IDERA® | Cloud Whitepaper

HOW TO MIGRATE EXISTING DATABASES TO AZURE SQL DATABASE

By Richard Giles

INTRODUCTION

Migrating SQL Server to Azure SQL Database provides important benefits. Such advantages include:

- lower cost by shifting expenses from a capital expenditure model to an operational expenditure model
- improved security with encryption on by default plus access threat protection
- improved scalability and high availability
- ease of maintenance including automatic backup and recovery and cloud-based disaster recovery

A successful migration should include preparation, pre-migration, migration, and post-migration. There are other tools, some older and some newer from Microsoft and other third-party vendors. However, this article focuses on how to migrate SQL Server databases using the two most recommended Microsoft tools for both small to medium and large databases. We will start with preparation.

PREPARATION

Preparation starts with:

- Review your offline and online migration options.
- Understand what tools are available.
- Verify that Azure SQL Database supports your source database instances.
- Check all the prerequisites.

Offline Versus Online Migration

You can perform an offline or online migration if you decide to use Azure Database Migration Service (DMS). For an offline migration, application downtime begins at once to make sure no change occurs from start to finish. For an online migration, application downtime is only limited to after the migration starts and the cutover phase is complete.

To decide which one makes more sense to use, review the migration tool options listed in the next section and use a test environment on a limited dataset.

Migration Tools

The following two sections outline the migration tools, their purpose, and the supported SQL Server versions.

Azure Database Migration Service (DMS)

Azure Database Migration Service (DMS) is a managed cloud service that supports online and offline migrations to Azure SQL Database and Azure SQL Managed Instances. It uses Microsoft Data Migration Assistant (DMA) for assessment and recommendations. It supports migrating SQL Server from version 2005 to version 2019 (Windows and Linux, starting with version 2017). This is the preferred tool for migrations.

Microsoft Data Migration Assistant (DMA)

Microsoft Data Migration Assistant (DMA) is a Windows client based tool for performing both assessments and migrations. Azure DMS uses it to conduct assessments, but it can also perform migrations for small to medium size database migrations. It supports migrating SQL Server from version 2005 to version 2017 (on Windows only). This choice does not address online migration.

Prerequisites

You should address the following prerequisite tool options before proceeding with pre-migration:

- For Microsoft DMA, download and install the latest version from Microsoft's website.
- For Azure DMS, which is an offering in Microsoft's Azure Migrate hub, consult the prerequisites in Microsoft's documentation.

PRE-MIGRATION

Pre-migration is used to find any issues that could block a migration and help resolve them before migration. Microsoft calls this the assessment phase. You can conduct this using Microsoft DMA.

An assessment begins with creating a project and selection of a source database. Assessments are used to check database compatibility and feature parity issues. Such assessments need to detail database compatibility issues based on each compatibility level (for example, 150, 140, and 130). The assessments contain migration blockers, behavior changes, deprecated features, and information issues. For each issue, the assessments note the impact and recommendation details along with any other reference links, as well as affected objects, object details and recommended fixes.

You can open, load, save, export, restart, and delete assessments. You can mark the assessment project status as New, In-Progress, Error or Completed for future reference. Assessments can also help to determine the Azure stock-keeping unit (SKU) recommendations using files that contain extended event sessions or traces. This is optional when using Microsoft DMA. Recommendations from the assessment this additional information can include a pricing tier, compute level, max data size, and estimated cost per month. You can develop a TCO versus return on investment (ROI) and business case when you use Microsoft's total cost of ownership (TCO) calculator. Once Microsoft DMA completes an assessment, you can upload it to Azure Migrate.

For more information on SKU recommendations, refer to "Identify the right Azure SQL Database/Managed Instance SKU for your on-premises database" in Microsoft's documentation.

MIGRATION

Migration performs the actual schema and data migration. Before you start the migration, make sure you have already provisioned an Azure SQL Database resource as determined in the pre-migration step Azure SKU recommendations. You can use both Microsoft DMA and Azure DMS to perform migrations. However, Microsoft recommends that Microsoft DMA is best reserved for proofs of concept, test migrations, or small databases.

Schema Migration

Migrating schema comprises the following steps:

- Select source and target instances and the database along with connection information.
- Select schema objects.
- Generate and review the SQL scripts created.
- Fix any errors in the SQL scripts.
- Deploy the schema and checking the target.

Migrate Data

Microsoft recommends you should migrate data in two phases. Once using a test copy of the database and a second time on a production copy, once you find that post-migration testing is with no issues.

Migrating data comprises the following steps:

- Specify source and target details, including databases to migrate (schemas should already exist).
- Run and monitor the migration (sometimes referred to as the data synchronization phase).
- Check the migration completion status.

Cutover

Once a data production migration is complete, make sure any applications that use the data are working fine before completing the cutover.

For specific more information on cutover, refer to “Perform migration cutover” in Microsoft’s documentation.

POST-MIGRATION

Post-migration includes testing, remediation, and optimization to help make sure that any application using the migrated data is performing as expected. You should perform post-migration on a stage test environment just in case any remediation needs to occur. Once you decide that post-migration is successful, Microsoft recommends redoing migration using a production copy of the database to avoid downtime.

Testing

A good migration test plan should include the following elements:

- Develop validation tests that include gathering sample queries and expected performance characteristics for the source environment.
- Set up a test environment isolated from production with access to both source data and migrated data.
- Run validation tests using the sample queries against the source and target data and confirm the results.
- Run performance tests to analyze results against the migrated data and compare to expected performance characteristics from the source environment.

Remediation

Remediate any application that consumes the source data or any problems that may exist in migrated data that may have surfaced from testing.

Optimization

As a last step, address any data quality or performance issues identified by testing.

For more information on addressing any issues and specific steps to mitigate them, refer to “Post-migration validation and optimization guide” and “Tuning performance in Azure SQL Database” in Microsoft’s documentation.

BIOGRAPHY

The author, Richard Giles, is an accomplished software and database architect. He has been developing commercial software for over 30 years and has played key roles in building successful products including Microsoft Operations Manager and IDERA’s SQL Server product line. Richard is currently providing technical product consulting services as a consultant. He has been involved with Microsoft Partner programs for over 20 years and has actively tested Microsoft products as part of the Insider program. Richard has a strong analytical ability, is thorough when researching emerging technology and takes great pride in producing innovative solutions. Always the consummate learner, he has been actively learning about new technologies for most of his career and has focused on database platforms, data science, analytics, and cloud computing.

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