

Migrate SQL Server to Azure MI Without Getting a Migraine



EIGHTKB

HELLO!

I am Josephine Bush

10+ years DBA experience
Microsoft Data Platform MVP
Manning liveProject Author
MBA IT Management
MS Data Analytics
[@hellosqlkitty](https://twitter.com/hellosqlkitty)
sqlkitty.com



Four-Project Series
Migrate
SQL Server
to Azure

MANNING
LIVEPROJECT

MVP
Microsoft®
Most Valuable
Professional



EIGHTKB

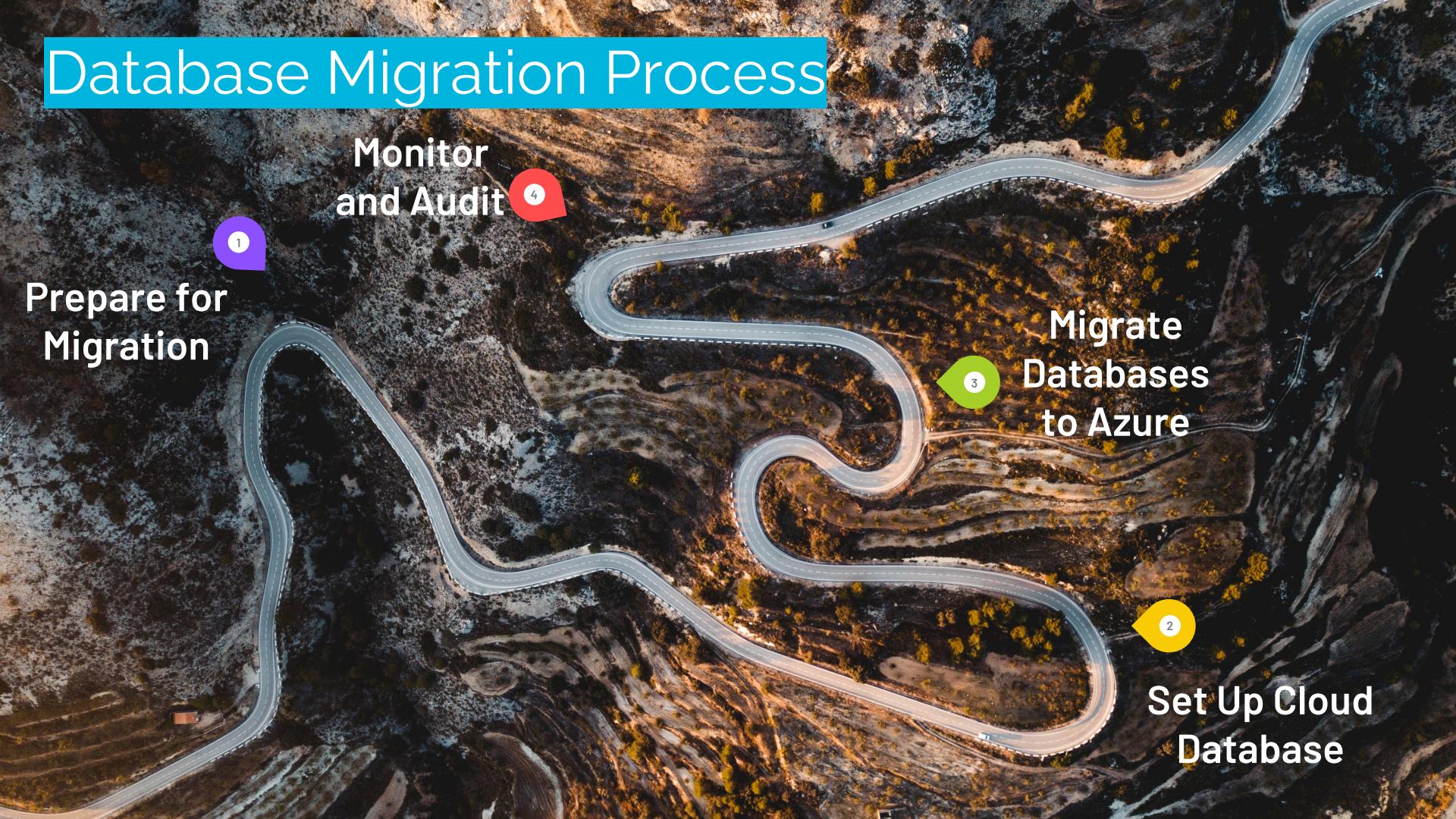
Database Migration Process

1
Prepare for Migration

Monitor
and Audit
4

Migrate
Databases
to Azure
3

2
Set Up Cloud
Database

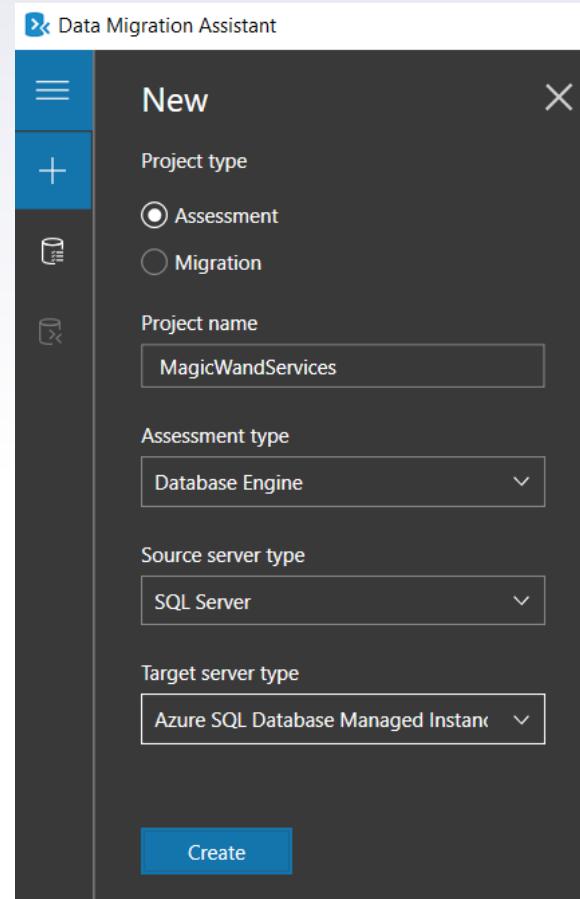


Prepare for Migration

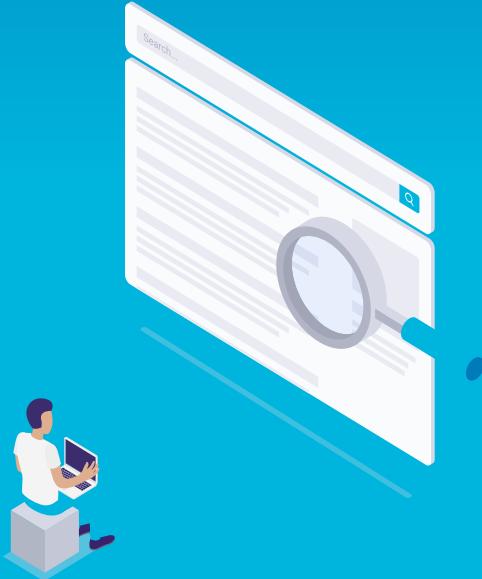
- **Analyze/Audit**
Using Microsoft
Data Migration
Assistant and SQL
Server Audit
- **Clean Up**
Remove
unsupported and
unused objects
- **Create
Checklist**
Catalogue items
migrating to the
cloud

Microsoft Data Migration Assistant (DMA)

Enables you to upgrade to a modern data platform by detecting compatibility issues that can impact database functionality on your new version of SQL Server



“ Note that the Microsoft Data Migration Assistant won’t warn you about all issues you might encounter. This is why it’s always important to test your migrations from start to finish in a lower environment.

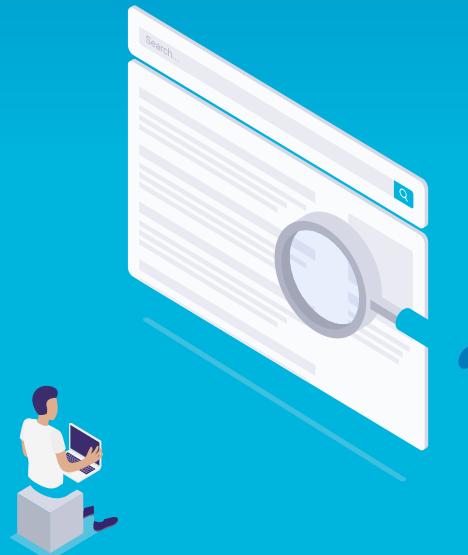


DMA Configuration

The screenshot shows the DMA configuration interface. At the top, there's a navigation bar with a blue icon, the text "Data Migration Assistant", and a back arrow pointing to "MagicWandServices". Below the navigation bar, there are two tabs: "1 Options" (which is highlighted in grey) and "2 Select sources". On the left, there's a vertical sidebar with icons for "≡", "+", and a report document. The main content area is titled "Select report type". It contains two items, each with a checkbox and a database icon:

- Check database compatibility**
Discover migration blocking issues and deprecated features by analyzing databases you c
- Check feature parity**
Discover unsupported or partially-supported features and functions that your application

“Azure uses Azure Active Directory, as opposed to Active Directory. This means that when your users are logging in with a domain account, it will change the way they have to log in.



DMA Results

Assess

1 Options 2 Select sources 3 Review results

SQL Server feature parity
 Compatibility issues

Search server instance name

DESKTOP-15

Target Platform: Azure SQL Database Managed Instance

DESKTOP-15 / SQL Server 2019

Feature parity (1)

Recommendation	Impacted objects
PowerShell job step is not supported in Azure SQL M...	1

Unsupported features (1)

PowerShell job step is not sup...	1
-----------------------------------	---

Compatibility 150 (1) **Compatibility 140 (1)**

Issue Impacted objects

Breaking changes (0)

Behavior changes (1)

Full-Text Search has changed since SQL Server 2008

3

Deprecated features (0)

Information issues (0)

Full-Text Search has changed si...
Full-Text Search has changed since SQL Server 2008.

Many full-text search options and settings have changed. Therefore, when you upgrade to SQL Server 2014 or SQL Server 2016 Full-Text Search, some of your settings might need modification. We recommend you to test your applications leveraging the

PowerShell job step is not supported in Azure SQL M...

Details Impacted

Type: Job step

Impact: It is a job step that runs a PowerShell script. PowerShell job step is not supported in Azure SQL Managed Instance.

Full-Text Search has changed since SQL Server 2008

Issue details Impacted objects

Type Name

FullTextIndex HumanResources.Jo...
FullTextIndex Production.Document

Object details

Type: FullTextIndex
Name:
HumanResources.JobCandidate

EIGHTKB

SQL Server Audit Tips

- ▶ I use this on all prod servers to audit DDL and security changes
- ▶ For migrations, I may audit more to see if something is in use or not
- ▶ Be careful to not over audit

Prepare for Migration

- ▶ Analyze/audit
- ▶ Clean up
- ▶ Create checklist



Set Up Cloud Database

- **Create a Baseline**

Check configuration settings with a SQL script

- **Create Azure SQL Managed Instance**

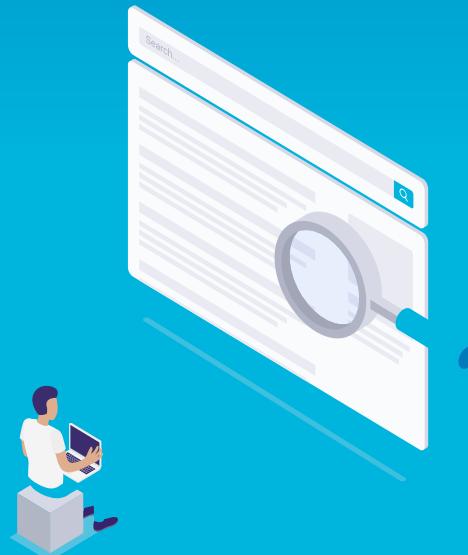
Create MI via the Azure portal

- **Migrate Server-Level Objects**

Using a PowerShell module named dbatools

SQL Managed Instance currently supports deployment only on the following types of subscriptions:

- ▶ Enterprise Agreement (EA)
- ▶ Pay-as-you-go
- ▶ Cloud Service Provider (CSP)
- ▶ Enterprise Dev/Test
- ▶ Pay-as-you-go Dev/Test
- ▶ Subscriptions with monthly Azure credit for Visual Studio subscribers



Create Configuration Baseline

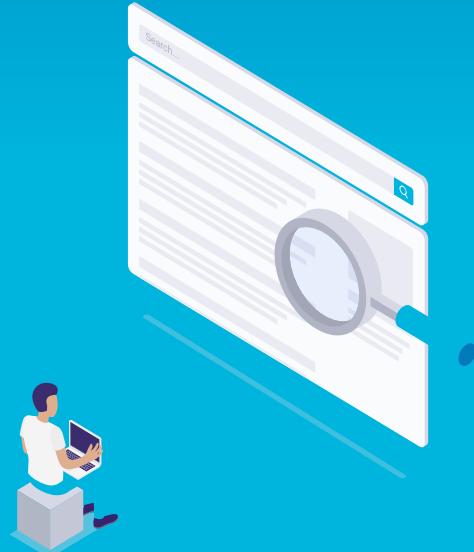
```
/*setup for querying SQL Server configuration */
DECLARE @tf TABLE (TraceFlag nvarchar(35), status bit,global bit, session bit)
INSERT INTO @tf execute('DBCC TRACESTATUS(-1)');

DECLARE @config TABLE (
    name nvarchar(35),
    default_value sql_variant
)

/*not all of these settings are in all versions of sql server*/
INSERT INTO @config (name, default_value) VALUES
('access check cache bucket count',0),
('access check cache quota',0),
('ADR cleaner retry timeout (min)', 0),
('ADR Preallocation Factor', 0),
('Ad Hoc Distributed Queries',0),
('affinity I/O mask',0),
('affinity64 I/O mask',0),
('affinity mask',0),
('affinity64 mask',0),
('Agent XPs',0), --Changes to 1 when SQL Server Agent is started. Default value is
('allow filesystem enumeration', 0),
('allow polybase export', 0),
('allow updates',0),
('awe enabled',0),
('backup checksum default', 0),
```

“Very important information about costs

A single managed instance Standard-series Gen 5 will cost approximately \$1/hour depending on your subscription



Create Managed Instance

Home > SQL managed instances >

Create Azure SQL Managed Instance

Microsoft

Basics Networking Security Additional settings Tags Review + create

SQL Managed Instance is a fully managed PaaS database service with extensive on-premises SQL Server compatibility and native virtual network security. [Learn more](#)

Project details

Select the subscription to manage deployed resources and costs. Use resource groups like folders to organize and manage all your resources.

Subscription * ⓘ Visual Studio Professional Subscription

Resource group * ⓘ (New) AzureSQLMI_RG Create new

Managed Instance details

Enter required settings for this instance, including picking a location and configuring the compute and storage resources.

Managed Instance name * josephinemi

Region * (US) East US 2

Not seeing a region?

Compute + storage * ⓘ

General Purpose
Standard-series (Gen 5), 4 vCores, 32 GB storage, Locally-redundant backup storage
[Configure Managed Instance](#)

Authentication

Select your preferred authentication methods for accessing this Managed Instance. Create a Managed Instance admin login and password to access your Managed Instance with SQL authentication, select only Azure AD authentication [Learn more](#) using an existing Azure AD user, group, or application as Azure AD admin [Learn more](#), or select both SQL and Azure AD authentication.

Use only Azure Active Directory (Azure AD) authentication

Use both SQL and Azure AD authentication

Use SQL authentication

Managed Instance admin login *

miadmin

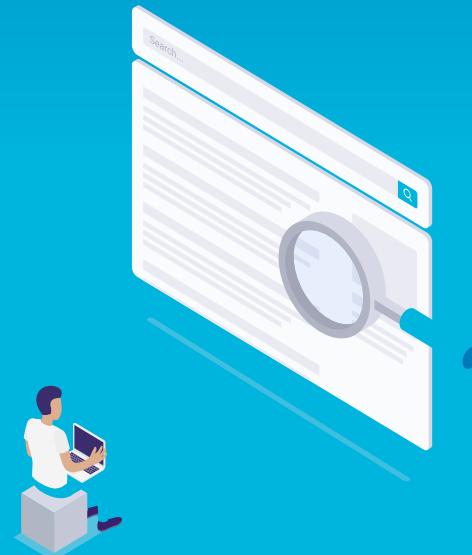
Password *

Confirm password *

EIGHTKB

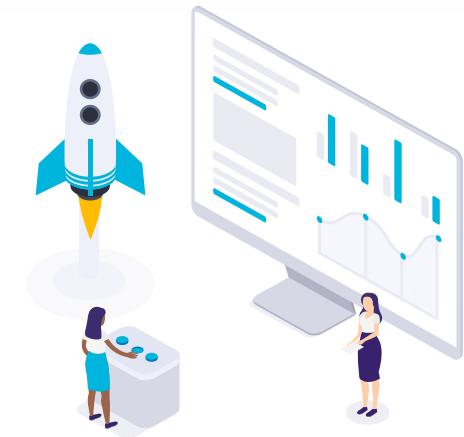
“ Azure SQL Managed Instance requires use of a dedicated vnet.

Make sure to check with your networking team to make sure you don't configure this incorrectly.



Tips for Managed Instance

- ▶ It can take up to 6 hours to create. 30 min create is in preview, but not available in all subscriptions.
- ▶ Start/stop is in preview, but not available in all subscriptions
- ▶ For testing, you can enable public endpoint, but don't do this for production
- ▶ To connect via SSMS with public endpoint:
`yourminame.publicxxxxxxxxxxxx.database.windows.net, 3342`



Migrate Server-Level Objects

- ▶ Using dbatools
 - ▶ Install module in PowerShell

```
1 $scred = Get-Credential sa
2 $dcred = Get-Credential miadmin
3 $params = @{
4     Source = "your_sql_server_name"
5     Destination = "copy_your_mi_name_from_azure,3342"
6     SourceSqlCredential = $scred
7     DestinationSqlCredential = $dcred
8 }
9
10 Start-DbaMigration @params -Force -Exclude Databases -Verbose
```

Set Up Cloud Database

- ▶ Create baseline
- ▶ Create managed instance
- ▶ Migrate server-level objects



Migrate Databases To Azure

- **Set Up Database Migration Service (DMS)**
Using Azure portal and Azure Data Studio (ADS)
- **Perform Online Migration**
Using Azure Data Studio
- **Verify Migration**
Check database configuration settings with a SQL script

Before You Set Up DMS

- ▶ Configure a VPN or ExpressRoute
- ▶ Register Microsoft.DataMigration
- ▶ Create a storage account
- ▶ Take a full backup of your on-premises database **WITH CHECKSUM**



Setting up DMS in ADS

The screenshot shows two panels of the Azure Data Studio application.

Left Panel: The Extensions view. It displays a search bar with "azure sql migration" typed in. Below the search bar, the "Azure SQL Migration" extension is listed, showing its icon (SQL with an upward arrow), name, description ("This extension lets you migrate y..."), developer ("Microsoft"), and an "Install" button. The left sidebar contains icons for various features like databases, notebooks, and security.

Right Panel: The main workspace. The title bar says "File Edit View Help". The left sidebar shows "CONNECTIONS" and "SERVERS". Under SERVERS, "SQLServerOnPrem" is expanded, showing "Databases", "System Databases", "MagicWandServices" (which is selected and highlighted in blue), "Security", and "Server Objects". A context menu is open over the "MagicWandServices" node, with the "Manage" option highlighted in blue and a cursor icon pointing at it. Other options in the menu include "New Query", "New Notebook", "Refresh", "Backup", and "Restore".

EIGHTKB

Set Up Migration in ADS

The screenshot shows the Azure Data Studio interface. On the left, there's a sidebar with 'CONNECTIONS' at the top, followed by a tree view under 'SERVERS'. The 'SQLServerOnPrem' connection is expanded, showing 'Databases', 'System Databases', 'MagicWandServices' (which is selected and highlighted in blue), 'Security', and 'Server Objects'. Below the tree view are two buttons: 'Azure SQL Migration' (which is also highlighted in blue) and 'General'. The main content area has a header 'SQLServerOnPrem X' and a breadcrumb trail 'Home > SQLServerOnPrem > MagicWandServices'. It features a navigation bar with 'Dashboard' (selected), 'Migrations', 'New migration', 'New support request', and 'Feedback'. The main content is titled 'Azure SQL Migration' and contains a call-to-action button 'Migrate to Azure SQL' with the subtext 'Migrate a SQL Server instance to Azure SQL.' To the right of this button is a section titled 'Things you need' with a bulleted list: 'An Azure account (n...', 'A source SQL Server machine running in t...', 'An Azure Managed database(s) to...', and 'Your database backu... for Azure SQL Datab...'. A 'Learn more' link is also present.

EIGHTKB

Steps to Set Up Migration

- ▶ Step 1: Databases for assessment
- ▶ Step 2: Assessment results and recommendations
- ▶ Step 3: Azure SQL target setup
- ▶ Step 4: Migration Mode – Online or offline
- ▶ Step 5: Data source configuration – along with location of db backups on the network
- ▶ Step 6: Azure Database Migration Service – includes installing self hosted integration runtime
- ▶ Step 7: Summary



DMS Setup: Step 1



Step 1: Databases for assessment

Select the databases that you want to assess for migration to Azure SQL.

Search

1/1 databases selected

<input checked="" type="checkbox"/>	Database	Status	Size (MB)
<input checked="" type="checkbox"/>	MagicWandServices	ONLINE	336

DMS Setup: Step 2

1

2

3

4

5

6

7

Step 2: Assessment results and recommendations

- We have completed the assessment of your SQL Server instance

Based on the assessment results, all 1 of your databases in an online state can be migrated to Azure SQL.

⟳ Refresh assessment

Choose your Azure SQL target



Azure SQL Managed Instance

ASSESSMENT RESULTS

1/1 databases can be migrated without issues

RECOMMENDED CONFIGURATION

Azure recommendation is not available. Click "Get Azure recommendation" button below



SQL Server on Azure Virtual Machine

ASSESSMENT RESULTS

1/1 databases can be migrated without issues

RECOMMENDED CONFIGURATION

Azure recommendation is not available. Click "Get Azure recommendation" button below



Azure SQL Database (PREVIEW)

ASSESSMENT RESULTS

1/1 databases can be migrated without issues

RECOMMENDED CONFIGURATION

Azure recommendation is not available. Click "Get Azure recommendation" button below

EIGHTKB

DMS Setup: Step 3



Step 3: Azure SQL target

Select an Azure account and your target Azure SQL Managed Instance.

Azure account *
 ▼
[Link account](#)

Azure AD tenant
 ▼

Subscription * ⓘ
 ▼

Location * ⓘ
 ▼

Resource group * ⓘ
 ▼

Azure SQL Managed Instance * ⓘ
 ▼

EIGHTKB

DMS Setup: Steps 4 & 5

- ▶ Step 4: Migration Mode – Offline or Online
- ▶ Step 5: Data source configuration



DMS Setup: Step 6

1 Step 6: Azure Database Migration Service

Azure Database Migration Service orchestrates database migration activities and tracks their progress. You can select an existing Database Migration Service if you have created one previously, or create a new one below.

Subscription
Dev

Location
East US 2

Resource group *

Azure Database Migration Service *

[Create new](#)

Connection status 

 Azure Database Migration Service 'DMSMI' is connected to self-hosted integration runtime running on the node

Authentication keys

EIGHTKB

Migration Status in ADS

The screenshot shows the Azure Database Migration Service (ADS) portal interface. The top navigation bar includes 'Welcome' and 'SQLServerOnPrem' tabs. The main navigation menu on the left lists 'Home', 'Databases', 'Administration', 'SQL Agent', and 'Azure SQL Migration'. The 'Azure SQL Migration' item is currently selected and highlighted in blue. The central content area displays the 'Database migration status' for the 'DMSMI (change)' target, which is part of the 'Azure Database Migration Service'. It shows one database migration in progress (blue circle icon) and zero completed migrations (green checkmark icon). A 'Refresh' button is also present.

Home > SQLServerOnPrem

Home Databases Administration SQL Agent Azure SQL Migration

Database migration status

DMSMI (change)
Azure Database Migration Service

Database migrations in progress	1
Database migrations completed	0

EIGHTKB

Begin Online Migration

- ▶ Stop applications and users from using the on-premises database
- ▶ Take a final log backup **WITH CHECKSUM**
- ▶ Verify final backup is restored
- ▶ Don't take your on-prem db offline

The screenshot shows the Azure SQL Migration interface. On the left, there's a navigation pane with 'Azure SQL Migration' selected. The main area has two tabs: 'General' (selected) and 'Logs'. In the 'General' tab, it shows:

Source server	Target server
d	dbopsmai

Below that, it shows 'Source version' as 'SQL Server 2019 15.0.4261.1' and 'Target version' as 'SQL Server 2019 15.0.4261.1'. Under the 'Logs' tab, it says 'Active backup files (1 item)' and lists one item:| Active backup files | Type | Status | Data uploaded / size |
| --- | --- | --- | --- |
| d | _MagicWandServices_FULL... | Database | Restored 0.20 GB / 0.20 GB |

Complete Online Migration

- ▶ Click Complete Cutover

The screenshot shows the Microsoft Azure Migrate service interface. At the top, there's a navigation bar with 'Dashboard' and 'Migrations'. Below that, a sub-navigation bar shows 'Migrations' selected and 'MagicWandServices' as the target. On the left, there are two buttons: 'Complete cutover' (with a rocket icon) and 'Cancel migration' (with a cancel icon). The main area is titled 'Complete cutover' for 'MagicWandServices'. It contains instructions: 'Perform the following steps before you complete cutover.' followed by a numbered list: 1. Stop all incoming transactions to the source database. 2. Create a final transaction log backup and store it on the network share. 3. Verify that all log backups have been restored on the target database. The 'Log backups pending restore' value should be zero. There's also a 'Refresh' button and a note about the last scan completion time (01:16 PM). A checkbox is checked, stating 'I confirm there are no additional log backups to provide and want to complete cutover.' A warning message in a pink box says: '⚠ Completing cutover without restoring all the backups may result in a data loss.' At the bottom, there are 'Complete cutover' and 'Cancel' buttons.



Complete cutover

Cancel

EIGHTKB

Verify Migration & Migrate DB Settings

```
1  DECLARE @dbname varchar(20);
2  SET @dbname = 'MagicWandServices';
3
4  DECLARE @config TABLE (
5      name nvarchar(35),
6      value sql_variant
7  )
8
9  INSERT INTO @config (name, value)
10 SELECT name, CASE
11     WHEN value = 1 then 'ON'
12     WHEN value = 0 then 'OFF'
13     ELSE value
14     END AS value
15 FROM sys.database_scoped_configurations
16 WHERE name <> 'MAXDOP'
17
18 INSERT INTO @config (name, value)
19 SELECT name, value
20 FROM sys.database_scoped_configurations
21 WHERE name = 'MAXDOP'
22
23
24 SELECT name = CONCAT('DBCONFIG:',dsc.name), dsc.value, is_value_default,
25     'USE ' + @dbname +'; ALTER DATABASE SCOPED CONFIGURATION SET ' + dsc.name + '=' + convert(nvarchar(35), c.value) + ';' as SQLscript
26 FROM sys.database_scoped_configurations dsc
27 INNER JOIN @config c
28 ON c.name = dsc.name
29 WHERE is_value_default <> dsc.value
30
```

Migrate Databases to Azure

- ▶ Set up DMS
- ▶ Perform online migration
- ▶ Verify migration



Monitor and Audit

➤ **Configure Auditing**
Using SQL Server Audit

➤ **Configure Alerting**
Monitor and alert on things such as CPU usage

➤ **Security Check**
Make sure your MI complies with CIS benchmarks

SQL Server Audit with MI tips

- ▶ Create a storage account to hold the audit files
- ▶ Use URL for audit destination
- ▶ Query that URL to get audit data

Monitoring/Alerting Tips

- ▶ Make sure to monitor and alert on things like
 - ▶ CPU usage
 - ▶ Memory usage
 - ▶ Storage space used
- ▶ Create an alert rule and alert action group

Home > dbops | Alerts >

Alert rules

×



Name ↑↓	Condition	Severity ↑↓	Target scope	Target resource type	Signal type ↑↓	Status ↑↓	...
<input type="checkbox"/> MICPUPERCENT90	avg_cpu_percent > 90	2 - Warning	dbops	SQL managed instance	Metrics	Enabled	...

Security Check Tips

- ▶ Use the PowerShell module dbachecks
 - ▶ CIS benchmarks help you ensure your managed instance is as secure as possible.
 - ▶ Must install Pester module

```
1 $Date = Get-Date -Format "yyyy-MM-dd"
2 Invoke-DbcCheck -Show Fails -SqlInstance "dbopsMI.public.rand0m1234.database.windows.net,3342" -SqlCredential (Get-Credential yourmiadmin) ` 
3 -ExcludeCheck Backup, HADR, Domain, LogShipping, AgentServiceAccount, IdentityUsage, FutureFileGrowth, FKCKTrusted, GuestUserConnect, ` 
4 ValidDatabaseOwner, InvalidDatabaseOwner, InstanceConnection, SqlEngineServiceAccount, TempDbConfiguration, BackupPathAccess, DefaultFilePath, ` 
5 DAC, MaxMemory, OrphanedFile, ServerNameMatch, MemoryDump, SupportedBuild, DefaultBackupCompression, ErrorLog, CrossDBOwnershipChaining, DefaultTrace, ` 
6 OLEAutomationProceduresDisabled, RemoteAccessDisabled, SystemFull, UserFull, UserDiff, Userrog ` 
7 -Passthru | Convert-DbcResult | Set-DbcFile -FilePath C:\windows\temp\ -FileName DbcCheck_$Date -FileType csv
```

Monitor and Alert

- ▶ Configure auditing and alerting
- ▶ Security check



Migrating to MI

Prepare to Migrate

Analyze and audit your on-premises database server, clean up unused and unsupported objects, and prepare a checklist

Set Up Cloud Database

Create a baseline of your on-premises db server, create MI, and migrate server-level objects

Migrate Databases to Azure

Create DMS, do online migration, and verify migration

Monitor and Alert

Configure auditing, alerting, and do a security check

100%

Total success!

EIGHTKB

Want the whole picture?

Get the Manning liveProject Series.

Four-Project Series

Migrate
SQL Server
to Azure

LIVEPROJECT

MANNING

Resources

- ▶ [Manning liveProject Series](#)
- ▶ [Migrate Without a Migraine GitHub Repository](#)
- ▶ [Managed Instance Features](#)
- ▶ [SQL Server Audit Presentations and Code](#)
- ▶ [dbatools PowerShell module](#)
- ▶ [dbachecks PowerShell module](#)

Credits

Special thanks to all the people who made and released these awesome resources for free:

- ▶ Presentation template by [SlidesCarnival](#)
- ▶ Illustrations by [Sergei Tikhonov](#)
- ▶ Photographs by [Unsplash](#)

THANKS!

Any questions?

You can find me at:

- ▶ [@hellosqlkitty](https://twitter.com/hellosqlkitty)
- ▶ hellosqlkitty@gmail.com
- ▶ <https://sqlkitty.com/>

