Microsoft

# Migrating SQL on-premises databases to Azure SQL Managed Instance

**Data SQL Ninja Engineering Team**

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# 2 Introduction

This document is intended to assist with migration SQL Server on-premises database(s) or instance to Azure SQL Managed Instance. There is a step by step process documented on how to use Database Migration Assistant (DMA) and Azure Database Migration Service (DMS) to move on-premises database to SQL Managed Instance (MI).

# 3 Background

Azure Database Migration Service (DMS) is designed as a seamless, end-to-end solution for moving on-premises SQL Server databases to the cloud. DMS is a fully managed service designed to enable seamless migrations in an offline/online mode from different database sources to Azure Data services with minimal downtime. Along with DMS we can leverage Data Migration Assistant (DMA) to detect compatibility issues that can impact database functionality on SQL Server Managed Instance. It recommends performance and reliability improvements for your target environment.

# 4 Migration Process Overview

Planning for migration from SQL Server on-premises to SQL MI is a seamless task but a process-oriented approach should to be followed to make the migration smooth. Here are the steps and pre-requisites to have in place before starting a migration.

## 4.1 Pre-requisites:

Ensure the environment for Azure SQL Managed Instance has been prepared per the following documents:

https://docs.microsoft.com/en-us/azure/sql-database/sql-database-managed-instance-vnet-configuration

For Managed Instance creation you need dedicate subnet inside the VNet that conforms to the following requirements:

- **Be empty**: The subnet must not contain any other cloud service associated to it, and it must not be Gateway subnet. You won't be able to create Managed Instance in subnet that contains resources other than managed instance or add other resources inside the subnet later.
- **No NSG**: The subnet must not have a Network Security Group associated with it.
- **Have specific route table**: The subnet must have a User Route Table (UDR) with 0.0.0.0/0 Next Hop Internet as the only route assigned to it. For more information, see Create the required route table and associate it
- **Optional custom DNS**: If custom DNS is specified on the VNet, Azure's recursive resolvers IP address (such as 168.63.129.16) must be added to the list. For more information, see Configuring Custom DNS.
- **No Service endpoint**: The subnet must not have a Service endpoint (Storage or Sql) associated to it. Make sure that Service Endpoints option is Disabled when creating VNet.
- **Sufficient IP addresses**: The subnet must have minimum of 16 IP addresses. For more information, see Determine the size of subnet for Managed Instances

Ensure Azure Database Migration Service environment prerequisites are in place:
https://docs.microsoft.com/en-us/azure/dms/tutorial-sql-server-to-managed-instance

- Create a VNET for the Azure Database Migration Service by using the Azure Resource Manager deployment model, which provides site-to-site connectivity to your on-premises source servers by using either ExpressRoute or VPN. Learn network topologies for Azure SQL DB Managed Instance migrations using the Azure Database Migration Service.
- Ensure that your Azure Virtual Network (VNET) Network Security Group rules do not block the following communication ports 443, 53, 9354, 445, 12000. For more detail on Azure VNET NSG traffic filtering, see the article Filter network traffic with network security groups.
- Configure your Configure your Windows Firewall for source database engine access.
- Open your Windows Firewall to allow the Azure Database Migration Service to access the source SQL Server.
- If you are using a firewall appliance in front of your source databases, you may need to add firewall rules to allow the Azure Database Migration Service to access the source database(s) for migration, as well as files via SMB port 445.

- Create an instance of Azure SQL Database Managed Instance by following the detail in the article Create an Azure SQL Database Managed Instance in the Azure portal.
- Ensure that the logins used to connect the source SQL Server and target Managed Instance are members of the sysadmin server role.
- Create a network share that the Azure Database Migration Service can use to back up the source database.
- Ensure that the service account running the source SQL Server instance has write privileges on the network share that you created.
- Make a note of a Windows user (and password) that has full control privilege on the network share that you created above. The Azure Database Migration Service will impersonate the user credential to upload the backup files to Azure storage container for restore operation.

Database Assessment has been performed to identify on prem source:

- **Instance(s)**
- **Database(s)**

### 4.2 Migration Process High-level Steps

Migration process steps are key to any migration, these must be followed in the order to make sure that all dependencies and pre-steps are completed.

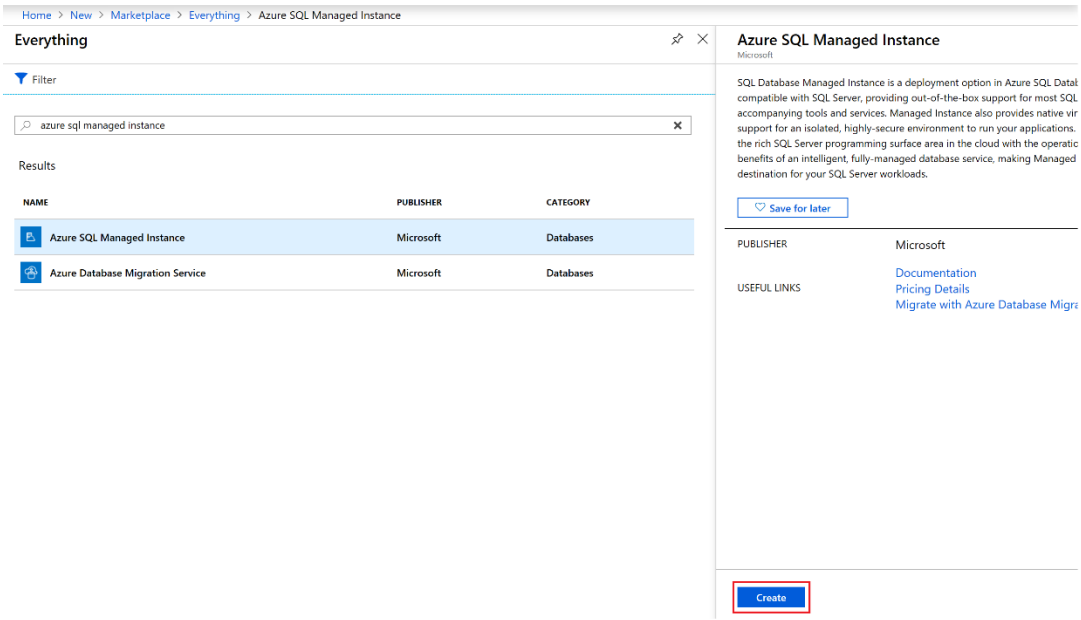
1. Create an Azure SQL Managed Instance
2. Create an Azure Storage Account
3. Create an Azure blob container
4. Generate Shared Access Signature (SAS) for the blob container
5. Install Database Migration Assistant (DMA) Desktop tool
6. Install Database Migration Service
7. Create a migration project to migrate on prem databases to Azure

# 5 Migration Process Step by Step

## 5.1 Create an Azure SQL Managed Instance

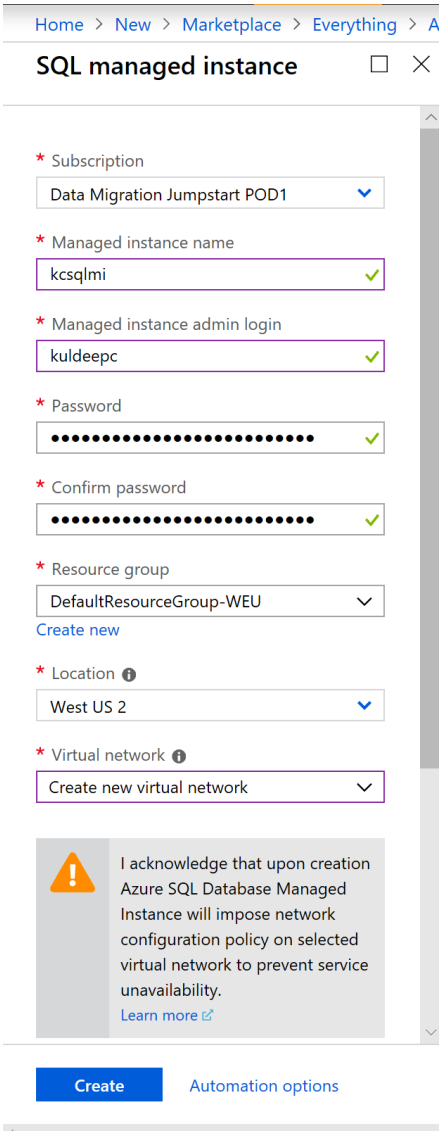
1. Login to the Azure Portal
2. Select 

3. Search for Azure SQL Managed Instance
4. Select Azure SQL Managed Instance

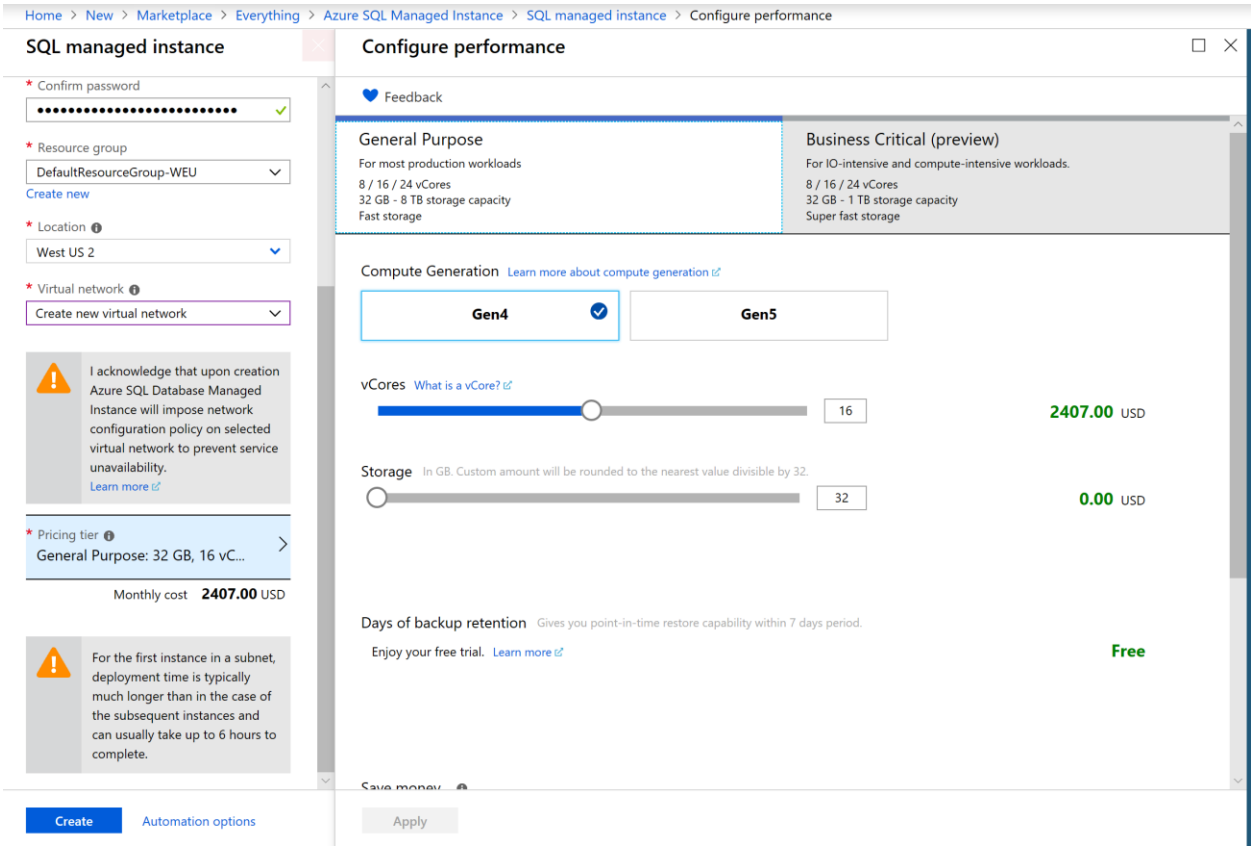



5. Click Create

6. Enter the subscription and fill details related to instance




Note: As of 10/01/2018 Azure SQL Managed instance is GA for General Purpose tier.



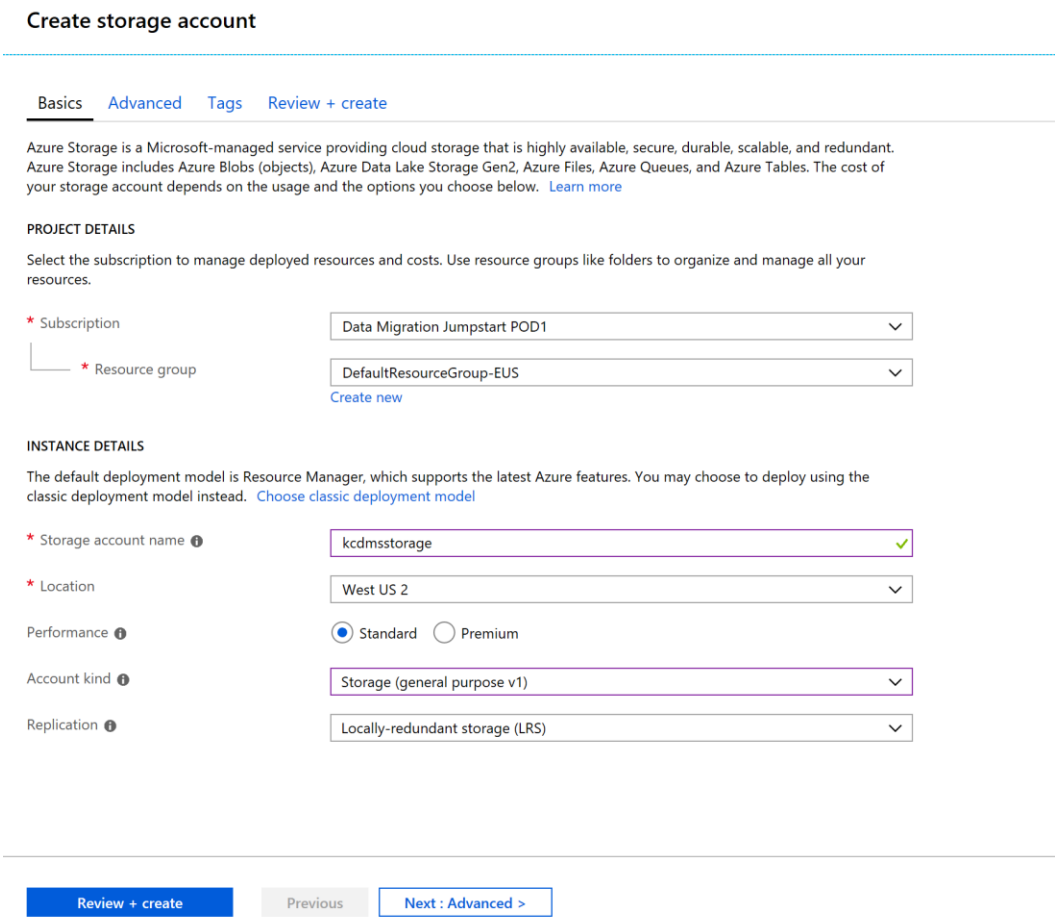

Note: Please consider allocating right storage information here. This will help us avoid any storage related errors during migration.

7. Click Create. Ensure that once Azure SQL Managed instance has been deployed to reserve the following for the migration step 6 of this document.
    - https://docs.microsoft.com/en-us/azure/sql-database/sql-database-managed-instance-tutorial-portal
    - Reserve/Obtain the following target MI information for the migration:
    - Azure Managed Instance Server name
    - Admin User credentials (User name/password)

## 5.2 Create an Azure Storage Account

1. Login to the Azure portal.
2. In the Azure portal, expand the menu on the left side to open the menu of services, and choose All services. Then, scroll down to Storage, and choose Storage accounts. On the Storage Accounts window that appears, choose Add.
3. Enter a storage account name (kcdmsstorage).
4. Set the Account kind field to StorageV1 (based on performance requirements – Standard or Premium storage can be chosen)
5. Set replication to Read-access geo-redundant storage(RA-GRS)

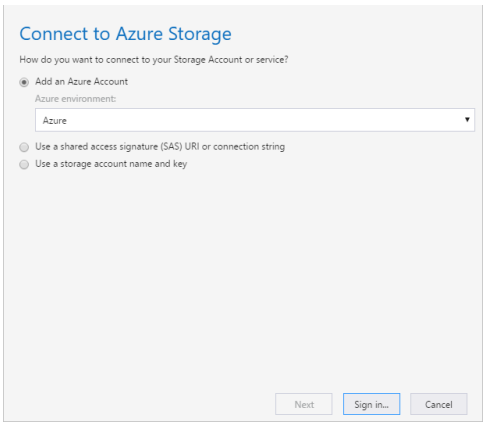
6. Leave these fields set to their defaults: Deployment model, Performance, Secure transfer required.
7. Choose the subscription in which you want to create the storage account.
8. In the Resource group section, select Create New Enter name of ResourceGroup.
9. Choose the location.
10. Select Create to create the storage account




## 5.3 Create a blob container

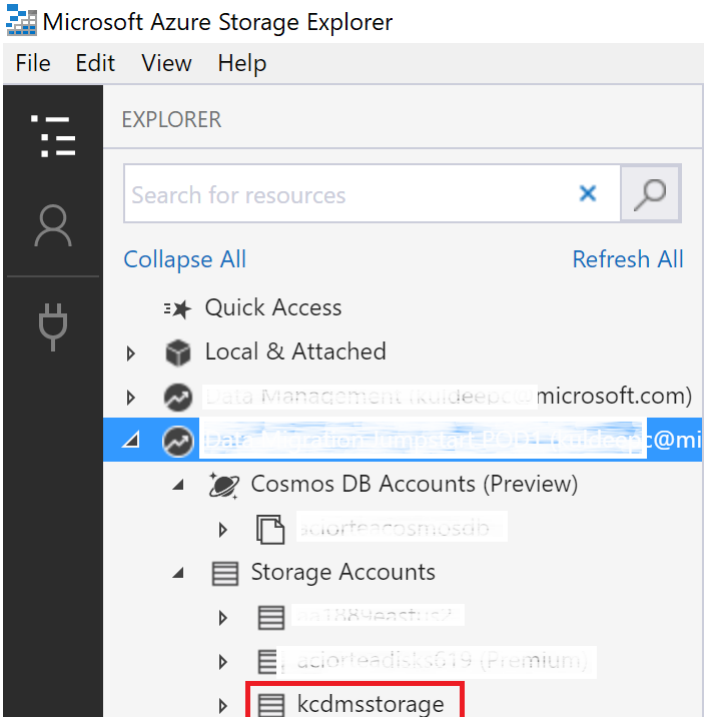
1. At a client workstation, download Azure Storage Explorer and run StorageExplorer.exe to install.

2. Open Storage Explorer and select the plug icon to connect to Azure storage.

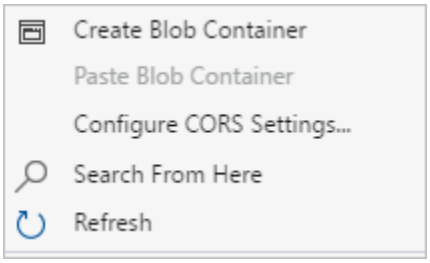



3. Select "Sign in…" and follow the multifactor authentication requirements.

4. In the left pane, expand the storage account within which you wish to create the blob container.

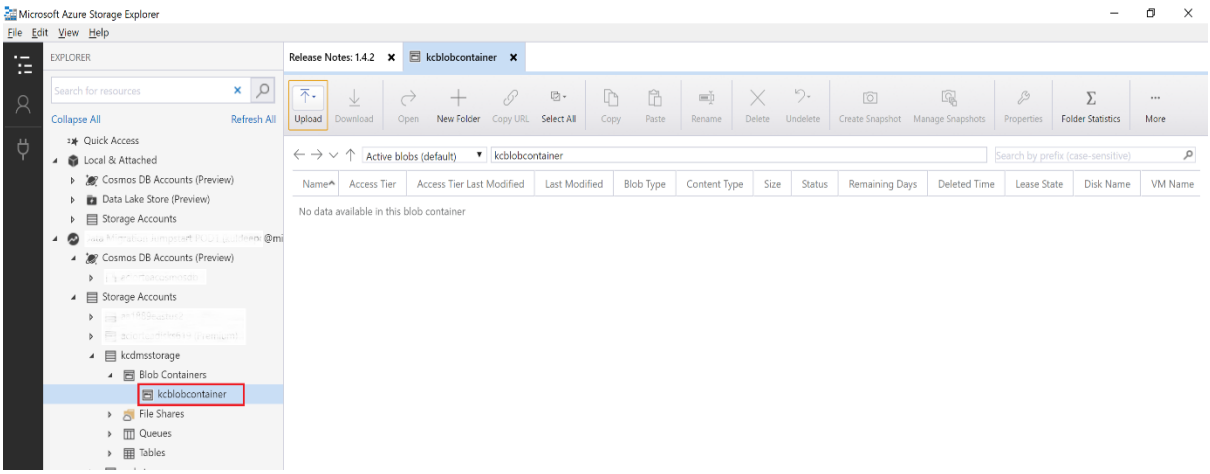



5. Right-click Blob Containers, and - from the context menu - select Create Blob Container.



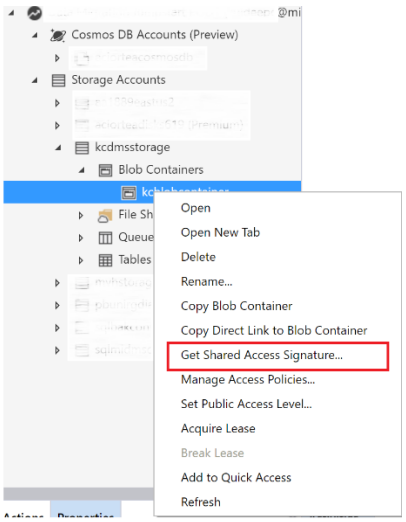
6. A text box will appear below the Blob Containers folder. Enter the blob container. See the Container name.

7. Press Enter when done to create the blob container.

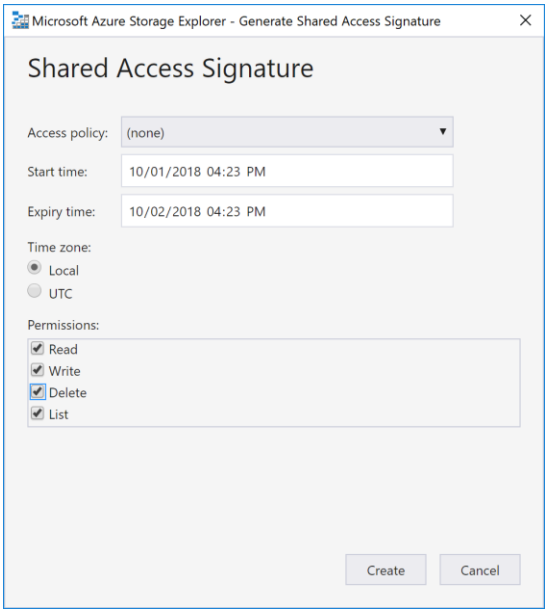



## 5.4 Generate SAS for the blob container

1. At Azure Storage Explorer, expand to the Blob Container generated in step 3.
2. Right click and - from the context menu - select Get Shared Access Signature.




3. In the Shared Access Signature dialog, specify the policy, start and expiration dates, time zone, and access levels you want for the resource.



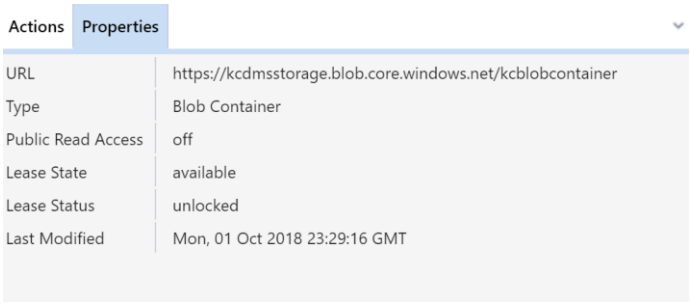

4. Click Create.

5. A Shared Access Signature dialog will then display that lists the blob container along with the URI and Query Strings you can use to access the storage resource. Select Copy next to the URI you wish to copy to the clipboard.

   Reserve the URI for step 6 below.

   https://kcdmsstorage.blob.core.windows.net/kcblobcontainer?st=2018-10-01T23%3A23%3A59Z&se=2018-10-02T23%3A23%3A59Z&sp=rwdl&sv=2018-03-28&sr=c&sig=PM5XcMCMxwbe3wOjdcK8gahu35sM%3D

6. Select Close.

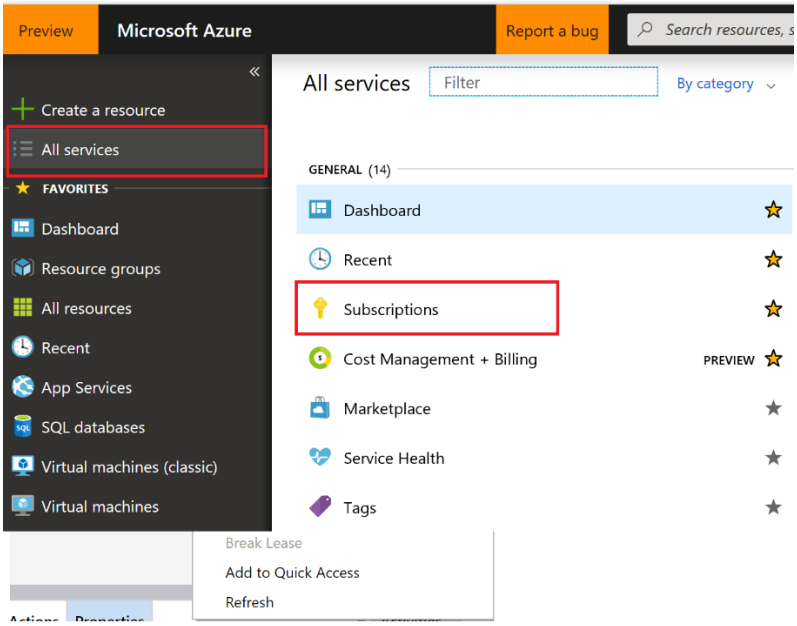



Note the bottom left corner in Azure Explorer will display the status of the SAS Lease.

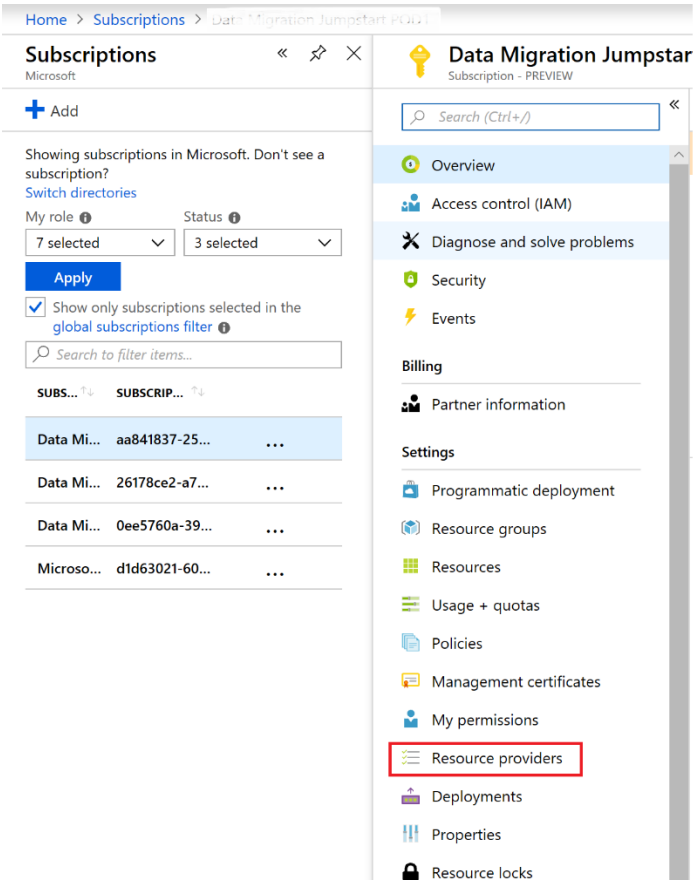
## 5.5 Install the Database Migration Service

1. Login to the Azure Portal

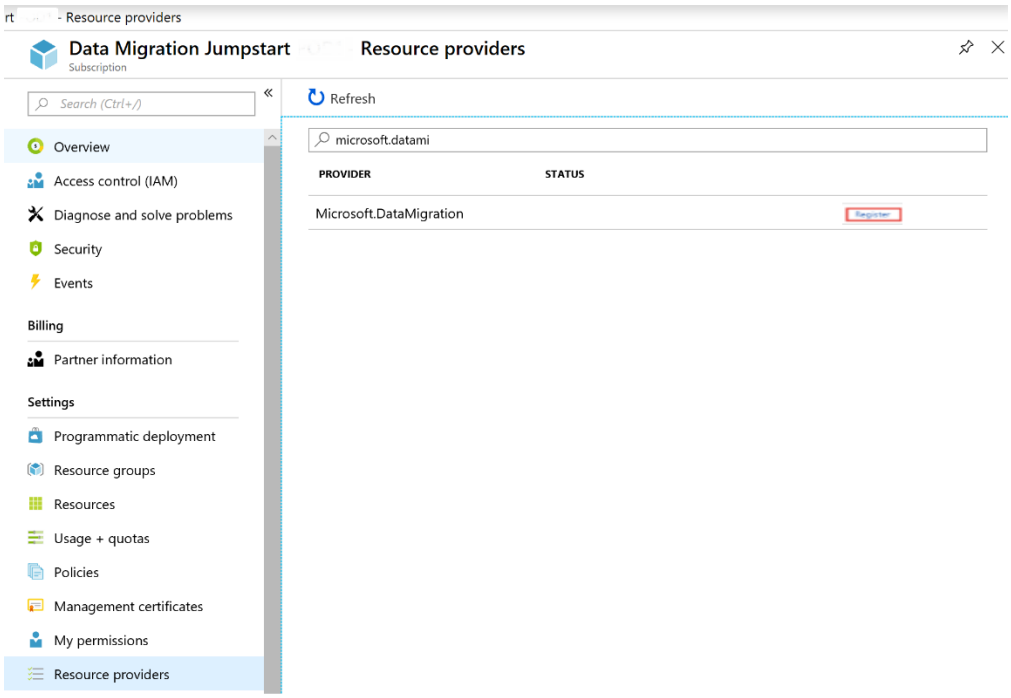
2. Register the resource provider
    a. In the Azure portal, select **All services**, and then select **Subscriptions**.




    b. Select the subscription in which you want to create the instance of the Azure Database Migration Service, and then select Resource providers.



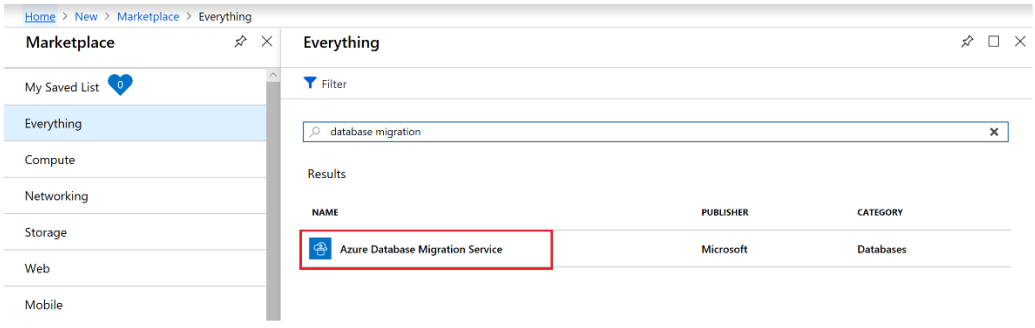
c. Search for migration, then to the right of **Microsoft.DataMigration**,




d. Select Register.

3. Create an instance of the service
   a. Sign-in to Azure portal and Click + Create a resource

   b. Search Azure Marketplace for "migration"



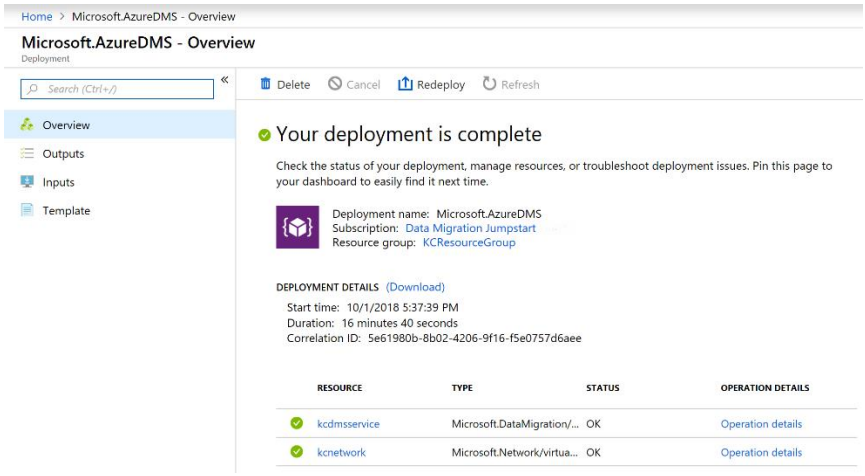

   c. Select **Azure Database Migration Service**, then select **Create**.

   d. On the Database Migration Service screen:
      - Choose a Service name that is memorable and unique to identify your instance of the Azure Database Migration Service.

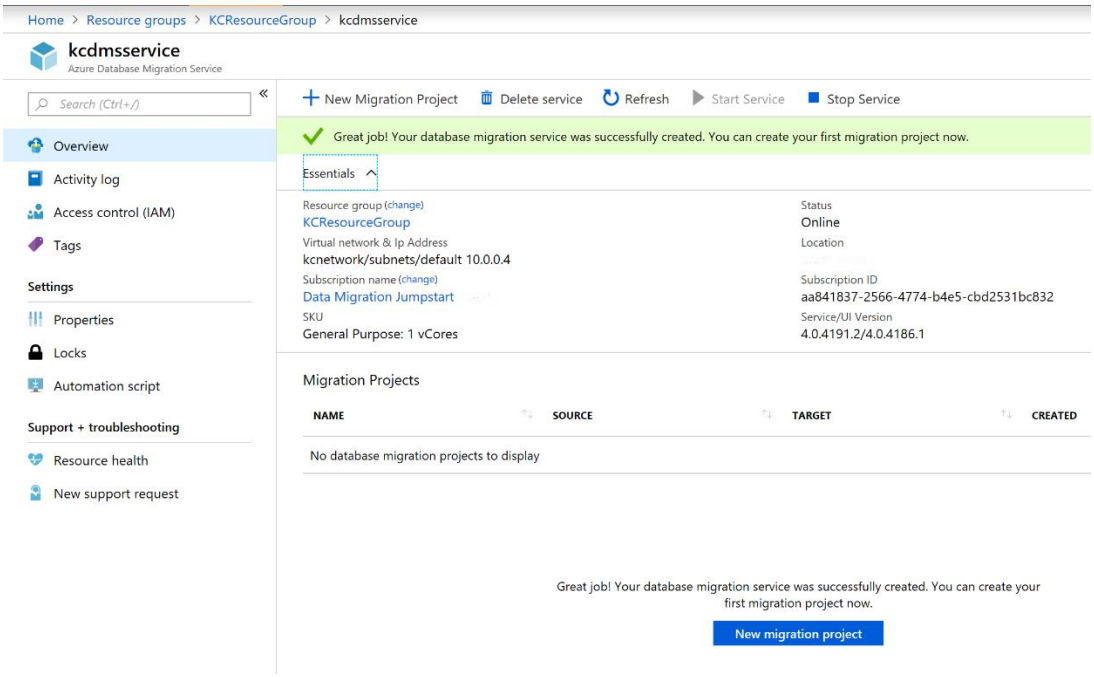
- Select the Azure Subscription in which you want to create the instance.
- Create a new Network with a unique name.
- Choose the Location that is closest to your source or target server.
- Select Basic: 1 vCore for the Pricing tier.

e. Click Create

Notification will be displayed when completed:



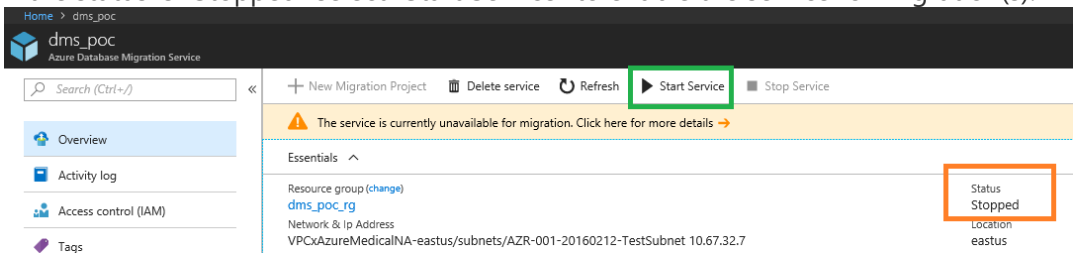

Azure Database Migration Service is now ready to build migration projects.



## 5.6 Step 6 Create a migration project

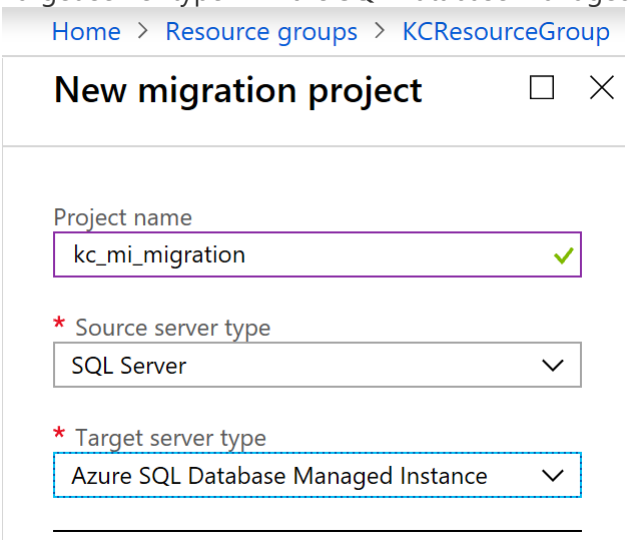
1. At the Azure portal, select the Azure Database Migration Service generated in step 4.

2. If the status is "Stopped" select "Start Service" to enable the service for migration(s).

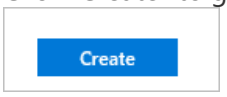



3. Select "+ New Migration Project."

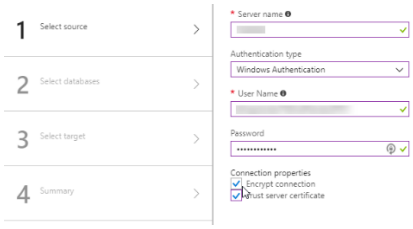
4. On the New migration project screen, specify:
   a. a name for the project
   b. Source server type = SQL Server
   c. Target server type = Azure SQL Database Managed Instance




   d. Click "Create" to generate a new migration project.



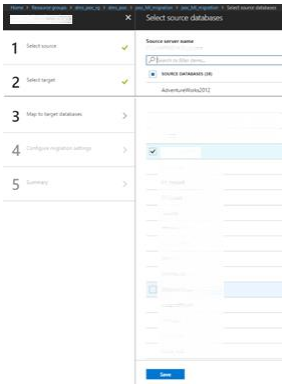

5. On the Source details screen, specify the connection details for the on prem source server.




6. Select save.
7. On the Target details screen, specify the connection details provisioned during creation of the Azure SQL Managed Instance.

8. Select “Save”.

9. Scroll through the list of databases and select the database(s) to be migrated.

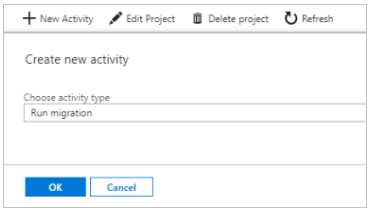



10. Select “Save”.

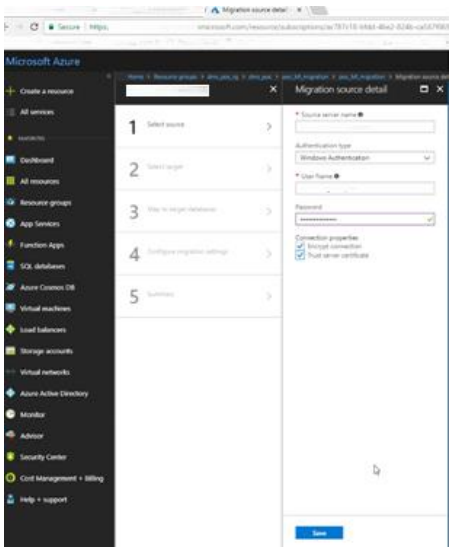
11. On the Project summary screen, review and verify the details associated with the migration project.

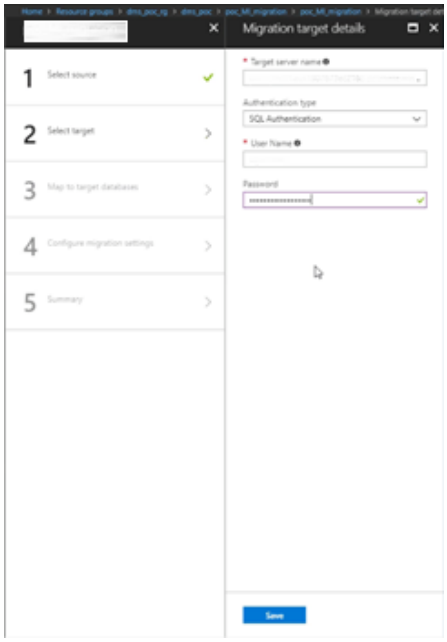
12. Select the project generated in step 6.10 and select “+New Activity”.

13. Select Run migration” from the drop-down list and select “OK”.

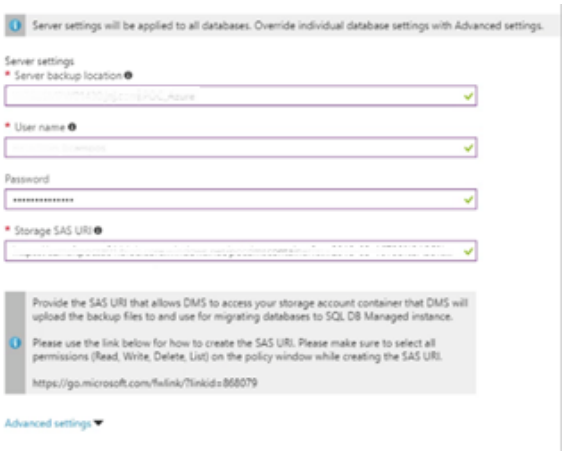



14. When prompted, enter the credentials of the source and target servers, and select “Save” on each details page.




15. On the "Configure migration settings" screen enter the following:
    a. Server backup location = local share (on the on-premise database server) where DMS will generate backup(s).
    b. User name = a member of sysadmin server role on the source database server.
    c. Password for the user in step b.
    d. The Azure Storage SAS URI generated in step 4.5 https://kcdmsstorage.blob.core.windows.net/kcblobcontainer?st=2018-10-01T23%3A23%3A59Z&se=2018-10-02T23%3A23%3A59Z&sp=rwdl&sv=2018-03




Note: Ensure to use the fully qualified domain name (FQDN) when entering the local SQL backup file share name.

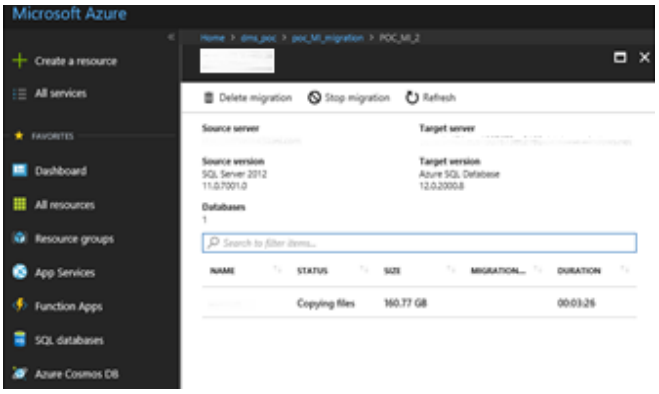
e. Select Save

16. On the Migration summary page, review and verify the Migration Activity details.

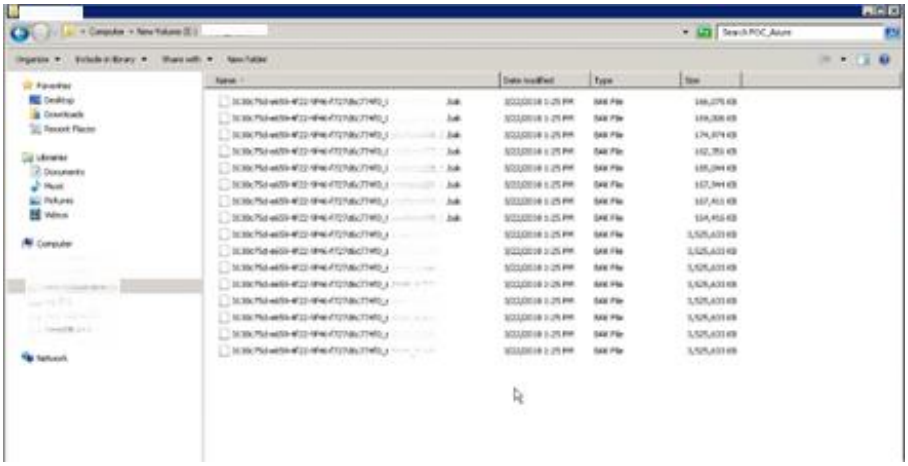

17. Select “Run migration”

## 5.7 Step 7 Monitoring

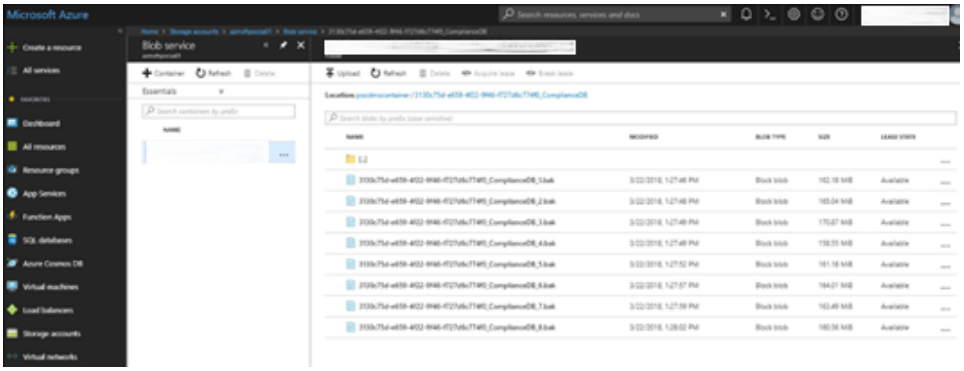
1. Monitor the migration progress by selecting the Migration activity and selecting “Refresh”.




During the migration backup files will be generated at the source database's file share:

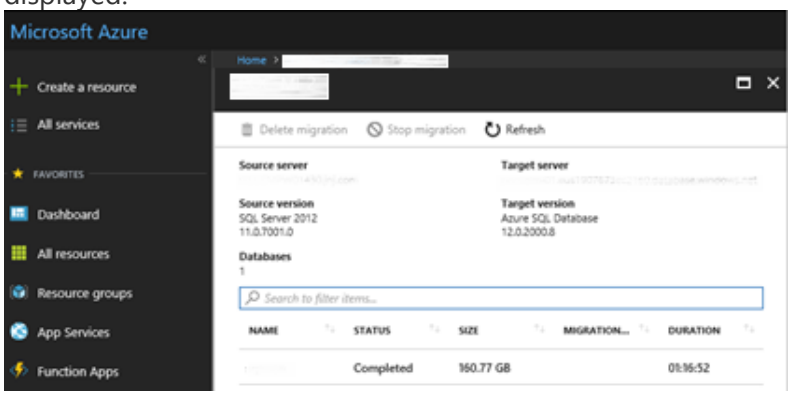


Then the backup files will be copied to the Blob Storage URI generated in step 3.



Once the restore(s) are completed the backup files will be deleted as part of the migration activity.

2. At the Azure Database Migration Project screen, select the migration activity from step 7.1. Once the migration is completed the duration of the data migration will be displayed.

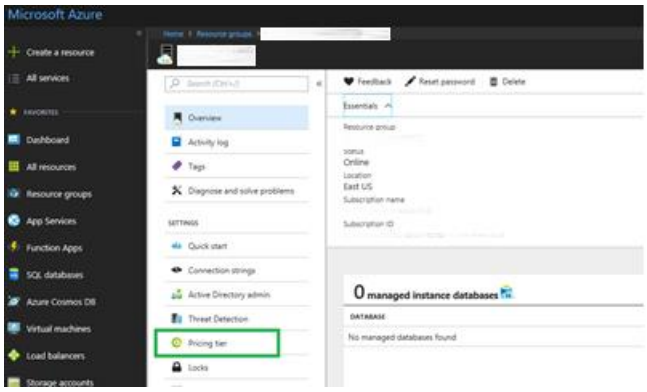



## 5.8 Troubleshooting MI storage capacity

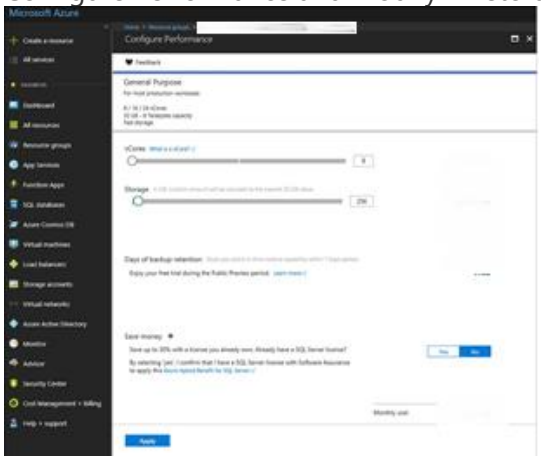
If a storage error is encountered during the migration an error such as the one below will be displayed.

> Failed to restore database 'sampledb' from URLs 'https://<storagename>.blob.core.windows.net/pocdmscontainer/3130c75d-e659-4f22-9f46-f727d6c774f0_sampledb/3130c75d-e659-4f22-9f46-f727d6c774f0_sampledb_1.bak,https://azmsftpocsa01.blob.core.windows.net/pocdmscontainer/3130c75d-e659-4f22-9f46-f727d6c774f0_sampledb/3130c75d-e659-4f22-9f46-f727d6c774f0_sampledb_2.bak,https://azmsftpocsa01.blob.core.windows.net/pocdmscontainer/3130c75d-e659-4f22-9f46-f727d6c774f0_sampledb/3130c75d-e659-4f22-9f46-f727d6c774f0_sampledb_3.bak,https://azmsftpocsa01.blob.core.windows.net/pocdmscontainer/3130c75d-e659-4f22-9f46-f727d6c774f0_sampledb/3130c75d-e659-4f22-9f46-f727d6c774f0_sampledb_4.bak,https://azmsftpocsa01.blob.core.windows.net/pocdmscontainer/3130c75d-e659-4f22-9f46-f727d6c774f0_sampledb/3130c75d-e659-4f22-9f46-f727d6c774f0_sampledb_5.bak,https://azmsftpocsa01.blob.core.windows.net/pocdmscontainer/3130c75d-e659-4f22-9f46-f727d6c774f0_sampledb/3130c75d-e659-4f22-9f46-f727d6c774f0_sampledb_6.bak,https://azmsftpocsa01.blob.core.windows.net/pocdmscontainer/3130c75d-e659-4f22-9f46-f727d6c774f0_sampledb/3130c75d-e659-4f22-9f46-f727d6c774f0_sampledb_7.bak,https://azmsftpocsa01.blob.core.windows.net/pocdmscontainer/3130c75d-e659-4f22-9f46-f727d6c774f0_sampledb/3130c75d-e659-4f22-9f46-f727d6c774f0_sampledb_8.bak'. The managed instance has reached its storage limit. The storage usage for the managed instance cannot exceed (32768) MBs. RESTORE DATABASE is terminating abnormally. RESTORE DATABASE is terminating abnormally.

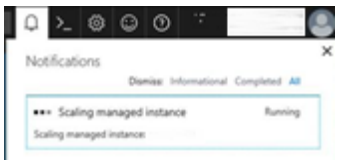
1. At the Azure portal, select the Resource group, the target Managed Instance, Pricing tier.




2. Configure Performance and modify MI storage appropriately.




3. Select “Apply”.




4. Monitor MI Scaling by selecting the Notifications icon at the top right of the portal.

5. Once Scaling is complete, navigate to the migration activity and repeat steps 6.14 through 6.18.

# 6 Appendix

References:

Create an instance of managed instance:
https://docs.microsoft.com/en-us/azure/sql-database/sql-database-managed-instance-tutorial-portal

Create a storage account
https://docs.microsoft.com/en-us/azure/storage/common/storage-quickstart-create-account?tabs=portal

Install Azure Database Service
https://docs.microsoft.com/en-us/azure/dms/quickstart-create-data-migration-service-portal

Create a blob container
https://docs.microsoft.com/en-us/azure/vs-azure-tools-storage-explorer-blobs#get-the-sas-for-a-blob-container

Network topologies for Azure SQL DB Managed Instance
https://docs.microsoft.com/en-us/azure/dms/resource-network-topologies

Overview of prerequisites for using Azure Database Migration Service (DMS)
https://docs.microsoft.com/en-us/azure/dms/resource-network-topologies

Migrate SQL Server to Azure SQL Managed Instance
https://docs.microsoft.com/en-us/azure/dms/tutorial-sql-server-to-managed-instance