Microsoft Azure

# Migrating to Azure:

## A resource guide for your database migration

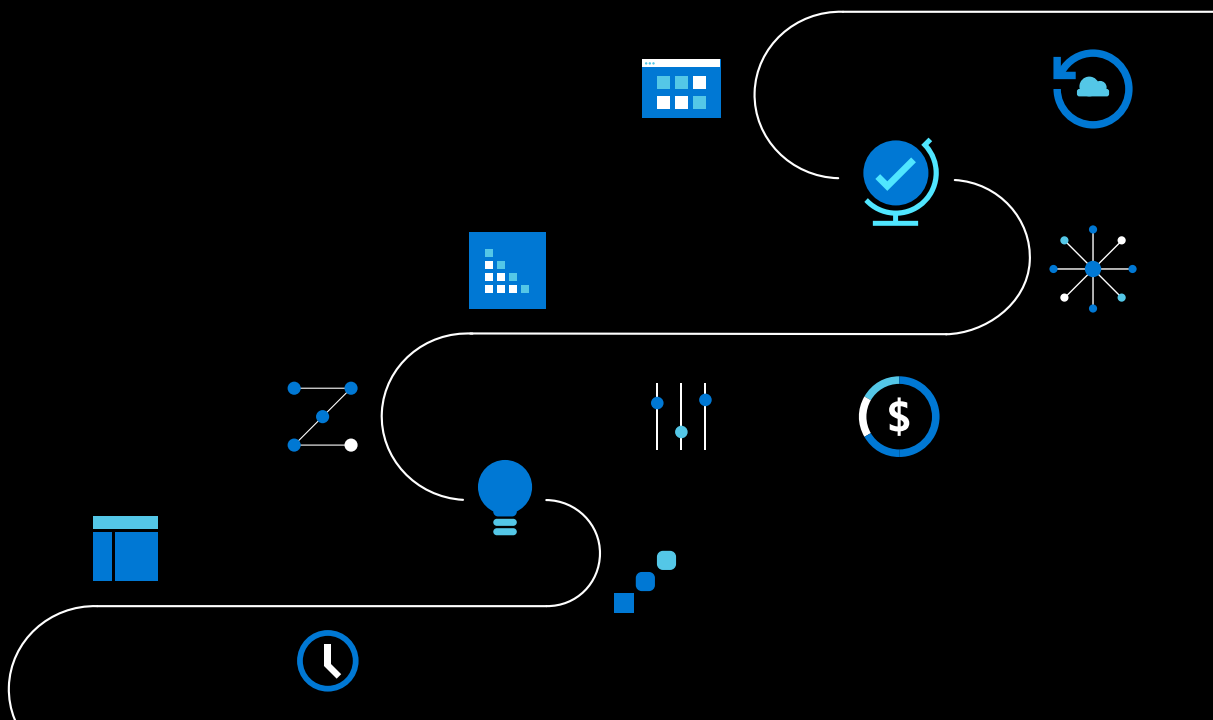
# Power your data and your business with Azure

Microsoft Azure offers an ever-expanding set of cloud services to help your organization overcome challenges and create new opportunities powered by the latest technology.

Azure gives you the freedom to build, manage, and deploy applications on a massive, global network using your favorite tools and frameworks. Security and privacy are built directly into the Azure platform to provide the highest levels of trust with the most comprehensive set of compliance offerings of any cloud service.[1]

Use cloud computing to do today's job better and build a competitive advantage for tomorrow.

[1] https://azure.microsoft.com/overview/trusted-cloud/compliance/



**Is this the right e-book for you?**

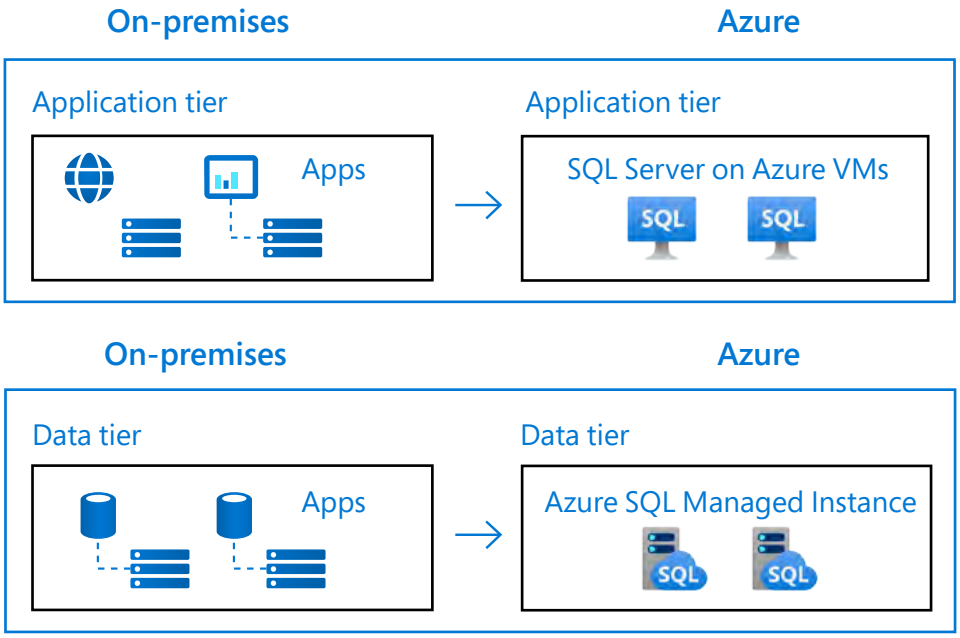
- Are you in charge of migrating your databases to the cloud?
- Would you like to move your SQL Server, MySQL, PostgreSQL, Maria DB, NoSQL, or Oracle database to Azure?
- Do you need resources to help you choose a data migration strategy and create a plan?

# Contents

## Are you ready for database migration?

There are two distinct parts to cloud migration—migrating the application and migrating the database that runs it. It is important to make independent migration choices for each component in order to fully optimize the workload.

This e-book provides a high-level overview of the process for migrating databases to Azure.



# 1. The Microsoft Cloud Adoption Framework

Whether you're planning to move a single database to the cloud, or you're tackling a larger scale cloud migration, we encourage you to refer to the Microsoft Cloud Adoption Framework for Azure. Created based on our experience with customers, the Microsoft Cloud Adoption Framework provides proven guidance and best practices to support your cloud migration process. The framework has a modular structure with six main phases starting with the 'define strategy' phase all the way up to ongoing 'governance' and 'management' of cloud operations. It also includes tools and templates to accelerate your cloud adoption. This e-book will mainly focus on the "adopt" phase of the framework, but for more information on the process please visit the Cloud Adoption Framework website or explore the Cloud Migration Simplified e-book.

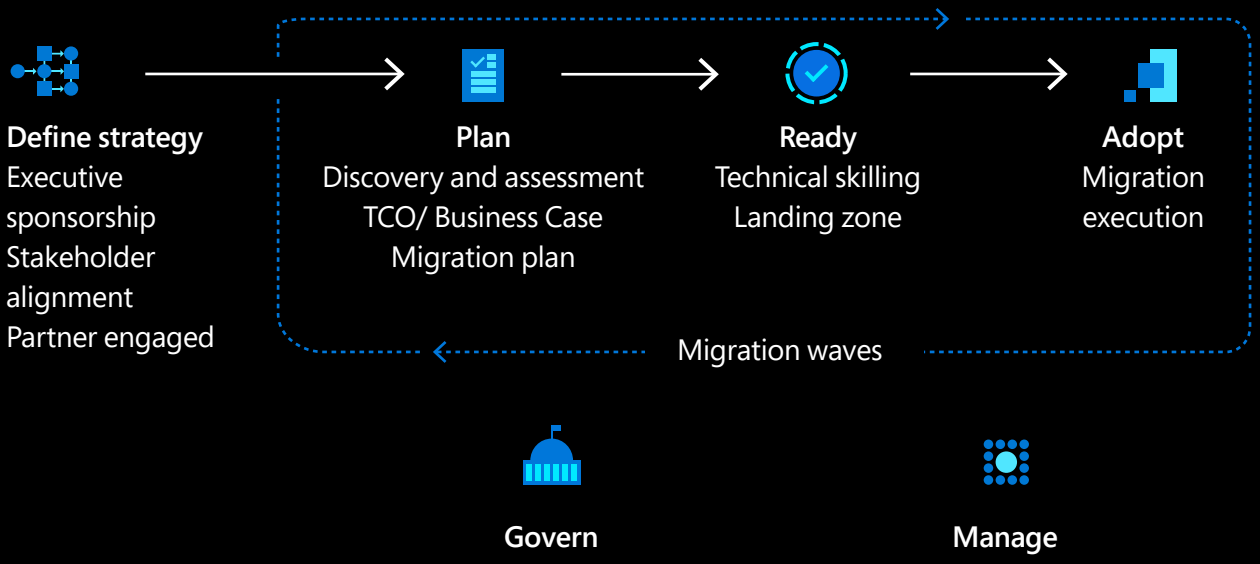



Figure 1: Common migration path

While the Cloud Adoption Framework provides end-to-end guidance for all types of migrations, we will also provide guidance on specialized database migration tools that may be different based on your scenario. You'll see these tools referenced throughout the e-book where they might come in handy.

# 2. Plan

Create a business case using the Azure TCO Calculator to estimate savings

238%

ROI with Azure SQL Managed Instance[2]

40%

increase in DBA productivity with Azure SQL DB Managed Instance[2]

## Make a case for database migration

Migrating workloads to the cloud can be a big step forward for your organization. The cloud makes it easy to modernize your apps with innovative data technologies. It improves data management and security through integrated, managed services. And it helps you lower your overall costs. By starting with a clear understanding of what you want to achieve, you can track and monitor your plan's success and build on it as you go. Some popular goals for migration include:

- Spend less time managing on-premises infrastructure and upgrades
- Reduce security risks through automatic security updates and patches
- Protect against threats posed by running end-of-support software
- Eliminate large, upfront investments for hardware and software
- Improve transparency into operational costs
- Decrease time to market and react quickly to market conditions
- Reach customers quickly across the globe

Work with your Microsoft representative or a certified Microsoft partner to prioritize workloads to migrate and build a migration plan that meets your desired goals.

[2] The Total Economic Impact™ of Migration to Microsoft Azure SQL Managed Databases, a commissioned study conducted by Forrester Consulting. March 2020.

## Start with the end in mind

Microsoft Azure offers just-right cloud options to help you get the most value from each individual database while ensuring a consistent experience across your hybrid estate.

You can accelerate your migration using proven strategies that support legacy database systems—SQL Server, as well as open source databases like Postgres, MySQL, MariaDB, or NoSQL—and competitive databases, such as Oracle or IBM.

After you've taken stock of your data estate using Azure Migrate and determined which apps and corresponding databases you want to move, you'll need to know where they're going. Use the table on the next page to match your existing on-premises database with your target cloud database.

**Still need to assess your app?**

To begin the discovery phase of your cloud migration, visit the Azure Migrate and Azure Site Recovery pages.

| | Azure SQL DB & SQL DB MI | SQL Server on Azure VMs | SQL Data Warehouse | Azure DB for PostgreSQL | Azure DB for MySQL | Azure Cosmos DB |
|---|---|---|---|---|---|---|
| Microsoft SQL Server | ✓ | ✓ | ✓ | | | |
| ORACLE | ✓ | | ✓ | ✓ | | |
| DB2 | ✓ | | | | | |
| MySQL | | | | | ✓ | |
| PostgreSQL | | | | ✓ | | |
| mongoDB. | | | | | | ✓ |
| cassandra | | | | | | ✓ |
| Access | ✓ | | | | | |
| Microsoft Azure Table Storage | | | | | | ✓ |

Figure 2: Suggested migration paths for existing databases.

Note: Our tools also support upgrade of on-premises databases.

# 3. Ready

## Preparing your environment

To ensure a seamless migration, consider setting up a landing environment in Azure which supports agility and innovation and at the same time provides protection through proper governance, management, and operations. Azure landing zones help build a cloud environment aligned to the optimal technology operations specific to your needs in the cloud. They provide a clear architecture, reference implementations, and code samples to create the initial cloud environment. Review the different implementation options available with Azure landing zones to best suit your specific cloud adoption needs. To learn more about Azure landing zones, check out the Ready section of the Cloud Adoption Framework.

As you set out to prepare your environment, reference the Azure setup guide overview for guidance on managing access, planning governance and compliance, and balancing cost and billing considerations.

# 4. Adopt

Once you have done the preliminary work to plan and prepare for cloud adoption, it's time to move into the core part of your migration. In this section, we'll share guidance specific to moving your database to the cloud.

## Get acquainted with Microsoft migration tools

Microsoft offers free tools to help simplify your database migration—many of which provide more than one service. Below is a list of the key tools that will be mentioned throughout the rest of this guide.

To stay up to date with the latest tools available and receive guidance on how to use them, visit: https://datamigration.microsoft.com/.

| Use case | Tool(s) | Description |
| --- | --- | --- |
| For discovery and inventory of data assets across your entire IT environment and assessment of SQL Server migration readiness. | Azure Migrate | Azure Migrate helps you migrate on-premises virtual machines to Azure. It performs a complete data environment assessment, provides migration recommendations, and offers migration guidance.<br><br>Take advantage of Data Migration Assistant (DMA), which can be installed from Azure Migrate. It helps you identify the optimal Azure migration target and size, and detects compatibility issues that can impact database functionality in Azure SQL. |
| For assessing readiness and migrating between different database platforms. | Microsoft SQL Server Migration Assistant (SSMA) | SSMA helps with assessment of existing databases and automates schema conversion from Microsoft Access, DB2, MySQL, Oracle, and SAP ASE (Sybase) to SQL Server or Azure SQL Database. |
| | Data Access Migration toolkit | The Data Access Migration toolkit provides tools to help migrate application source code from one database platform to another. Discover and extract SQL queries from files using APIs. |
| For validating workload performance on your migration target. | Database Experimentation Assistant (DEA) | DEA evaluates a targeted version of SQL Server for a specific workload. It provides useful data metrics such as queries with compatibility errors and degraded queries and query plans to help you make the best choice. |
| For performing near-zero downtime migration to Azure. | Azure Database Migration Service (DMS) | DMS offers a fully managed, end-to-end migration service with near-zero downtime. DMS provides rich orchestration capabilities to group together multiple database migrations. It supports PowerShell commandlets and REST APIs to automate the migrations at scale. |

## Assess your current on-premises environment

**Discover, evaluate, and map your data estate** to build an informed migration plan.

Perform an assessment of your entire data environment and plan your migration to Azure using Azure Migrate to create a holistic view of your on-premises IT infrastructure. Azure Migrate can Discover and assess on-premises VMware VMs, Hyper-V VMs, and physical servers in preparation for migration to Azure. Azure Migrate also gives you access to tools for application and database assessments, including Data Migration Assistant (DMA).

**Choose your database migration path** and plan to mitigate issues.

Use the Data Migration Assistant (DMA), accessed from the Azure Migrate tool, to evaluate your database, get recommendations for the Azure target and size of the migration environment, and surface new features that might benefit your data post-migration. The Database Experimentation Assistant (DEA) shows you exactly

**Not sure which is the best tool to use for your database conversion? Check the Data Migration Guide.**

how your workload will perform in the new target location, so you can decide the best way to move it. DEA captures the workload and replays it on your targeted cloud environment, providing you with specific insights.

**Assess other database management systems** to ensure compatibility.

Migrate from other relational database management systems such as Oracle, Sybase, and IBM DB2 to SQL Server in a VM using the Microsoft SQL Server Migration Assistant (SSMA). To migrate from Cassandra to Azure Cosmos DB, follow the documentation on using the Cassandra API.

# Migrate your databases to Azure

Interested in scaling and optimizing your application for the cloud using rearchitecting and rebuilding migration strategies? Read up on them here.

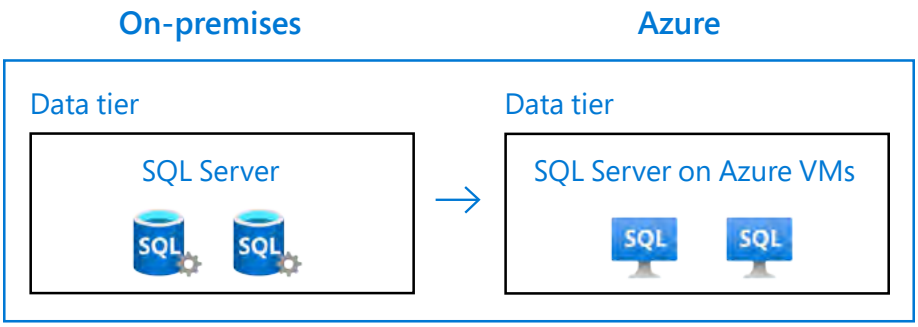
After assessing your database, the next step is to migrate your database using one of the two most popular database migration strategies, rehosting ("lift and shift") or refactoring. Azure offers migration tools designed to help you get to the cloud faster and more intelligently.

**Migrate your databases** by rehosting or refactoring.

Migrate multiple database sources to Azure data platforms with minimal downtime using the fully managed Database Migration Service (DMS) for rehosting or refactoring. Database Migration Service supports multiple, simultaneous migrations at scale.

Also called the "lift and shift" migration path, rehosting allows you to migrate your existing database as-is without any code changes.

**Rehosting sample path**

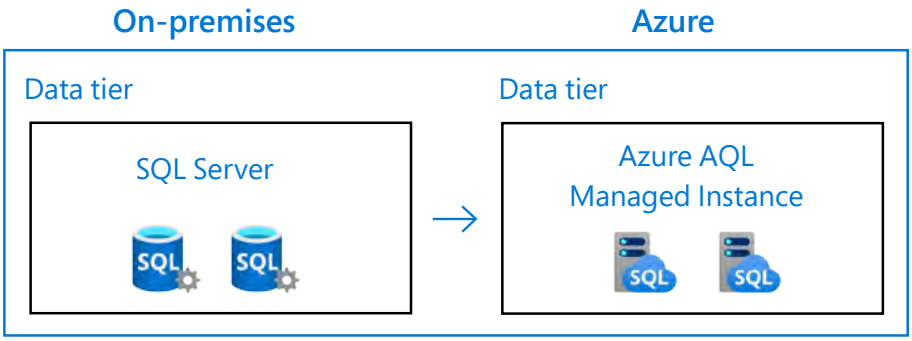



Ideal for:

- App and database requiring OS-level access
- Databases that have requirements best met by SQL Server on Azure Virtual Machines
- Apps architected to leverage the scalability of Azure IaaS (Infrastructure as a Service)

**Refactoring involves making some change to the database and application design, but no wholesale changes to its code.**

### Refactoring sample path




Ideal for:

- Modernizing apps quickly with services such as Azure App Service and Azure SQL Database or Azure SQL Managed Instance
- Addressing code portability concerns that necessitate using the existing codebase and development skills
- Using DevOps and containers to help drive continuous innovation
- Use in conjunction with the App Service Migration Assistant tool for migration to Azure App Service

# Optimize your databases to maximize your investment

Optimize performance of your migrated databases using Azure tools and services. Long after migration, you can continue to use these services to improve the ongoing value and performance of your cloud databases.

**Welcome to Azure! Let's make your database hum.**

**Complete the migration process** with database optimization

- Run functional and performance tests immediately post migration (User Acceptance Testing).
- Use Intelligent Insights to monitor and troubleshoot database performance with customized recommendations for Azure SQL Database and Azure Database for PostgreSQL.
- Assess what new features may be available on the target platform via a few clicks in the Azure Portal.

**Continue to optimize** your cloud investment

- **Monitor your cloud spend with** Azure Cost Management.
- **Lower out-of-pocket expenses** through the
  - Azure Hybrid Benefit.
  - Azure Reserved Virtual Machine Instances and SQL Database and Cosmos DB reserved capacity.
- **Identify security threats using** Azure Security Center with Advanced Threat Protection.
- **Avoid costly business disruptions** and errors with Azure Backup.
- **Ensure business continuity** during outages with Azure Site Recovery.
- **Track the health and performance** of your cloud services with Azure Monitor.

# 5.
# Customer case studies

Willis Towers Watson achieves scalability and savings in the cloud, enabling them to serve more customers

Innovative Systems unites its far-flung databases in the cloud to stay a step ahead of money launderers

Komatsu achieves performance gains and savings using Azure SQL Database Managed Instance

H&R Block delivers scalable, multichannel tax preparation services with Azure SQL Managed Instance and SQL Server on Azure VM

Epos Now switches to Azure to deliver higher quality capabilities and offer new reporting solution for its customers

Willis Towers Watson

# Willis Towers Watson achieves scalability and savings in the cloud, enabling them to serve more customers

Willis Towers Watson helps insurers calculate reserves and prices through their ICT line of business. To handle peak loads, they had to procure massive amounts of compute and storage capacity although they typically only ran 20 to 30 percent of it. By migrating to Microsoft Azure SQL Database, Willis Towers Watson was able to scale seamlessly to meet changes in demand, save money on their infrastructure, and offer services to a wider audience at a lower cost.

Read more >

**"The database instances were moved overnight or over a weekend, depending on the size. Our users were able to pick up where we left off like nothing had changed."**

Greg Matuskovic, Director of Global Solutions Architecture, Insurance Consulting and Technology

# Innovative Systems unites its far-flung databases in the cloud to stay a step ahead of money launderers

With the help of Microsoft partner 10th Magnitude, Innovative Systems used the Database Migration Service to move its on-premises databases to Microsoft Azure SQL Database. In doing so, they consolidated 25 virtual servers into just 10, reducing the burden of management on IT and cutting operating costs 30 percent. Innovative Systems is maximizing its migration to Azure by exploring the new markets and capabilities now available to them.

Read more >

**"With Azure database services, we start every day seeing the art of the possible—how we can continue to improve our operations and provide better services to our customers."**

Brandon Ekberg, Senior Vice President of Global Operations

KOMATSU

# Komatsu achieves performance gains and savings using Azure SQL Managed Instance

Komatsu, the heavy machinery manufacturer, consolidated their mainframes into a single system to create a single source of truth for all their data that's accessible to their different teams and to enable new services such as advanced analytics data. By moving to Microsoft Azure SQL Managed Instance, Komatsu Australia improved performance, reduced costs by half, and provided employees and customers with the data they need, when they need it.

Read more >

**"We determined Azure SQL Database Managed Instance was the best choice for us in terms of scalability, cost, and performance.... We've seen a 49 percent cost reduction and 25 to 30 percent performance gains."**

Nipun Sharma, Analytics Architect, Business Technology and Systems Komatsu Australia


# H&R Block delivers scalable, multichannel tax preparation services with Azure SQL Managed Instance and SQL Server on Azure VM

H&R Block wanted to unify its disparate data sources so the company could deliver more seamless multichannel experiences and provide better service for its customers. By moving various workloads to Microsoft SQL Server 2017 and Microsoft Azure and using Azure data services, the tax provider has been able to enhance service delivery, scale to meet its peaks in demand, and accelerate innovation. Starting with SQL Server on Azure Virtual Machines and later adding Azure SQL Managed Instance, H&R Block improved application performance and reduced roadblocks to innovation. Now it can meet the future head on—and deliver smart, powerful multichannel experiences that keep customers coming back.

Read more >

**"All of our data experts are now working in SQL Server and Azure, so they can work together in a common domain and reduce the roadblocks to delivering smart, powerful solutions."**

Sameer Agarwal, Manager, Enterprise Data Analytics

# Epos Now switches to Azure to deliver higher quality capabilities and offer new reporting solution for its customers

Epos Now, creator of point-of-sale software for a wide range of business customers, wanted to offer additional reporting and data visualization capabilities but was limited by its current data ecosystem. The company worked closely with Microsoft FastTrack for Azure to migrate its data from SQL Server on a competing cloud provider to Microsoft Azure SQL Database. The solution also uses Azure Blob storage, Azure SQL Database managed instance, and Azure Data Factory for a connected data pipeline. Epos Now developed a data as a service offering with robust reporting. The company reduces costs by running in Azure, while also providing a valuable service for customers of all kinds to gain data insights and make smarter business decisions.

Read more >

**"Using Azure for our data solution will give tens of thousands of our customers the latest technology to save time and provide the real-time insights they need to compete and thrive."**

Andrew Morris, Chief Product Officer

# 6. Start your Azure migration today

Ready to take advantage of the benefits of the cloud?

Sign up for an Azure free account—USD200 credit for 30 days, 12 months of free services.

Learn about the application migration process at the Azure Migration and Modernization Center.

Find step-by-step guidance in the Azure Data Migration Guide.

Read answers to common questions on the Database Migration Service FAQ page.

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