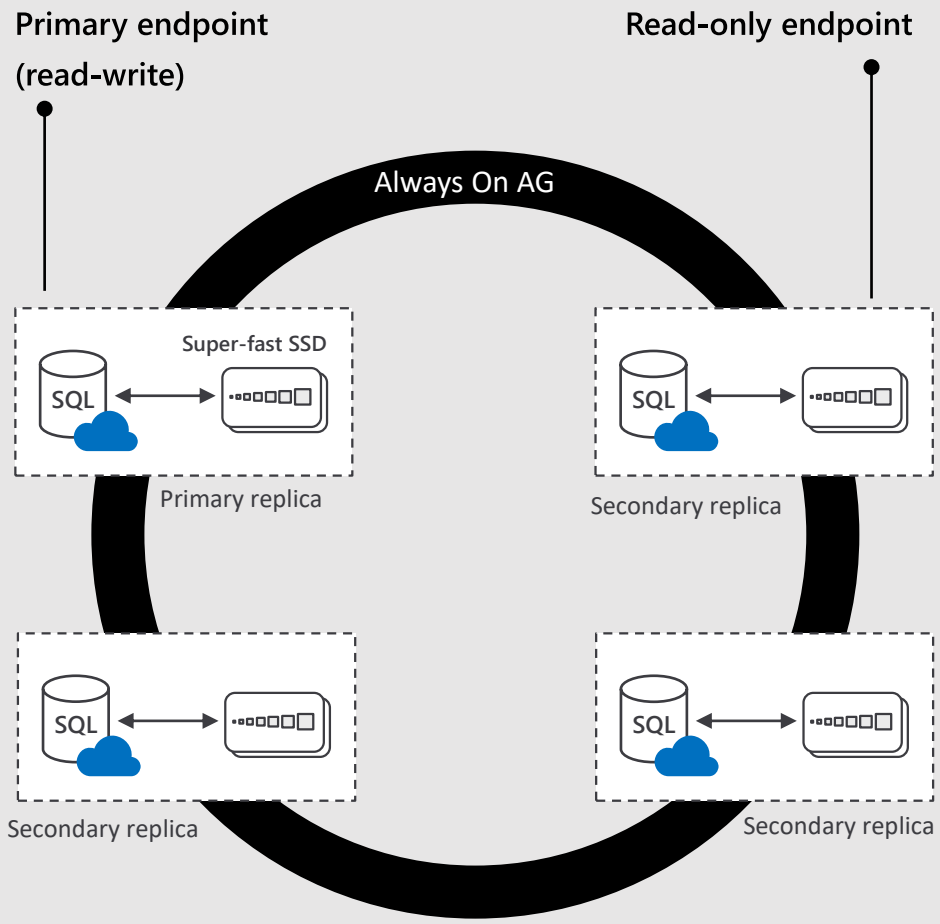
General Purpose

Feature	Description
Number of vCores*	8, 16, 24 (Gen 4) 8, 16, 24, 32, 40, 64, 80 (Gen 5)
SQL Server version / build	SQL Server (latest available)
Min storage size	32 GB
Max storage size	8 TB
Max storage per database	Determined by the max storage size per instance
Expected storage IOPS	500-7500 IOPS per data file (depends on data file). See Premium Storage
Number of data files (ROWS) per the database	Multiple
Number of log files (LOG) per database	1
Managed automated backups	Yes
HA	Based on remote storage and Azure Service Fabric
Built-in instance and database monitoring and metrics	Yes
Automatic software patching	Yes
VNet - Azure Resource Manager deployment	Yes
VNet - Classic deployment model	No
Portal support	Yes



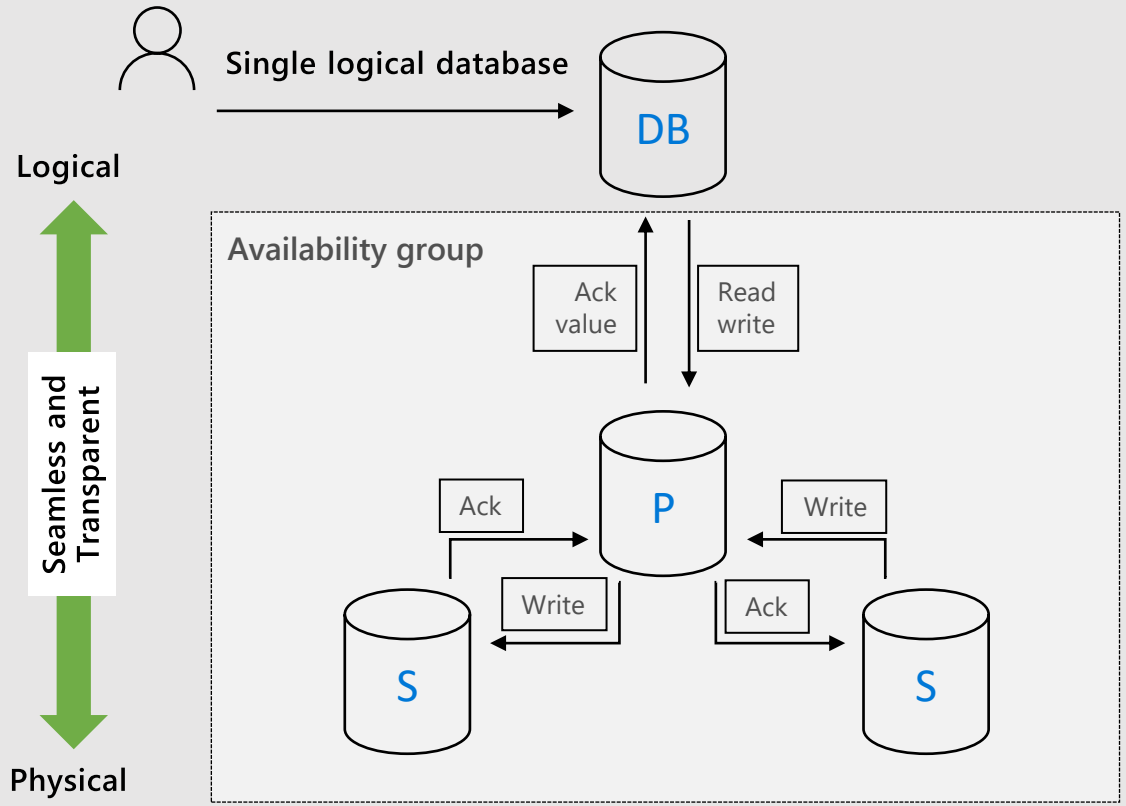
Business Critical

Feature	Description
Number of vCores*	8, 16, 24, 32 (Gen 4) 8, 16, 24, 32, 40, 64, 80 (Gen 5)
SQL Server version / build	SQL Server (latest available)
Additional features	In-Memory OLTP 1 additional read-only replica (Read Scale-Out)
Min storage size	32 GB
Max storage size	•Gen 4: 1 TB (all vCore sizes Gen 5:1 TB for 8, 16 vCores •2 TB for 24 vCores •4 TB for 32, 40, 64, 80 vCores
Max storage per database	Determined by the max storage size per instance
Number of data files (ROWS) per the database	Multiple
Number of log files (LOG) per database	1
Managed automated backups	Yes
HA	Based on Always On Availability Groups and Azure Service Fabric
Built-in instance and database monitoring and metrics	Yes
Automatic software patching	Yes
VNet - Azure Resource Manager deployment	Yes
VNet - Classic deployment model	No
Portal support	Yes



Business Critical service tier: collocated compute and storage

Built-in high availability



Reads are completed at the primary

Writes are replicated to secondaries

Virtual network guidance

A Managed Instance must be deployed in an Azure Virtual Network

Allows for connecting directly from an on-premises network

Allows for connecting linked servers or other on-premises data stores

Allows for connecting to additional Azure resources

Plan your deployment

Managed Instance requires a minimum of 16 IP addresses in a subnet and may use up to 256 IP addresses

If deploying multiple Managed Instances inside the subnet, you need to optimize the subnet size

The default values create a subnet that takes all the VNet address space, allowing for only Managed Instance inside the virtual network

Routes

Effective routes on the Managed Instance subnet are not supported

Routes can be user-defined (UDR) or Border Gateway Protocol (BGP) routes propagated to network interfaces through ExpressRoute or site-to-site VPN connections

For BGP routes, create a 0.0.0.0/0 Next Hop Internet route and apply it to the Managed Instance subnet

Network Security Groups (NSG)

NSGs on the Managed Instance subnet are not supported

SQL Server Agent

Built into Managed Instance

Azure SQL Database requires using on-premises SQL Server Agent, Azure Automation, Elastic Jobs, or PowerShell

Always running

Services cannot be stopped or restarted like they can with on-premises
Option to auto-restart SQL Server if it stops unexpectedly is disabled
Option to auto-restart SQL Server Agent if it stops unexpectedly is disabled

Forwarding SQL Server events is disabled

On-premises SQL Server Agent allows for forwarding events to another server but this is currently not an option for a Managed Instance

Connection

Alias local host server is predefined for a Managed Instance, whereas on-premises SQL Server Agent allows that to be configured if needed

Creating jobs

Creating jobs is as simple and easy as on-premises
Jobs can be created using the UI or T-SQL

Alert System

Functions the same as on-premises for sending email alerts

SQLCMD

Cannot be called within a SQL Server Agent job
Can be used to connect to a Managed Instance

Database mail

Fully supported in Managed Instance

Functions the same as on-premises to set up and use

Azure SQL Database does not have Database Mail support

Replication support

Supported

Snapshot replication. Same functionality as on-premises
Transactional replication

Unsupported

Peer-to-peer replication
Merge replication
Heterogeneous replication
Oracle publisher
For comparison, Azure SQL Database only supports being a transactional replication push subscriber

Some restrictions when used with a Managed Instance

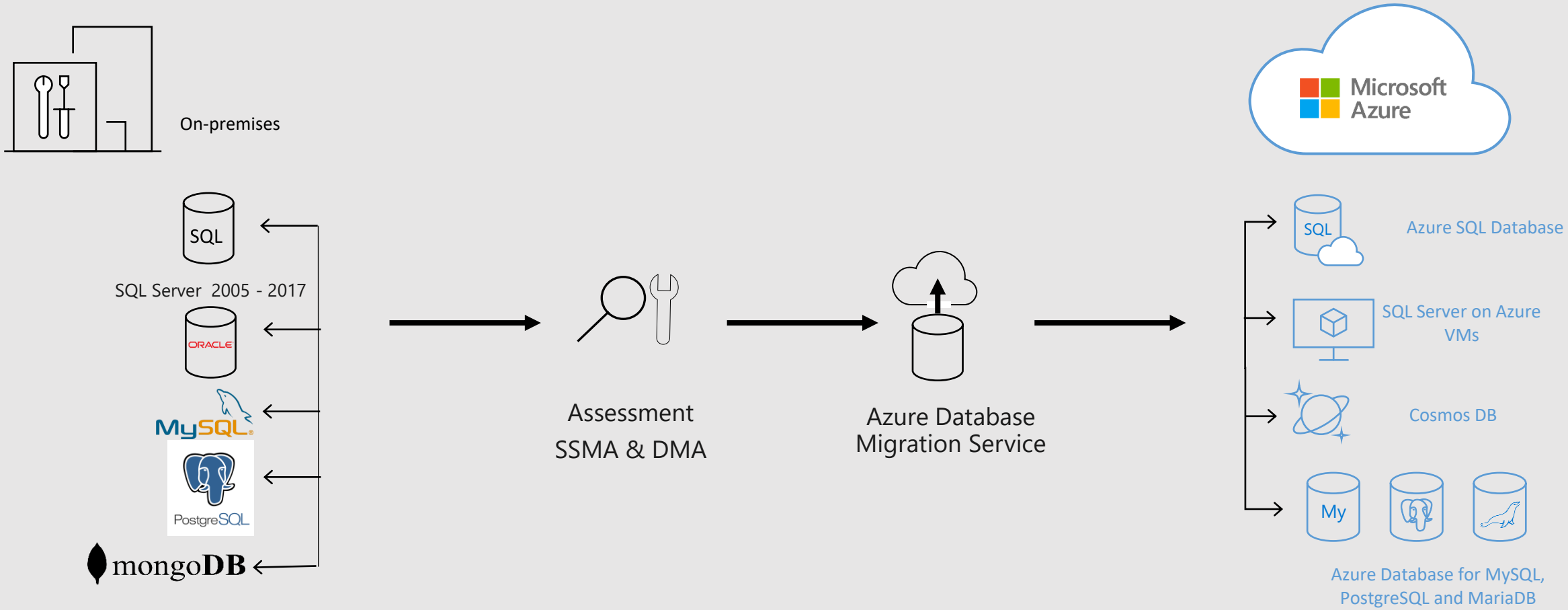
Updatable subscriptions are not permitted
Publisher and distributor must be in the same location
If publisher and distributor are in a Managed Instance, Azure file share must be used to store data and schema from the publication
Connections to the Distributor must use SQL authentication

Additions to support Managed Instance

New fields have been added in replication-related tables in msdb
job_login, job_password, storage_connection_string
SSMS replication wizard supports using a Managed Instance

Migrating databases using Azure Database Migration Services

Seamless, end to end solution | Near-zero downtime | Resilient | Migrate at-scale from multiple sources



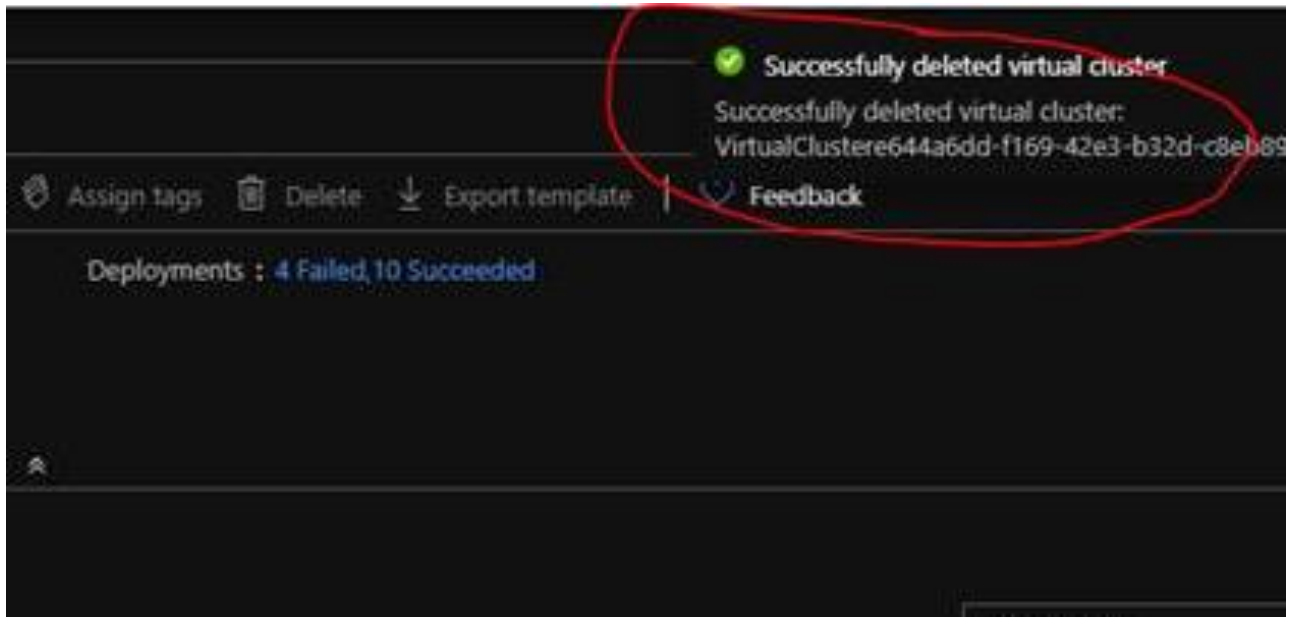
Lessons Learned

- Creating an instance takes time
- Subscriptions may be restricted (no of cores)
- Make good planning of your network resources

Status	Last modified	Duration
Failed (Error details)	3/2/2020, 9:10:38 PM	1 minute 13 seconds
Failed (Error details)	3/2/2020, 8:08:32 PM	1 minute 2 seconds
Succeeded	2/25/2020, 1:08:26 PM	4 hours 42 minutes 42 seconds
Failed (Error details)	2/25/2020, 8:21:56 AM	1 minute 2 seconds

Lessons Learned

- Removing resources doesn't always work (like all in Azure)
- Virtual Cluster is the most problematic one



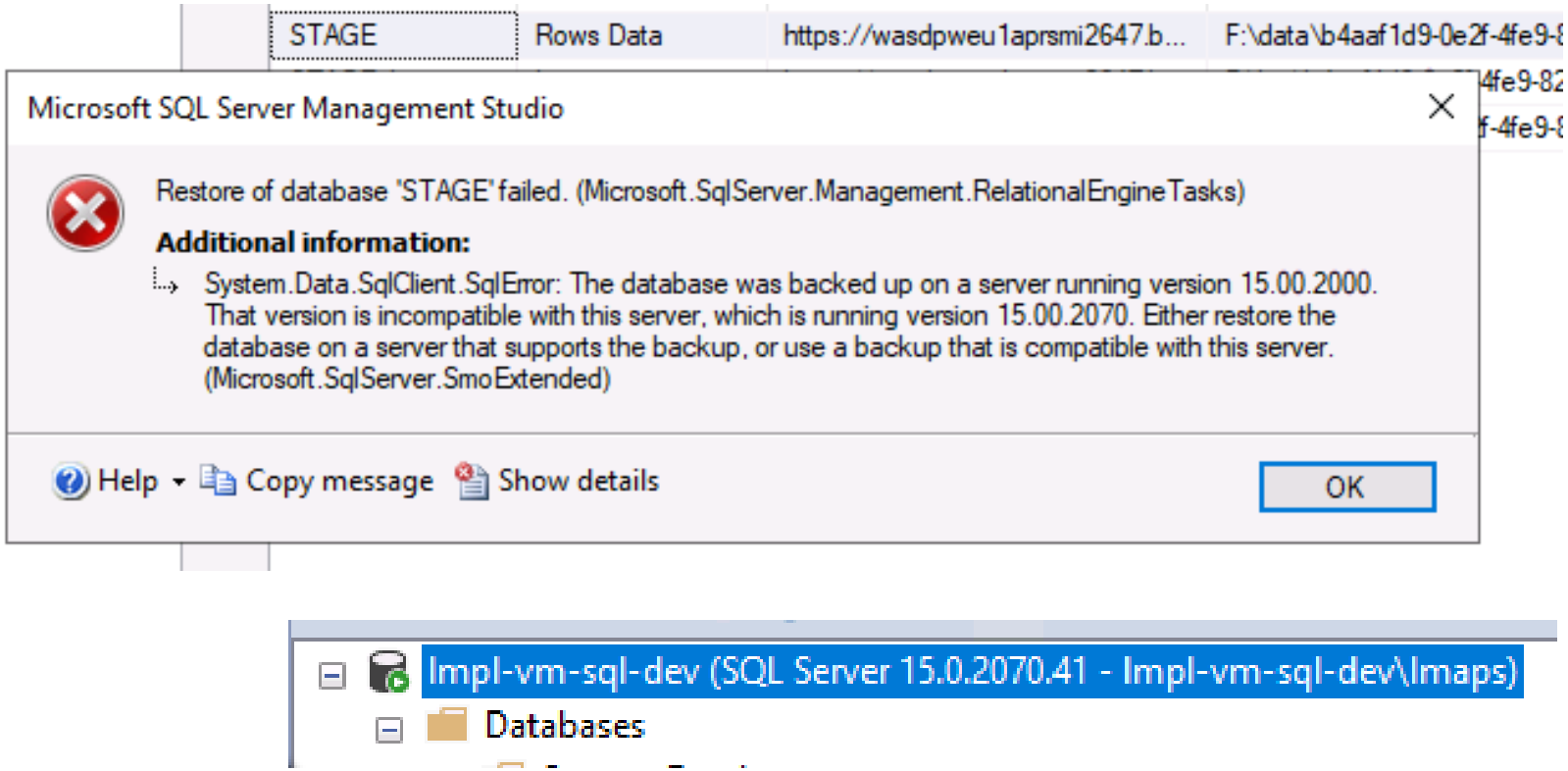
Lessons Learned

- Performance may vary
- Dropping all related objects may require few rounds
- Dropping an instance and re-creating takes minutes (not hours)

Status	Last modified	Duration
Succeeded	3/5/2020, 11:21:40 AM	3 hours 48 minutes 59 seconds

Lessons Learned

- Backups cannot be restored on on-premises



Lessons Learned

- Backups can help with migration
- Split DB into several filegroups before migration
- One disk per DB file - Azure Premium Disk Storage

File size	>=0 and <=128 GiB	>128 and <=256 GiB	>256 and <= 512 GiB	>0.5 and <=1 TiB	>1 and <=2 TiB	>2 and <=4 TiB	>4 and <=8 TiB
IOPS per file	500	1100	2300	5000	7500	7500	12,500
Throughput per file	100 MiB/s	125 MiB/s	150 MiB/s	200 MiB/s	250 MiB/s	250 MiB/s	480 MiB/s

CODEC EMPOWERING BUSINESS

Thank you!

Hubert Kobierzewski
hkobierzewski@datacommunity.pl

https://www.linkedin.com/in/kobierzewski/

codec.pl