Caltech | Center for Technology & Management Education

Post Graduate Program in Cloud Computing

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PG CC - Microsoft Azure Architect Design: AZ:304

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Design Migrations

Learning Objectives

By the end of this lesson, you will be able to:

- Implement assessments using Azure Migrate
- Recommend a solution for migrating applications and virtual machines (VM)
- Recommend a solution for migrating databases
- Determine migration scope
- Recommend a solution for migrating data

A Day in the Life of an Azure Architect

You are working as an Architect in an organization which has decided to move to cloud. The company has 500 virtual machines hosted in a VMWare environment. The VMs are of varying size and have varied utilization levels.

- You need to recommend the right solution and service to move all the virtual machines to Azure.
- You need to ensure that administrative efforts are minimized and recommend the number and size of Azure VMs needed.
- You need to also consider the .NET and PHP web projects that needs to be migrated.

To achieve all the above, along with some additional features, we would be learning a few concepts in this lesson that will help you find a solution for the above scenario.

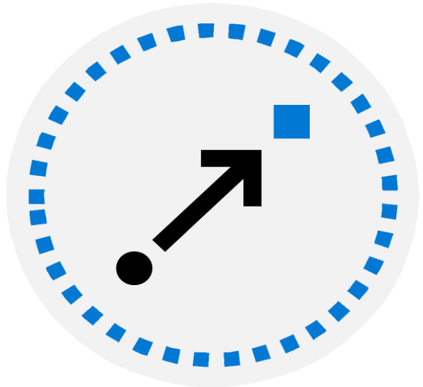
Assessments Using Azure Migrate

Planning Azure Migration

A user can follow the migration path by using the Cloud Adoption Framework of Assess, Migrate, Optimize, and Monitor.

Assess

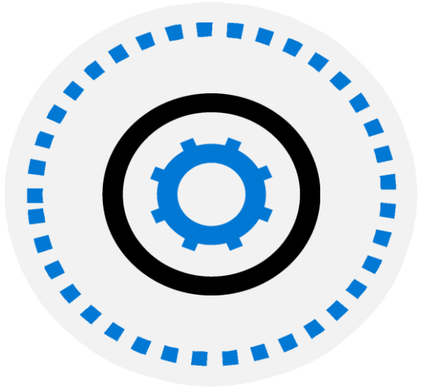
Start with a full assessment of your current environment



Migrate

To migrate to Azure, users will need destination systems and services

Planning Azure Migration



Optimize

Once the services are migrated, it is important to optimize them to ensure their efficiency

Monitor

Captures health and performance information from Azure VMs using Log Analytics agent

Assess

Start with a full assessment of your current environment and identify the servers, applications, and services that are in scope for migration.

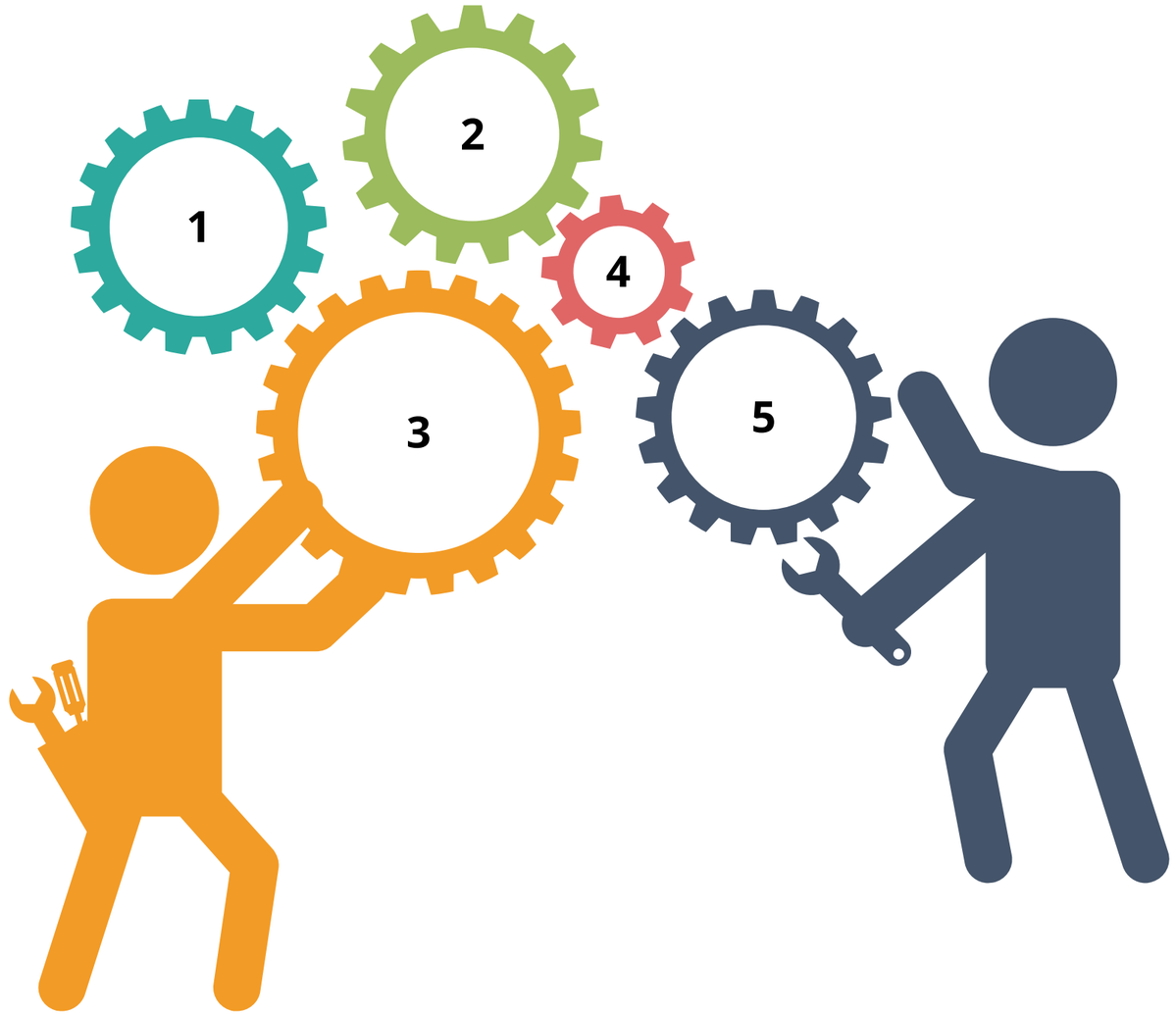
Assess

For each application there are multiple migration options:

Rehost	Recreate existing infrastructure by moving virtual machines from the data center to VMs on Azure.
Refactor	Move services running on VMs to PaaS services.
Rearchitect	Rearchitect some systems so that they can be migrated.
Rebuild	Rebuild software if the cost to rearchitect is more than that of starting from scratch.
Replace	Third-party applications could replace custom applications. Evaluate SaaS options to replace existing applications.

Assess

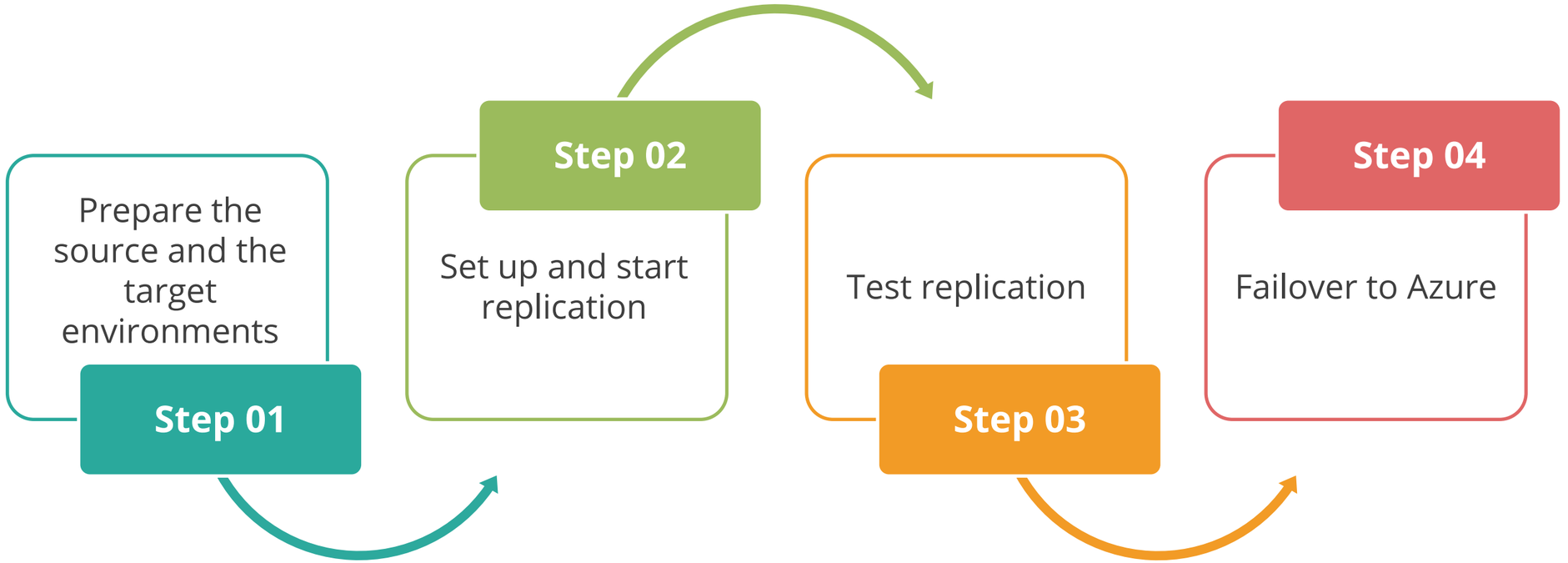
Migration planning includes the following steps:



- Create a cloud migration plan (Requirements, environment, and tools)
- Involve stakeholders (Business and IT)
- Estimate cost savings using tools like TCO
- Discover, evaluate, and document applications
- Discover tools that help in migration journey

Migrate

Migration includes the following steps:



Migrate

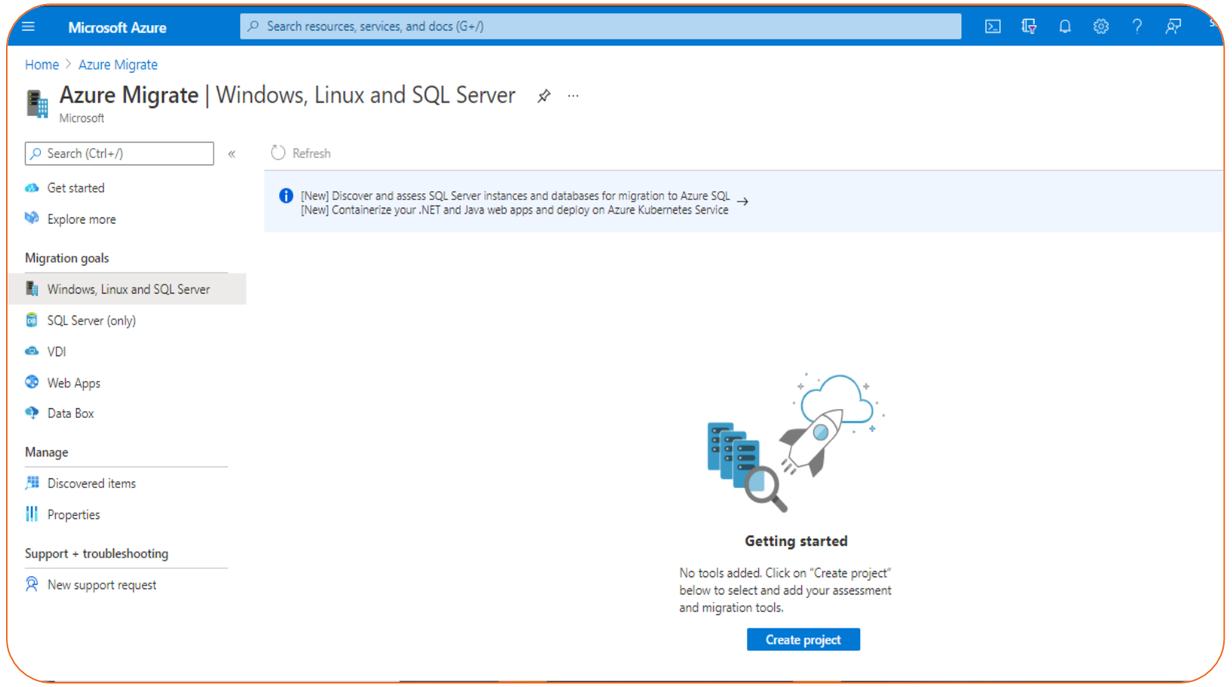
Database migration includes the following steps:

- Assess your on-premises databases
- Migrate the schemas
- Create and run an Azure Database Migration Service
- Monitor migration

Using Azure Migrate to Assess Environment

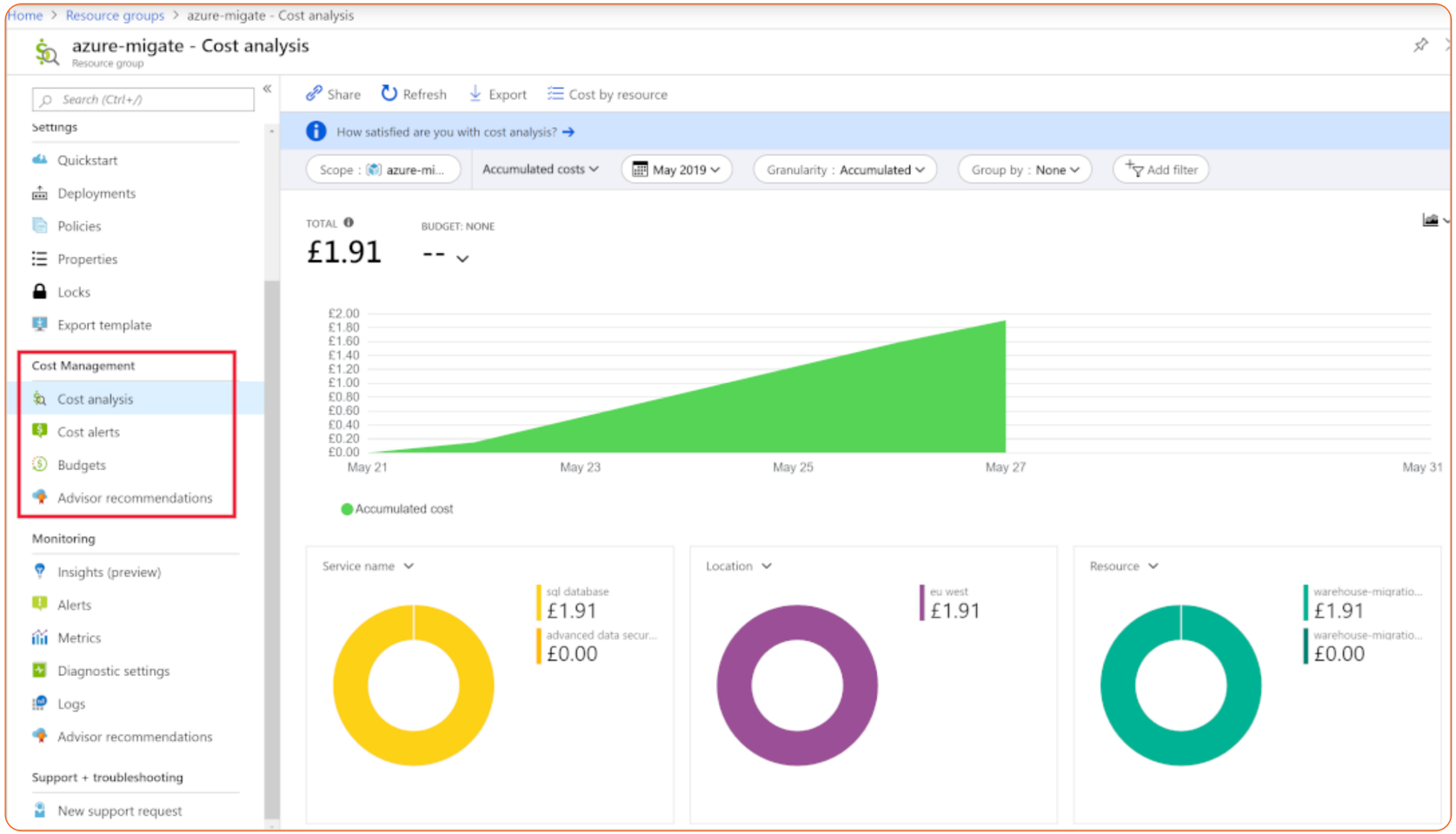
The Azure Migrate assessments are created within a project.

- Group VMs according to the types of VM workloads
- Assessment steps:
  - Discover virtual machines
  - Create assessments



Optimize

Use Azure Cost Management to analyze Azure costs for various management scopes.



Monitor

The Azure Monitor captures health and performance information from Azure VMs (Log Analytics agent).

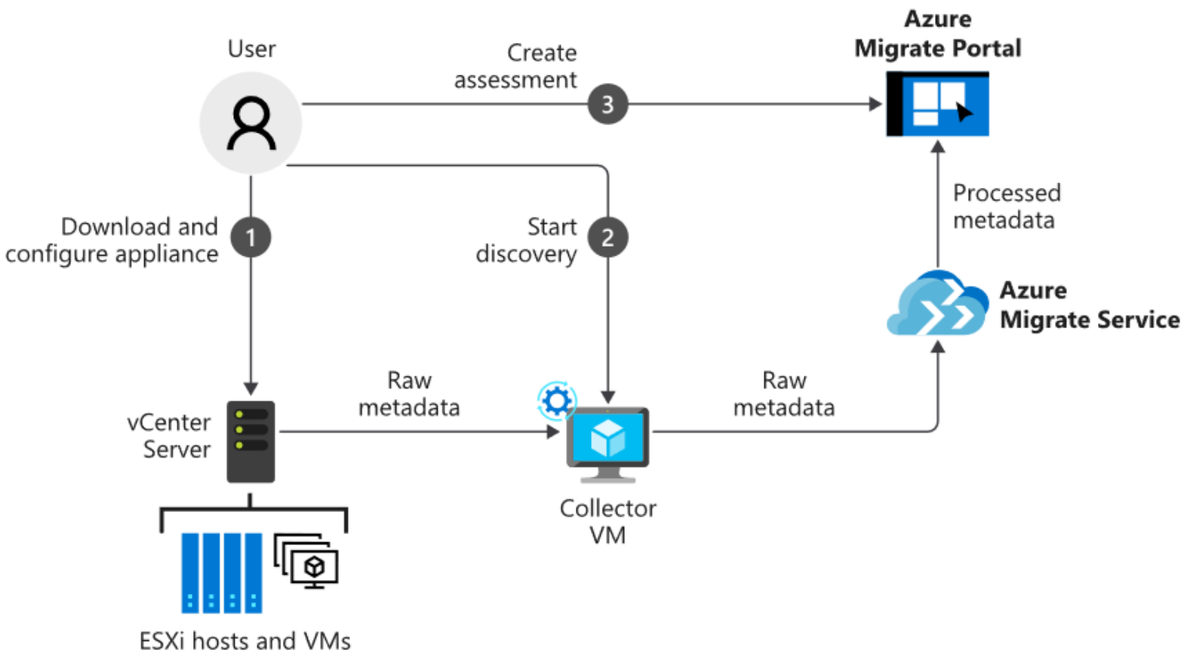
Azure Migrate

The Azure Migrate service is used to assess readiness and assist with migration to Azure from an on-premises environment.

It helps with performance-based sizing calculations for the machines that will be migrated and estimates the ongoing cost of running these machines on Azure.

Discover Machines

Import and spin up the collector appliance on a Hyper-V or VMware host.

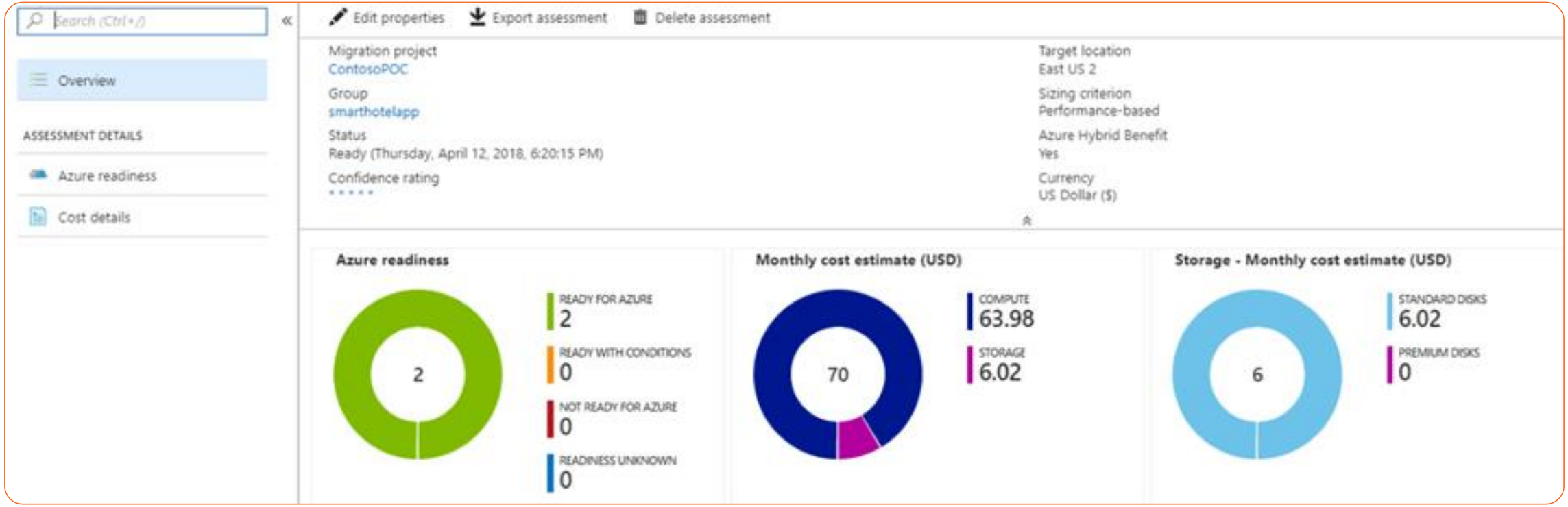


- Collector gathers data on VM cores, memory, disk sizes, and network adapters.
- Performance data like CPU and memory usage, disk IOPS, disk throughput, and network output is gathered.
- The output of data collection is pushed to Azure Migrate project.

The user can view discovered systems on the Azure portal.

Create an Assessment

Azure Migrate assesses an environment's readiness to be migrated to Azure on the portal.

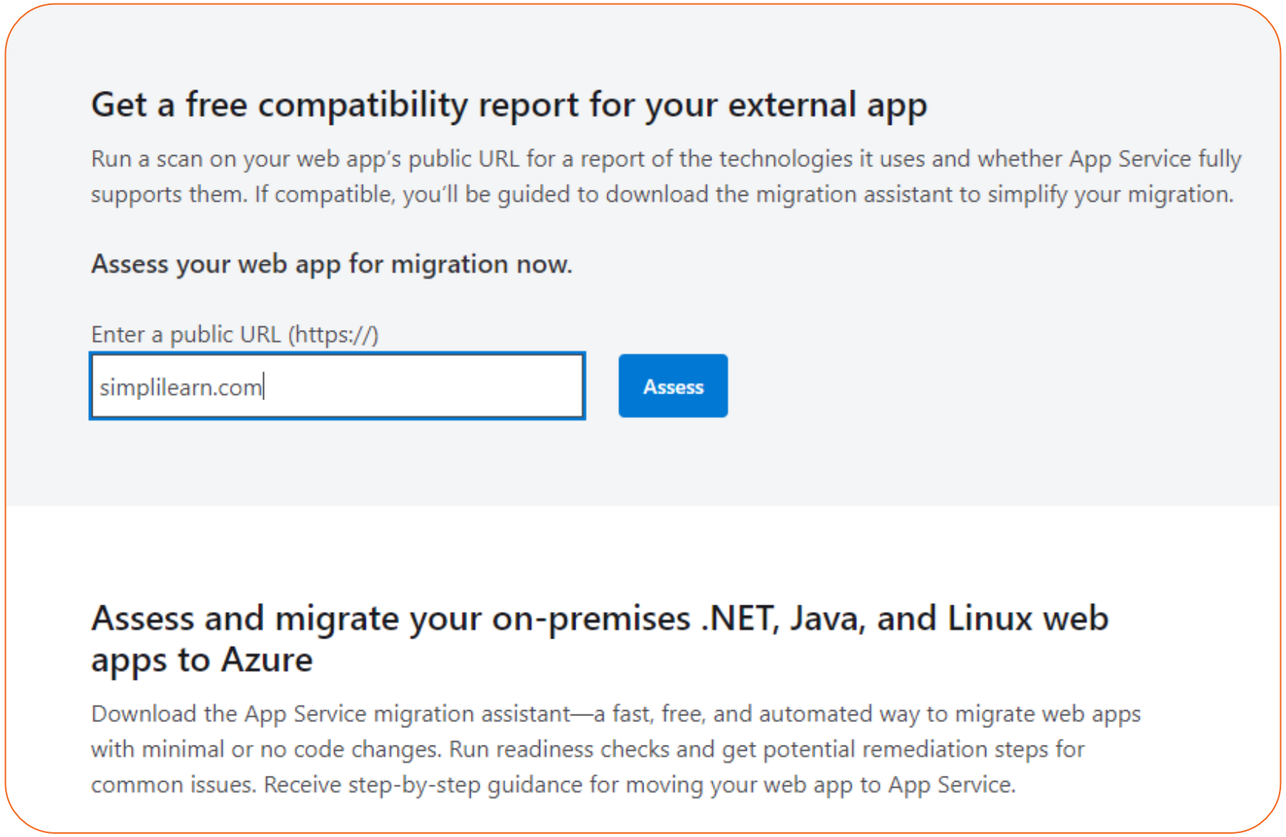


Recommend a Solution for Migrating Applications and VMs

Migrate Azure App Service with Azure Migration Assistant

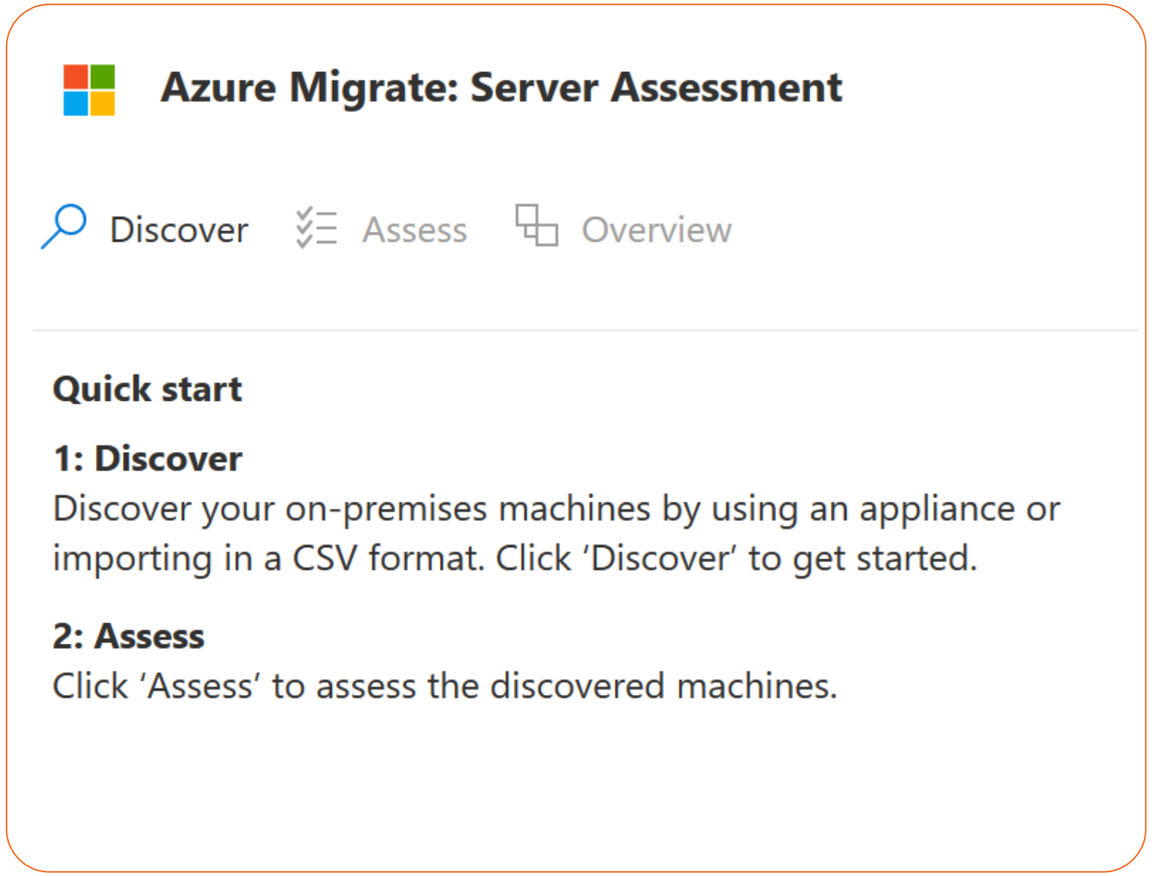
Enter a public URL and access your web app for migration.

- Simplify the migration of your web apps to the cloud with minimal or no code changes
- Run readiness checks and get potential remediation steps for common issues



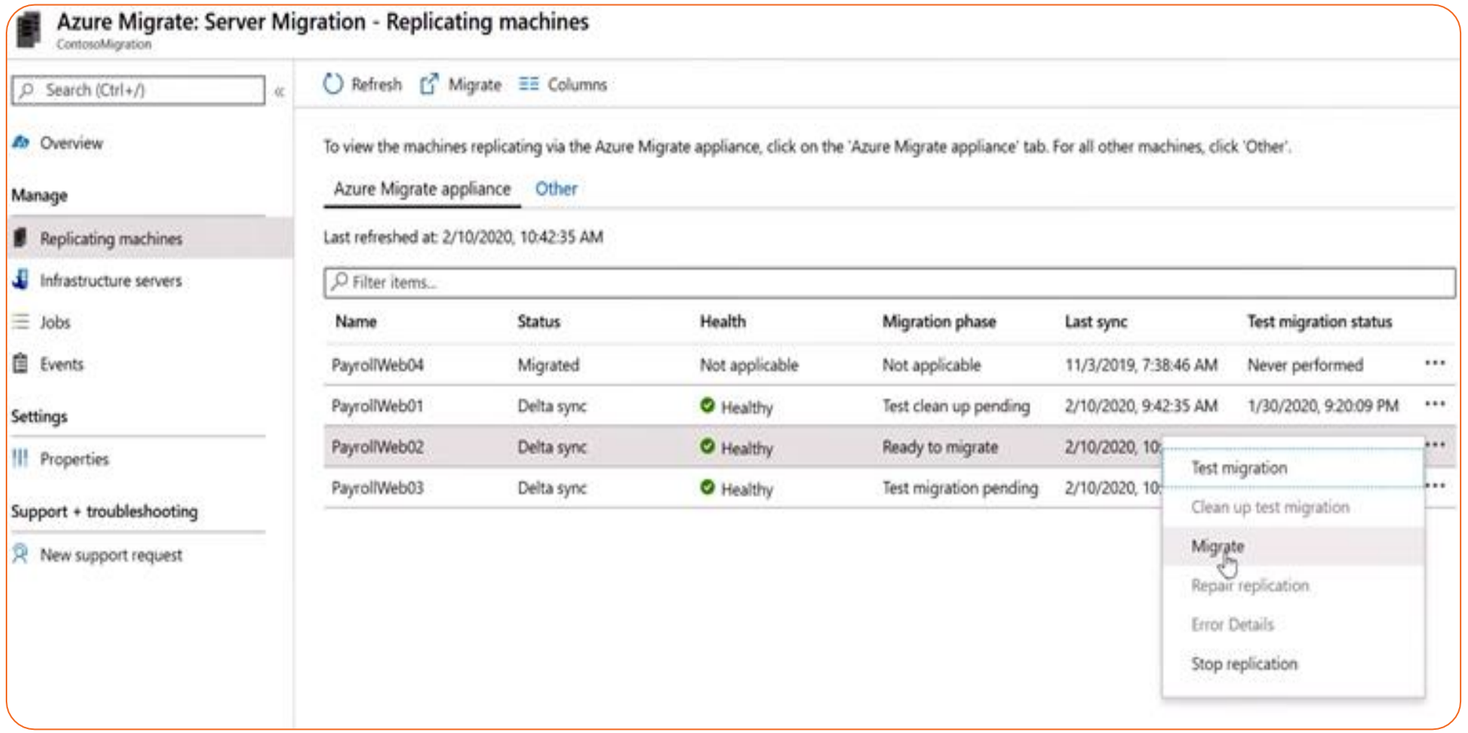
Migrate Servers with Azure Migrate

The Azure Migrate assessment identifies candidates for server migration to Azure.



Azure Migrate runs an agentless migration of virtual and physical servers into Azure.

Migrating the Virtual Machines to Production



Once you are ready for the production migration, then:

- Select Migrate from the replicating machines
- Shut down the VMs for final replication
- Migrate during off-peak hours

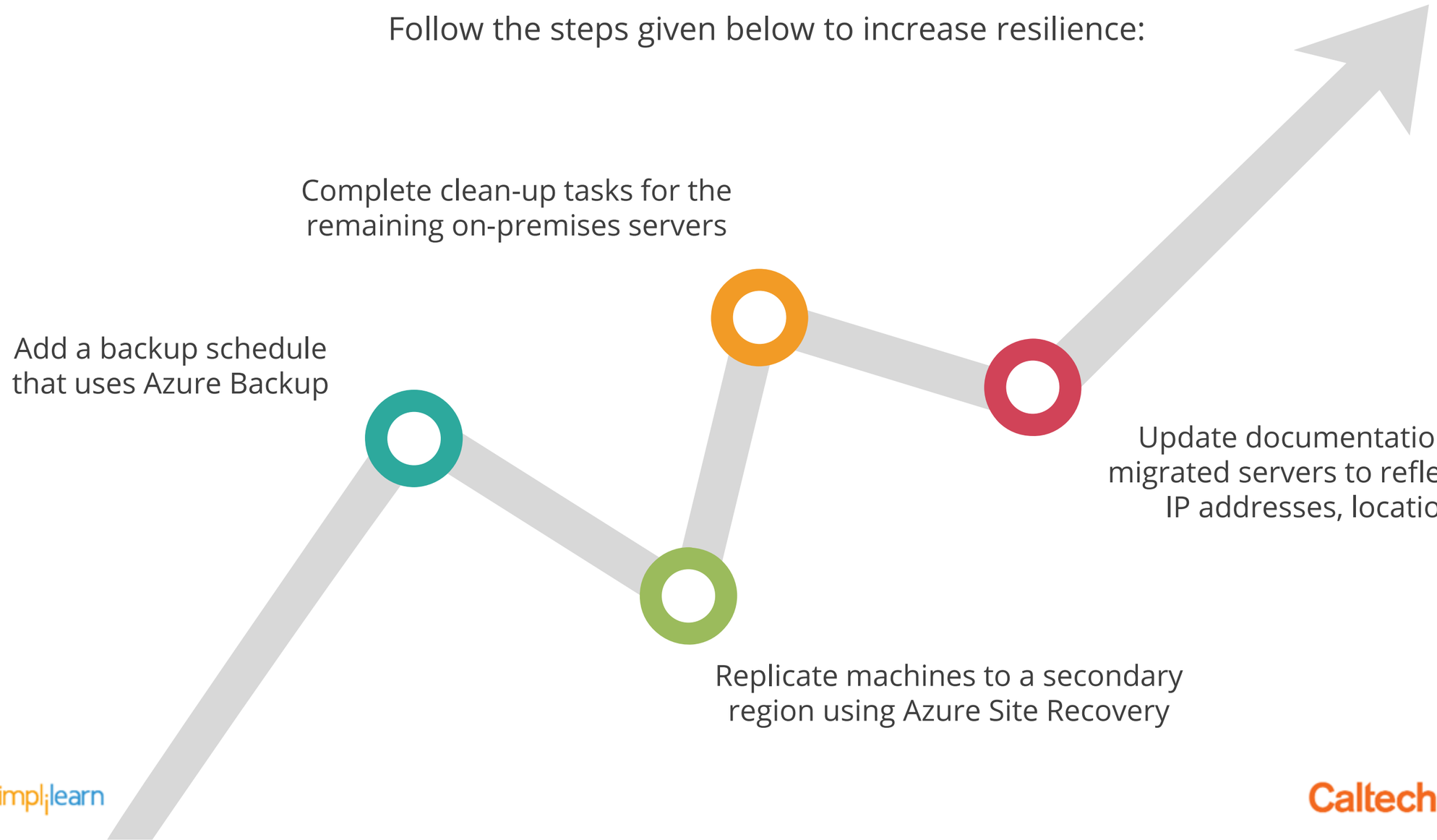
Post-Migration Steps

After the migration:

- Review security settings of virtual machines
- Restrict network access for unused services (NSG)
- Deploy Azure Disk Encryption

Post-Migration Steps

Follow the steps given below to increase resilience:



Assisted Practice

Migrate Azure App Service with Azure Migration Assistant
Duration: 10 Min.

Problem Statement:

As an Azure Architect, you've been asked to assist your company with an Azure migration solution for .NET and PHP web projects.

Assisted Practice: Guidelines

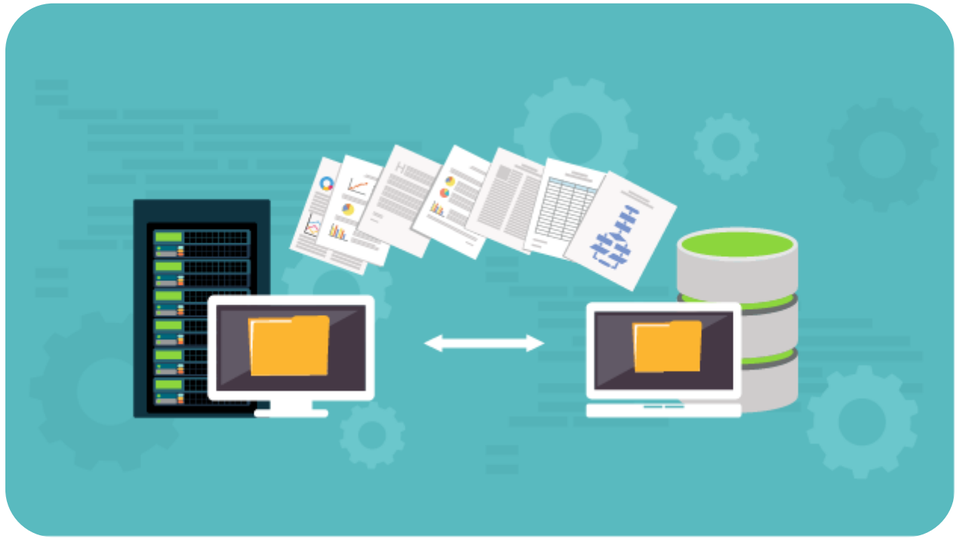
Steps to migrate an azure app service with an azure migration assistant are:

1. Login to your Azure portal
2. Navigate to https://azure.microsoft.com/en-in/services/app-service/migration-assistant/
3. Enter the URL of the web app that needs to be migrated
4. Get a report on an external web app
5. Do a greenfield deployment of your application to App Services

Recommend a Solution for Migrating of Databases

Azure Database Migration Service

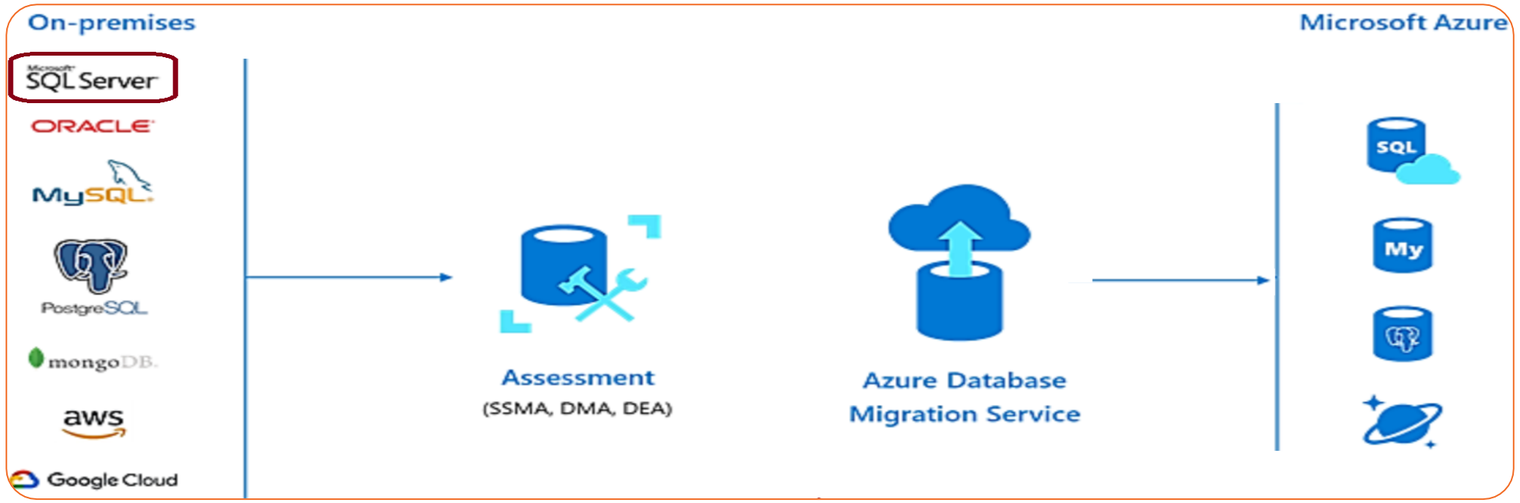
Azure database migration service enables online and offline migrations from multiple database sources to Azure data platforms, all with minimal downtime.



Migrate Databases with Azure Database Migration Service

Two different ways to migrate SQL Server databases:

Offline migration requires shutting down the server at the start of the migration for service



Online migration uses a continuous synchronization of live data, allowing a cutover to the Azure replica database at any time

Migrate Databases with Azure Database Migration Service

User relational database can be migrated to several destinations in Azure:

Single Azure SQL Database instance:	A fully managed, single SQL database
Azure SQL Database managed instance:	Database Engine but missing some minor SQL Server features
SQL Server on Azure Virtual Machines:	An infrastructure-as-a-service (IaaS) offering that runs a full version of SQL Server and supports all the features of SQL Server

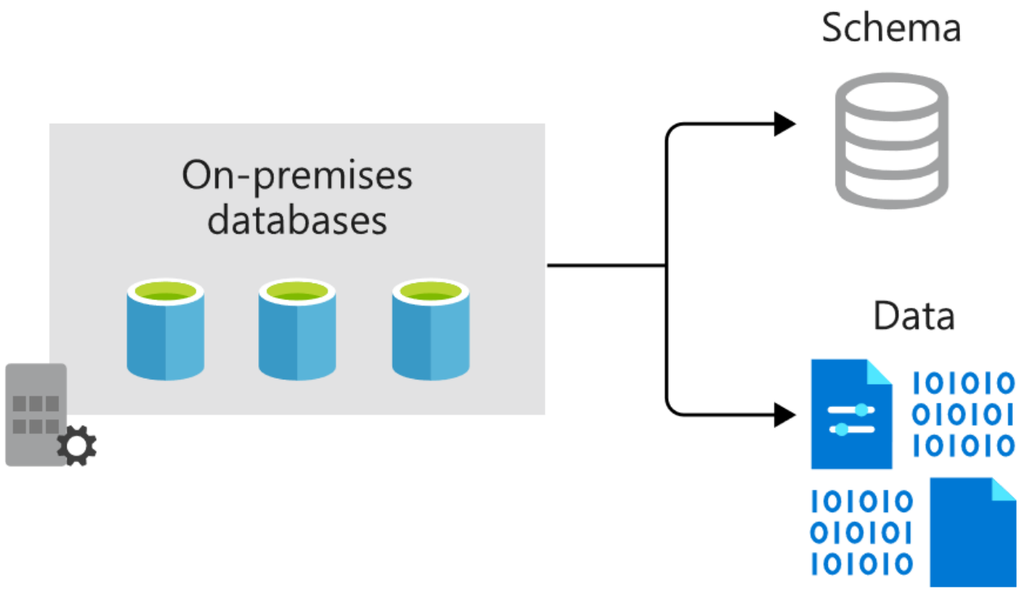
Migrate Databases with Azure Database Migration Service

User relational database can be migrated to several destinations in Azure:

Azure Database for MySQL:	An Azure database service based on the MySQL Community Edition, versions 5.6 and 5.7
Azure Database for PostgresSQL:	An Azure database service based on the community version of the PostgreSQL database engine
Azure Cosmos DB:	A globally distributed, multi-model, fully managed database service

Overview of Database Migration

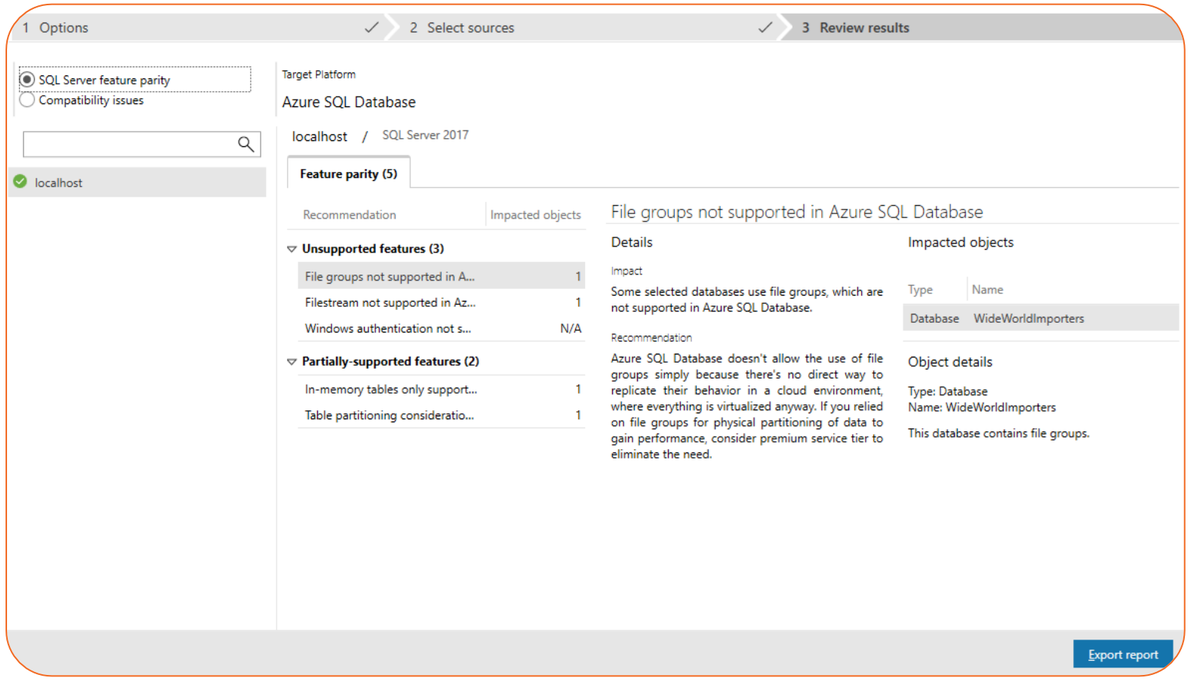
Offline and online migrations prerequisites:



- Download the Data Migration Assistant
- Create an Azure Virtual Network instance
- Configure the network security group
- Configure the Windows Firewall
- Configure credentials

Assess the On-Premises Databases

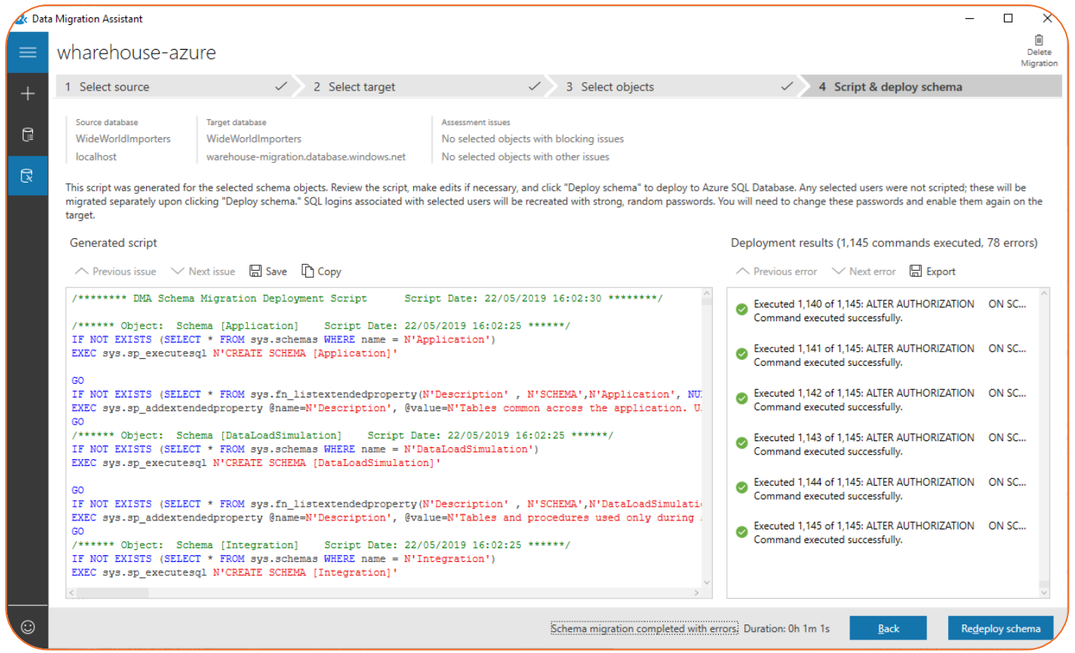
These are the steps to assess the on-premises databases:



- Use Data Migration Assistant to create an Assessment project
- Select the source and target servers
- Provide the connection details and permissions
- Choose the database to migrate

Data Migration Assistant

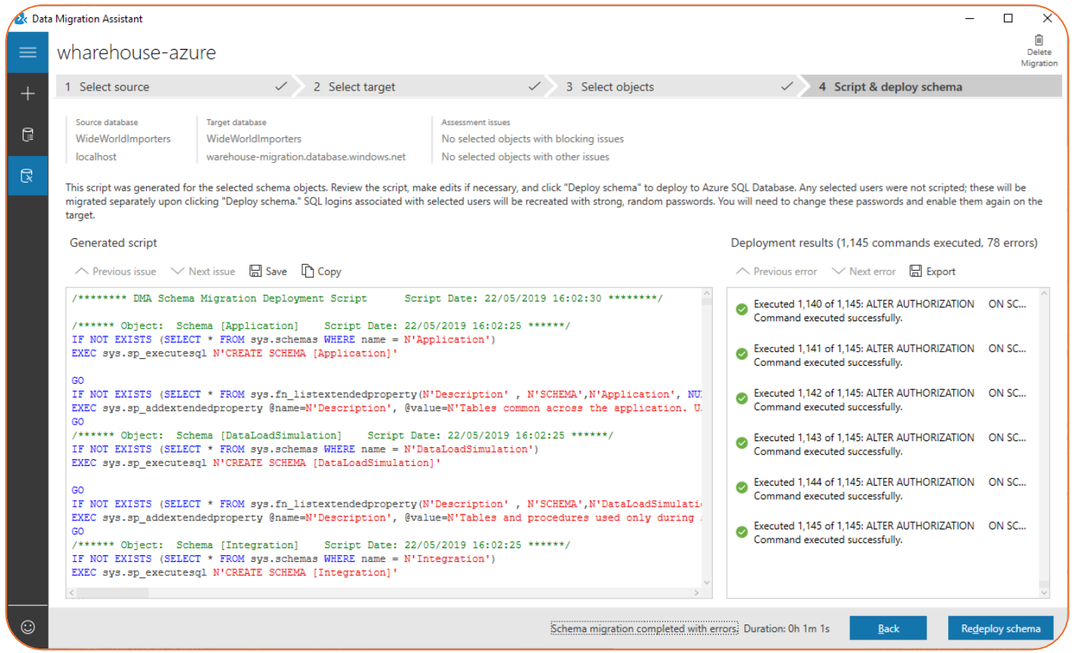
These are the steps to migrate the schema using the data migration assistant:



- Select an on-premises SQL Server instance as the source server
- Set the Azure SQL Database instance as the target server
- Set the scope of the migration to Schema Only
- Once connected to the source database, choose the schema objects to deploy to the new SQL database

Data Migration Assistant

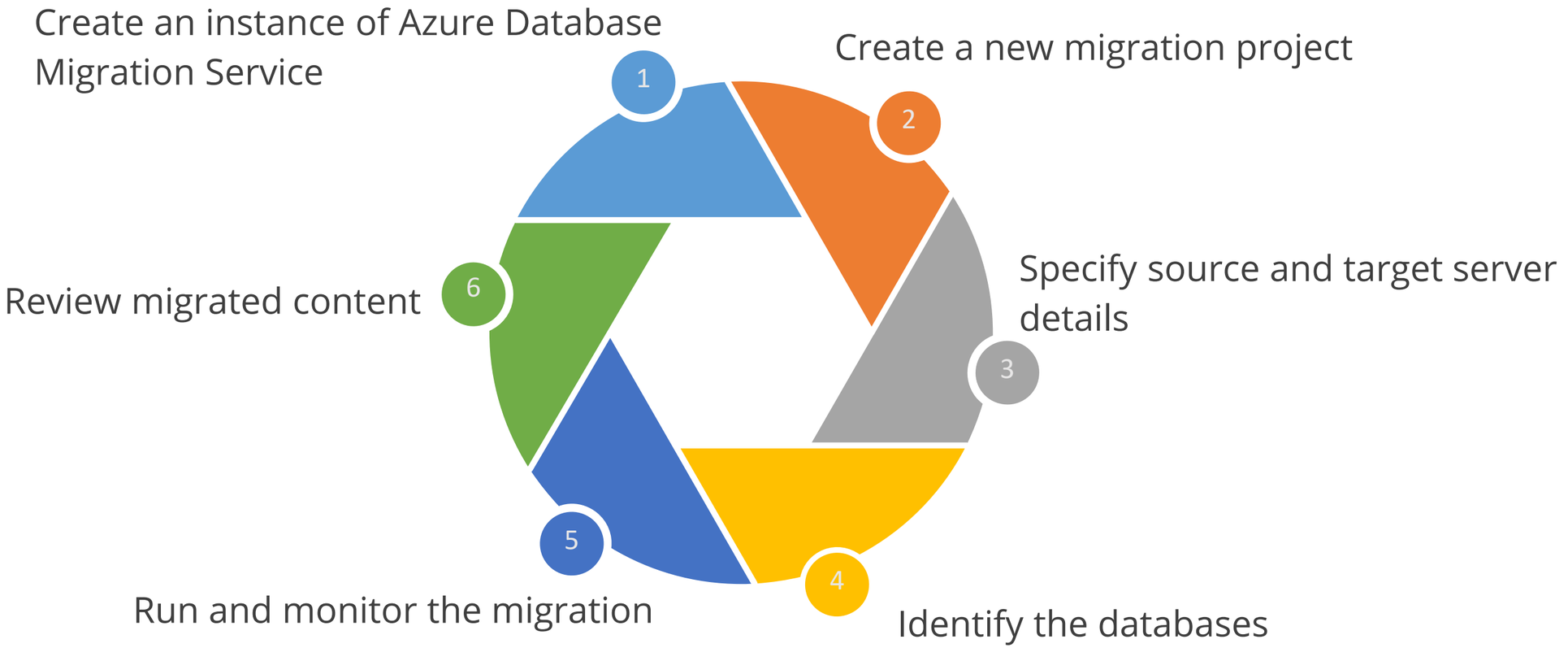
These are the steps to migrate the schema using the data migration assistant:



- Data Migration Assistant will create a script of actions
- Select Deploy Schema to run the script
- Once the script has run, check the target server to make sure it has been configured correctly

Migrate Data with Database Migration Service

These are the steps to migrate data with database migration service:



Determine Migration Scope

Supported Scopes of Migration

There are four different ways to complete migration of compute, network, and storage resources:

Migration of virtual machines (Not in a virtual network)

Migration of virtual machines (In a virtual network)

Migration of unattached resources

Migration of storage accounts

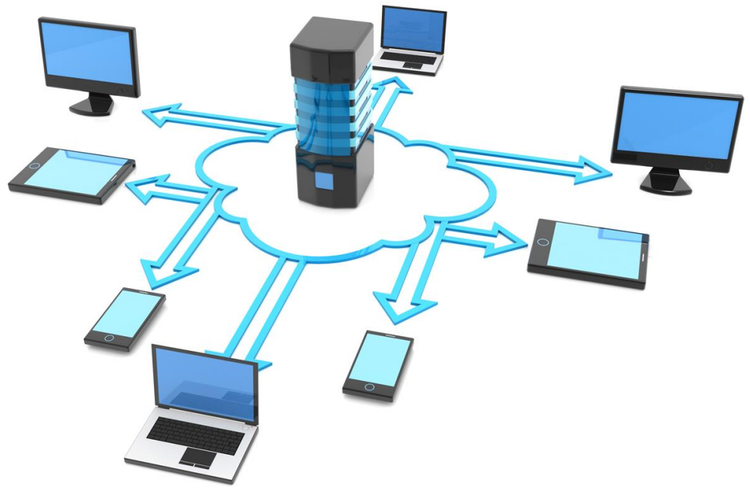
Migration of Virtual Machines (Not in a Virtual Network)

There are two options for the virtual networks that the Virtual Machines will be migrated to:

- Request the platform to create a new virtual network and migrate the virtual machine into the new virtual network.
- Migrate the virtual machine into an existing virtual network in Resource Manager.

Migration of Virtual Machines (In a Virtual Network)

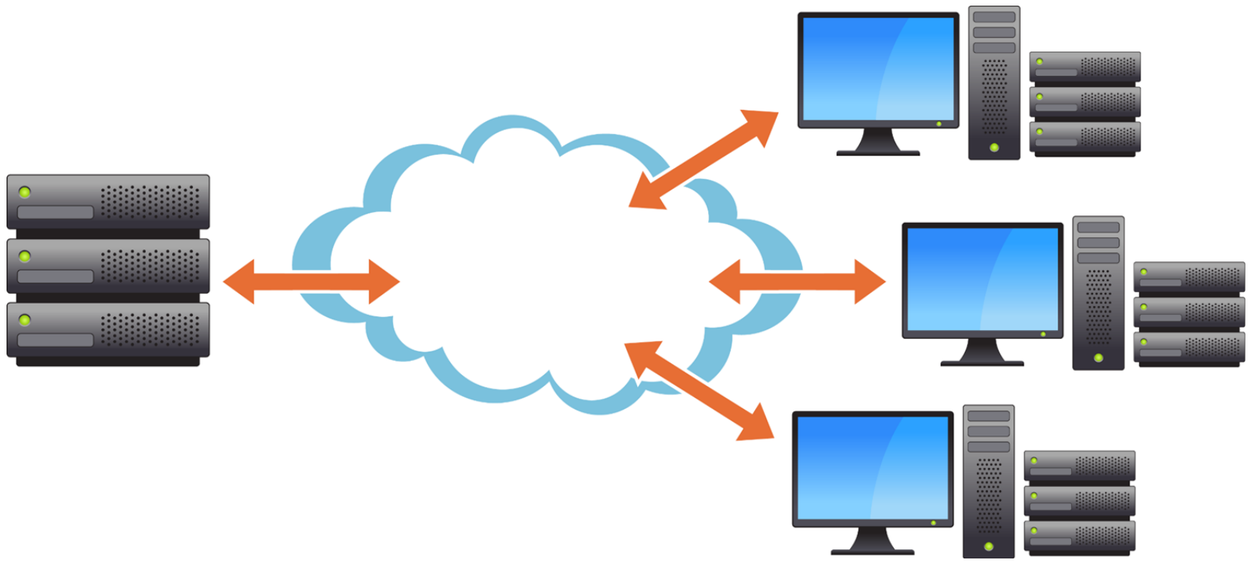
There are two options for the virtual networks that the Virtual Machines will be migrated to:



- For most VM configurations, only the metadata is migrating between the Classic and Resource Manager deployment models.
- The underlying VMs are running on the same hardware, in the same network, and with the same storage.

Migration of Storage Accounts

If you are using a VM with a classic storage account, then compute and network resources can and should be migrated independently of storage accounts.



Once migrate over the Virtual Machines and Virtual Network, need to migrate over user storage accounts to complete the migration process.

Migration of Storage Accounts

If storage account does not have any associated disks or Virtual Machines data and only has blobs, files, tables, and queues then, the migration to Azure Resource Manager can be done as a standalone migration without dependencies.

Migration of Unattached Resources

Storage Accounts with no associated disks or Virtual Machines data may be migrated independently.

Network Security Groups, Route Tables & Reserved IPs that are not attached to any Virtual Machines.

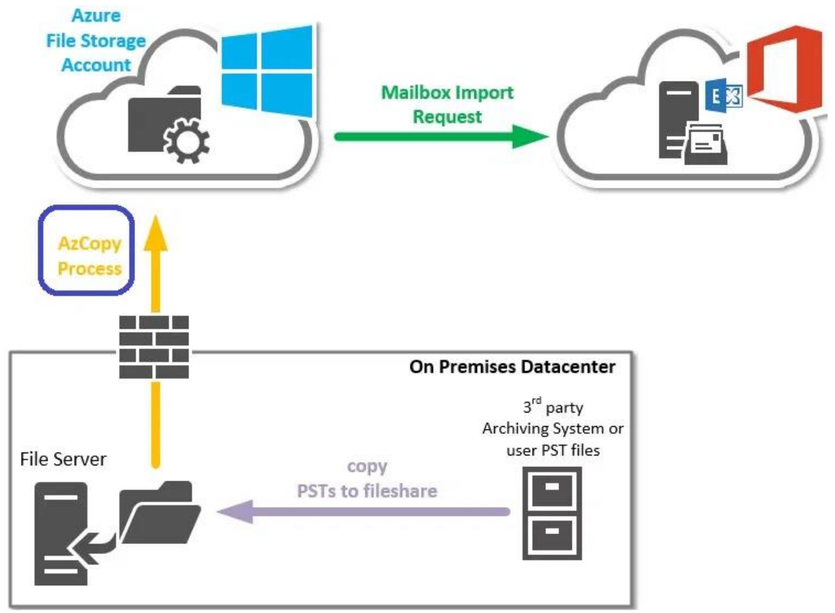
Virtual Networks can also be migrated independently.

Recommend a Solution for Migrating Data

AzCopy

AzCopy is a command-line tool for copying data to, or from, Azure Blob storage, Azure Files, and Azure Table storage.

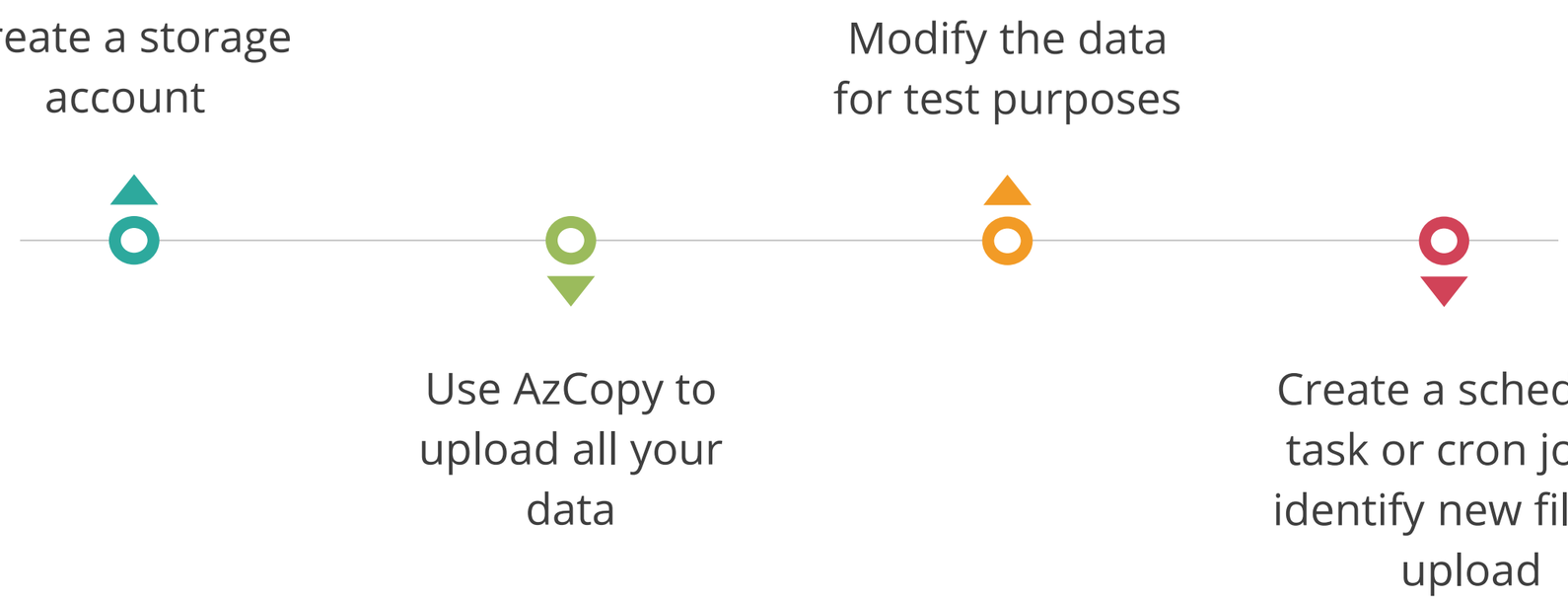
The commands are designed for optimal performance.



Using AzCopy, users can either copy data between a file system and a storage account, or between storage accounts.

Workflow of AzCopy

Workflow for using AzCopy to migrate on-premises data to cloud storage with AzCopy:

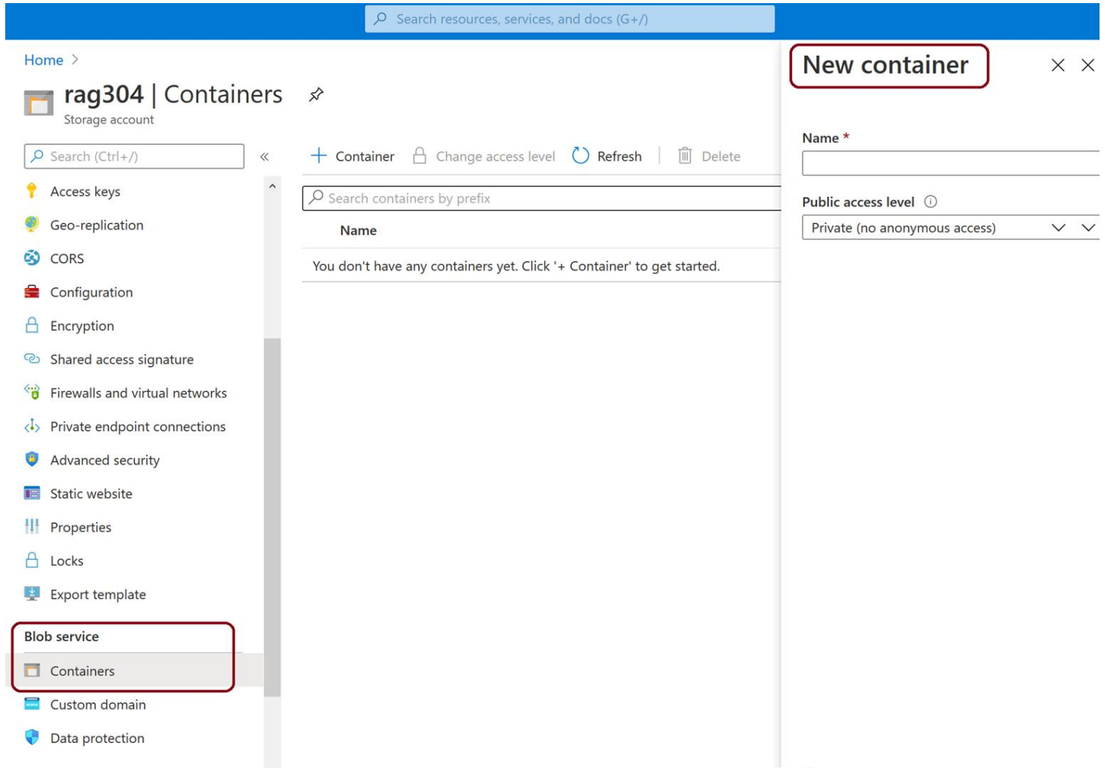


Create a Container

Blobs must be uploaded into a container.

Steps to upload Blobs on a container:

- Select the Storage Account
- Select Containers under Blob Services



Authenticate with Azure AD

Providing the access using RBAC to perform the required operation:

1. Storage Blob Data Contributor
2. AzCopy <enter>
3. Authentication URL (code provided)
4. Sign into your Azure account
5. Begin using AzCopy

Upload Contents of a Folder to Blob Storage

Syntax for uploading a file content to Blob Storage using the azcopy copy command is:

Upload Blob:

```
azcopy copy "<local-folder-path>" "https://<storage-account-
name>.<blob or dfs>.core.windows.net/<container-
name>" --recursive=true
```

To upload the contents of the specified directory to Blob storage recursively, specify the –recursive option.

Upload Modified Files to Blob Storage

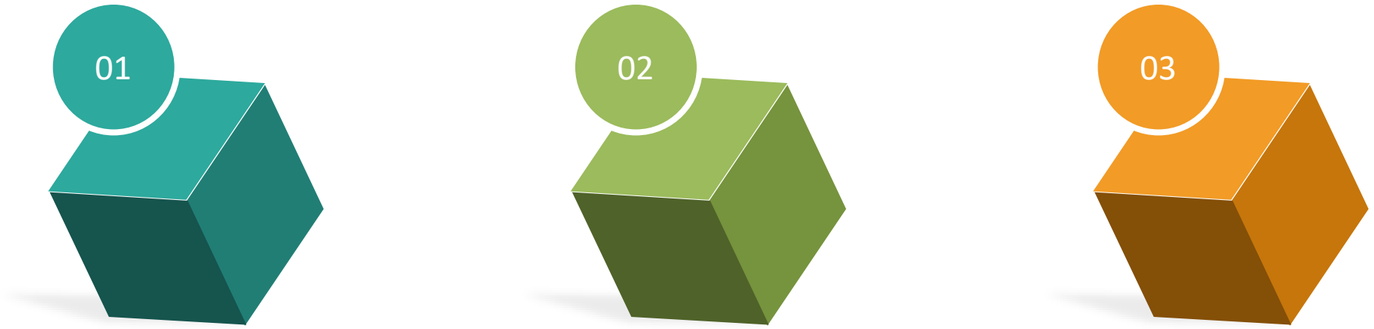
The AzCopy used to upload files based on their last-modified time by entering the following AzCopy command:

Syntax

```
azcopy sync "<local-folder-path>" "https://<storage-
account-name>.blob.core.windows.net/<container-name>"
--recursive=true
```

Create a Scheduled Task

Steps to be followed for creating a scheduled task using AzCopy command script:



Copy the AzCopy command to a text editor (Windows or Linux)

Update the parameter values

Save the file as script.sh (Linux) or script.bat (Windows)

Create a Scheduled Task

To create a cron job using the AzCopy command script:

- Cron allows Linux and Unix users to schedule the execution of commands or scripts at a specified date and time.
- On a local or remote computer, Schtasks allows an administrator to create, delete, query, update, run, and end scheduled tasks.

For Linux, using Terminal:

```
crontab -e */5 * * * * sh
/path/to/script.sh
```

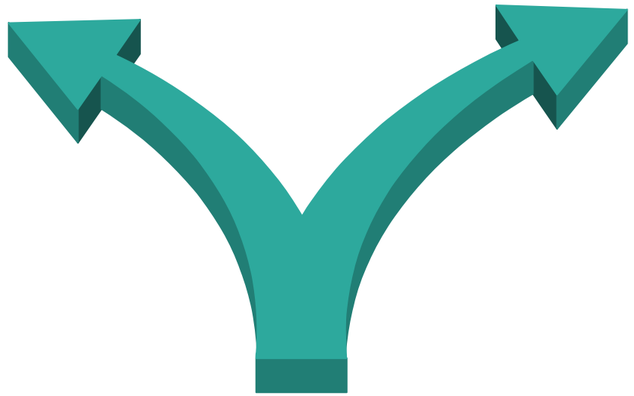
For Windows, using PowerShell:

```
schtasks /CREATE /SC minute /MO 5 /TN
"AzCopy Script" /TR C:\script.bat
```

Azure Data Box

The Microsoft Azure Data Box cloud solution lets you send terabytes of data into and out of Azure in a quick, inexpensive, and reliable way.

Offline data transfer

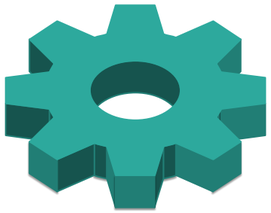


Online data transfer

The Azure Data Box family can be divided into two groups:

Offline Data Transfer

The devices in the offline grouping include:



Data Box Disk:
Provides one ~35-TB transfer to Azure

Data Box:
Provides one ~80-TB transfer to Azure per order

Data Box Heavy:
Provides one ~800-TB transfer to Azure

Online Data Transfer

Online data transfer enables a link between a user's on-premises assets and Azure.

- Transferring huge amounts of data to Azure is similar to copying data to a networking share.
- Online data transfer is ideal when a user needs a continuous link to transfer a massive amount of data.

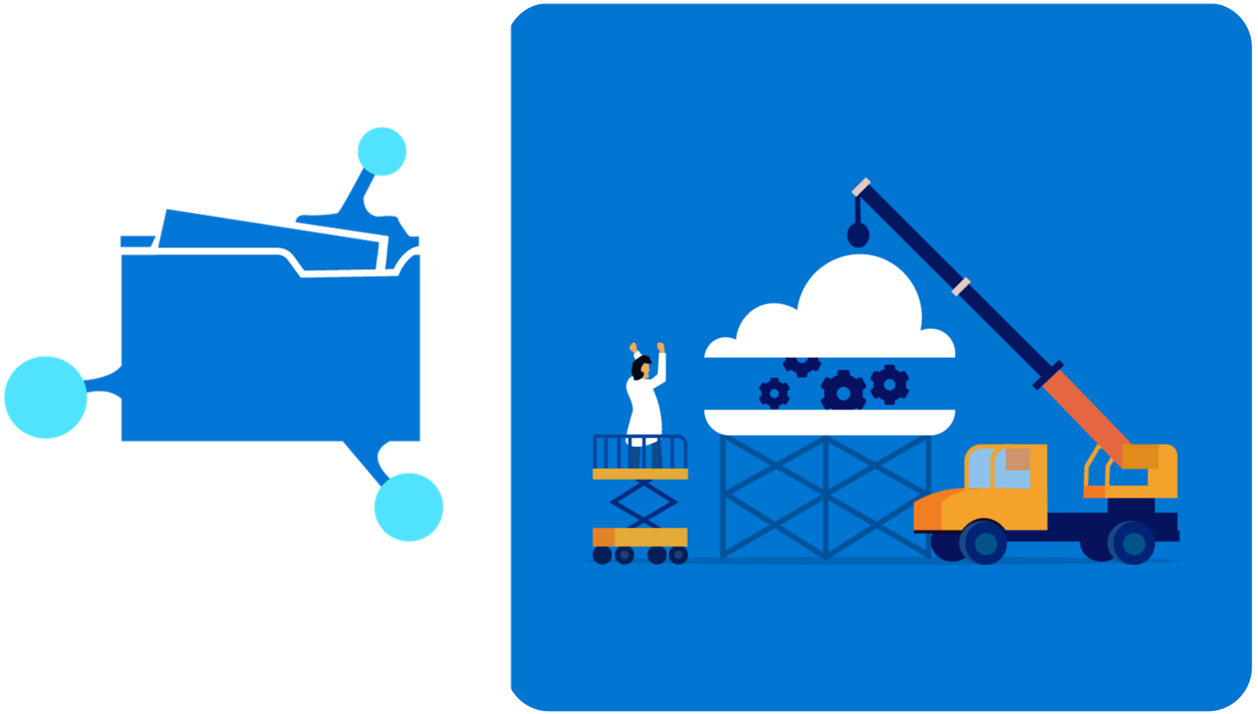
Data Box Gateway:

This device is an entirely virtual appliance.

It is based on a virtual machine that one can provision in their on-premises environment.

Azure File Sync

Azure file sync enables centralizing your organization's file shares in Azure Files, while keeping the flexibility, performance, and compatibility of a Windows file server.



Source: https://docs.microsoft.com/

Benefits of Azure File Sync

Azure File Sync offers the following benefits:

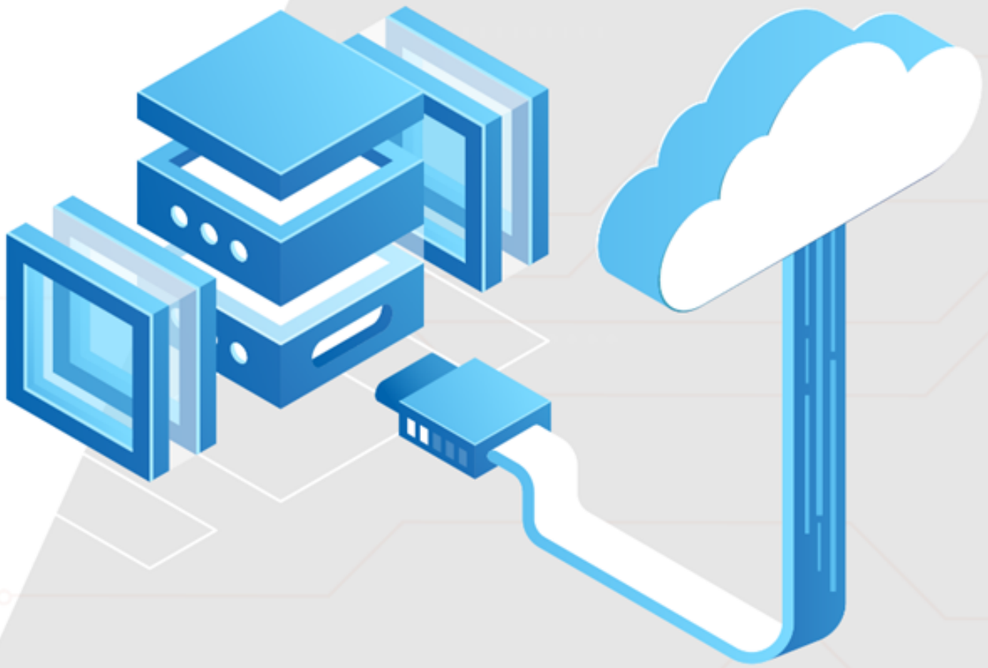
- **Cloud tiering:**
  Most frequently accessed files are cached on your local server and your least frequently accessed files are tiered to the cloud

- **Multi-site access and sync:**
  Good for distributed access scenarios

- **Business continuity and disaster recovery:**
  Azure File Sync is backed by Azure Files, which offers several redundancy options for highly available storage

Key Takeaways

- Azure Migrate service is used to assess readiness and assist with migration to Azure from an on-premises environment.
- Azure Migrate runs an agentless migration of virtual and physical servers into the Azure.
- Azure DB migration service enables online and offline migrations from multiple database sources to Azure data platforms.
- Using AzCopy, users can either copy data between a file system and a storage account, or between storage accounts.



Thank you