AZ-305T00A Designing Microsoft Azure Infrastructure Solutions

Design a migration solution

https://learn.microsoft.com/training/modules/design-migrations/

Learning Objectives

- Evaluate migration with the Cloud Adoption Framework
- Describe the Azure Migration Framework
- Assess your workloads
- Compare migration tools
- Migrate your databases
- Select an online storage migration tool
- Select an offline storage migration tool
- Learning recap

AZ-305: Design Infrastructure Solutions (30-35%)

Design migrations

- Evaluate a migration solution that leverages the Microsoft Cloud Adoption Framework for Azure
- Evaluate on-premises servers, data, and applications for migration
- Recommend a solution for migrating workloads to infrastructure as a service (IaaS) and platform as a service (PaaS)
- Recommend a solution for migrating databases
- Recommend a solution for migrating unstructured data

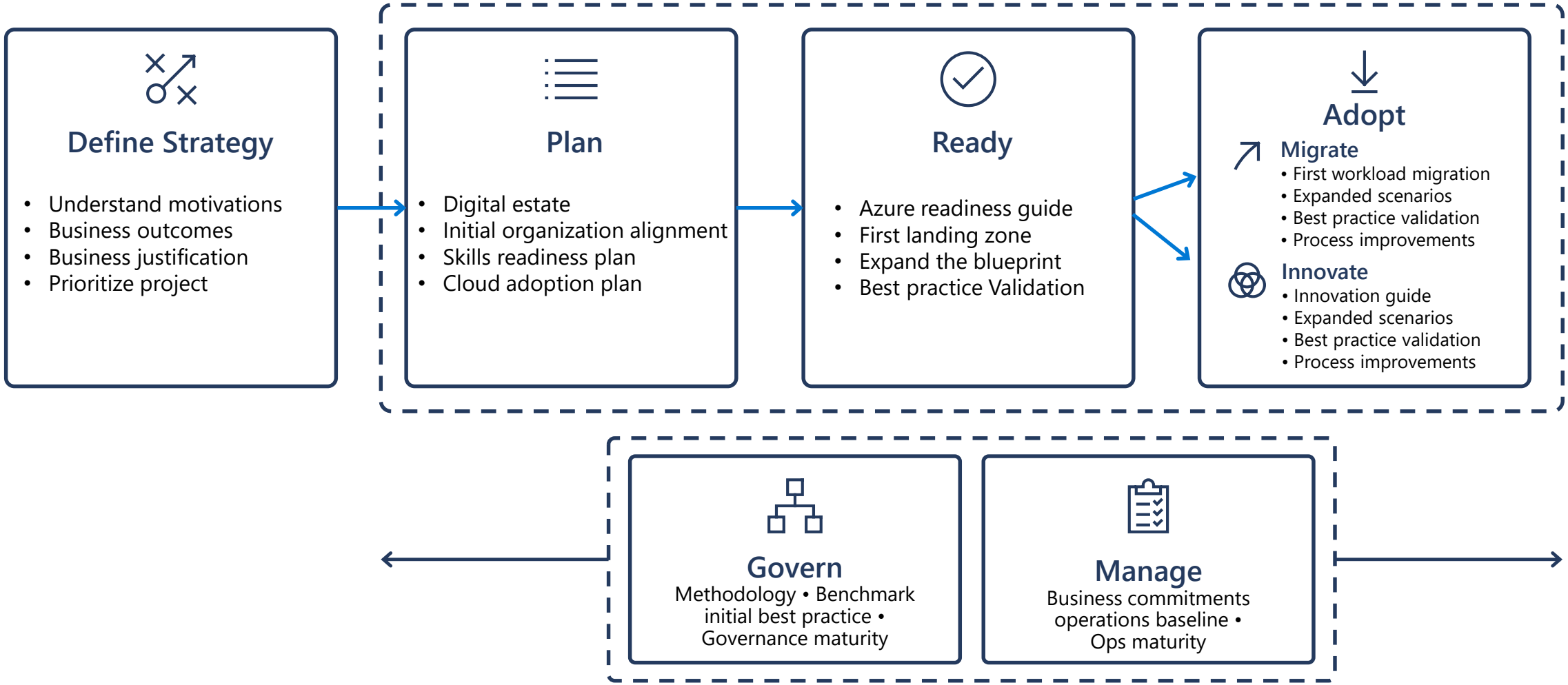
Evaluate migration with the Cloud Adoption Framework

The Microsoft Cloud Adoption Framework for Azure provides recommendations, best practice guidance, documentation, and tools to help you drive adoption of Azure in your organization.

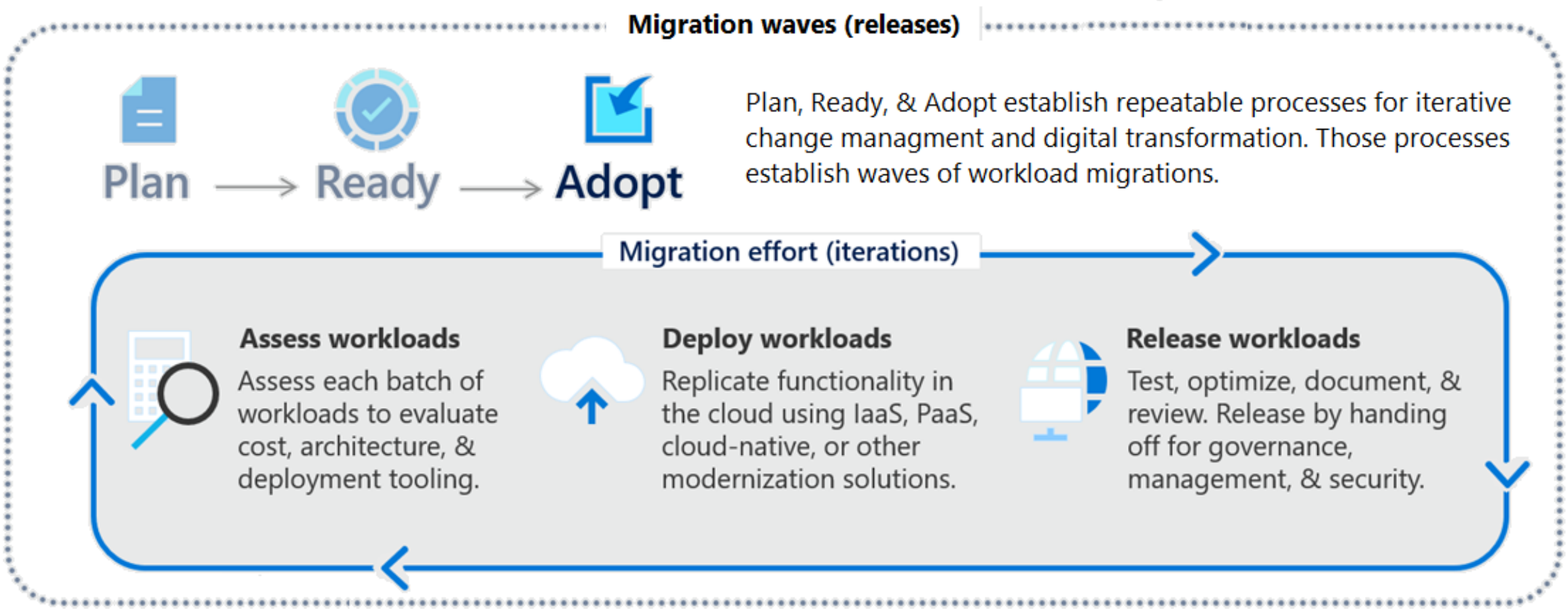
The Cloud Adoption Framework guides this security journey by providing clarity for the processes, best practices, models, and experiences. This guidance is based on lessons learned and real world experiences of real customers, Microsoft's security journey, and work with organizations, like NIST, The Open Group, and the Center for Internet Security (CIS)

https://aka.ms/CAFSecure

Review the Cloud Adoption Framework



Focus on migration efforts



Using the migration guidance in the Cloud Adoption Framework
Tailwind Traders shouldn't undertake cloud adoption without considerable planning. Proceeding with caution is especially recommended for the migrate phase in the cloud adoption lifecycle. To prepare for migration and learn more about the migration approach, review the following documentation:

•Azure migration guide overview. Review the Azure migration guide to learn about Azure native tools and a relevant approach to migration.

•The One Migrate approach to migrating the IT portfolio. Examine the scenarios captured in this Migrate methodology. The examples demonstrate the same set of consistent guidelines and processes for migrating both Microsoft and third-party technologies.

•Azure cloud migration best practices checklist. Follow this document to learn how best to address common migration needs through the application of consistent best practices.

•The Cloud Adoption Framework migration model. Explore this document to understand migration and why the process can be an intensive activity. As you increase your migration effort, review these process improvements to help optimize aspects of your migration.

Describe the Azure Migration Framework

Determine your migration strategy

Select a strategy that meets your goals – you may need several strategies

Pattern	When to use
Rehost	• Move workloads quickly to the cloud • Don't need immediate changes to app capabilities
Refactor	• Apply Azure DevOps practices or using a container strategy for workloads. • Consider the portability of your existing code base and available development skills.
Rearchitect	• Use existing application investments, • Apps need major revisions for new features and to work effectively on a cloud platform.
Rebuild (new)	• Rapid development and existing apps have limited functionality and lifespan. • Expedite business innovation by using Azure DevOps practices. • Legacy apps as no code or low apps in the cloud.

The Azure migration framework can help you develop your plan and work through your migration. The framework consists of four stages: *Assess*, *Migrate*, *Optimize*, and *Monitor*.

Stage 1: Assess your on-premises environment

In the first stage, you assess the current on-premises environment:

- Identify your apps, and their related servers, services, and data, that's within scope for migration
- Start to involve stakeholders, such as the IT department and relevant business groups
- Create a full inventory and dependency map of your servers, services, and apps that you're planning to migrate
- Estimate your cost savings by using the Azure Total Cost of Ownership Calculator (TCO)
- Identify appropriate tools and services you can use to perform the four stages

Migration strategy patterns

There are five broad strategy patterns for migrating workloads to the cloud, usually called the five Rs of rationalization: Rehost, Refactor, Rearchitect, Rebuild, and Replace. The strategy you adopt depends on your business drivers and migration goals. You might consider adopting multiple patterns. You could choose to rehost simple apps or apps that aren't critical to your business, but rearchitect apps that are more complex and business critical.

•**Rehost**: Rehost is often referred to as a *lift and shift migration*. This strategy doesn't require code changes, and allows you to migrate your existing workloads to Azure quickly. Each workload is migrated as is, without the risk and cost associated with code changes.

•**Refactor**: Refactor is often referred to as *repackaging*. Refactoring requires minimal changes to apps so they can connect to Azure platform as a service (PaaS) and use cloud offerings. You can migrate existing apps to Azure App Service or Azure Kubernetes Service (AKS). Or, you could refactor relational and non-relational databases into other options. Refactor into Azure SQL Managed Instance, Azure Database for MySQL, Azure Database for PostgreSQL, and Azure Cosmos DB (if your app can easily be repackaged to work in Azure).

•**Rearchitect**: Rearchitecting for migration focuses on modifying and extending app functionality and the code base to optimize the app architecture for cloud scalability. You can break down a monolithic application into a group of microservices that work together and scale easily. Or, you could rearchitect relational and non-relational databases to a fully managed database solution. Rearchitect to Azure SQL Managed Instance, Azure Database for MySQL, Azure Database for PostgreSQL, and Azure Cosmos DB.

•**Rebuild**: Rebuild takes things a step further by completely rebuilding an app by using Azure cloud technologies. You can build green-field apps with cloud-native technologies such as Azure Functions, Azure AI, Azure SQL Managed Instance, and Azure Cosmos DB.

•**Replace**: Implement solutions using the best technology and approach available at this time. Sometimes, software as a service (SaaS) applications can provide all the necessary functionality for your hosted applications. Then, a workload can be scheduled for replacement, removing it from the migration scope.

The following table lists scenarios for working with the four patterns.

Expand table

Rehost	Refactor	Rearchitect	Rebuild	Replace
Move workloads quickly to the cloud	*Apply innovative DevOps practices provided by Azure*	*Your apps need major revisions to incorporate new capabilities*	*Rapid development*	*Standardize around industry best practices*
Move a workload without modifying it	*Implement a DevOps container strategy for workloads*	*Your apps need major revisions to work effectively on a cloud platform*	*Support existing apps with limited functionality and lifespan*	*Accelerate the adoption of business process-driven approaches*
For apps designed to take advantage of Azure IaaS scalability after migration	*Support portability of your existing code base and available development skills*	*Use existing application investments*	*Expedite business innovation by using DevOps practices*	*Reallocated development investments that create competitive differentiation or advantages*
When workloads are important to your business, but you don't need immediate changes to app capabilities		*Meet scalability requirements*	*Rebuild with new cloud-native technologies like Azure Blockchain*	*Replace existing solutions in favor for SaaS offerings*
		Apply innovative DevOps practices	*Rebuild legacy applications as "no code apps" or "low apps" in the cloud*	
		Minimize use of virtual machines		

Stage 2: Migrate your workloads

After you complete the assessment, you can begin the process of migrating your targeted apps and their related services and data. The migration stage typically consists of the following efforts:

- **Deploy cloud infrastructure targets**. Before you can migrate Tailwind Traders workloads, you need to create the required cloud infrastructure targets. Depending on the tools you use to perform the migration, you might need to create the required Azure resources before you begin the migration. Some tools, such as Azure Migrate and Azure Database Migration Service can create the target Azure resources for you.

- **Migrate workloads**. It's a good idea to pilot your workload migration, and to choose a non-critical app for the pilot. This approach enables you to become familiar with tools, gain experience with processes and procedures, and reduce risk when migrating large or complex workloads.

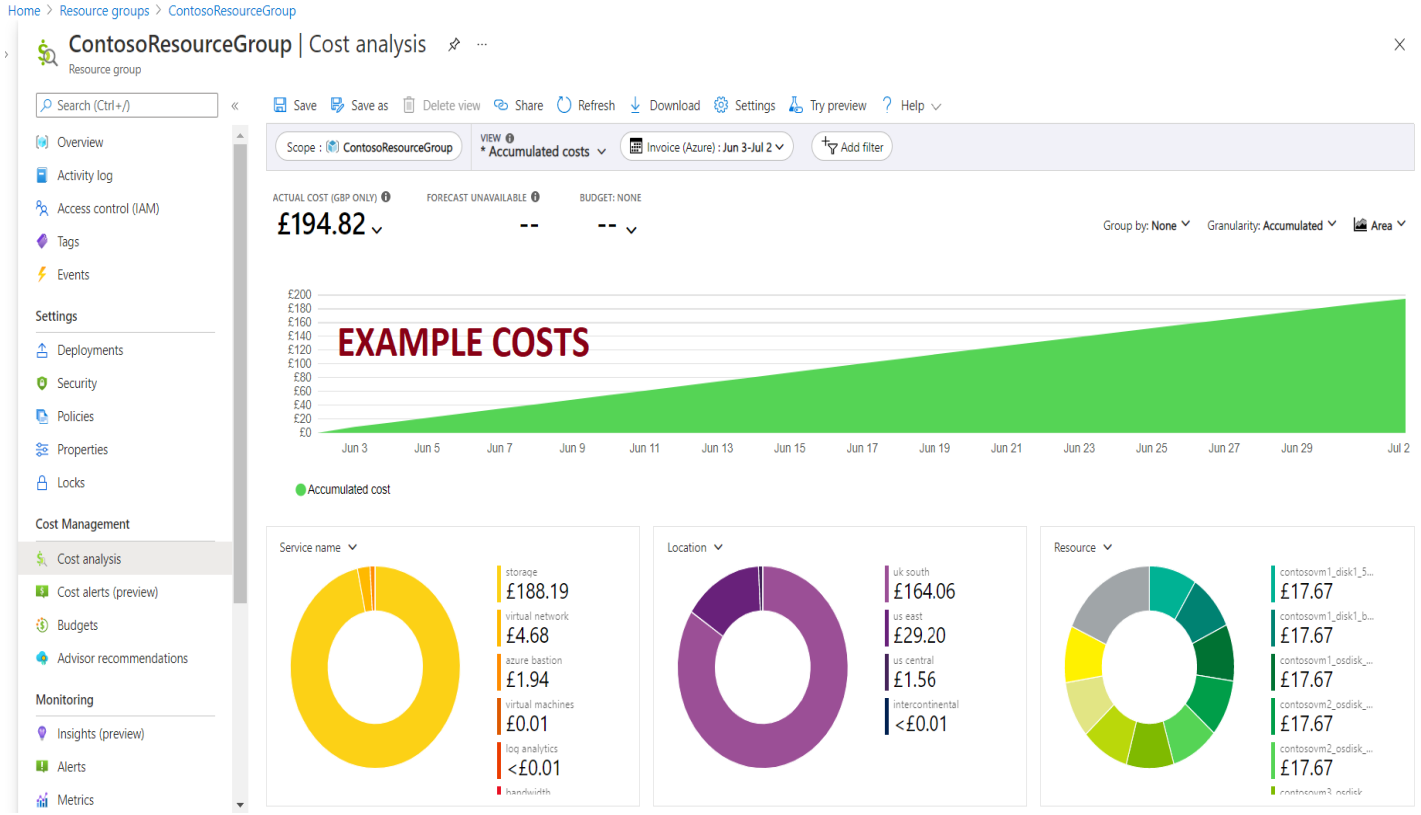
- **Decommission on-premises infrastructure**: After you're satisfied that your source apps and databases are migrated successfully, you need to decommission the source workloads. Consider retaining the source workload backups and archived data. This data might prove useful as it provides a historical archive. You can store these backups and archives in Azure Blob Storage.

Stage 3: Optimize your migrated workloads

For the optimization stage, there are three main efforts to focus on for your planning:

- Analyze migration costs for your workloads
- Review recommendations for reducing your costs
- Identify options for improving your workload performance

You can use Microsoft Cost Management (formerly known as Azure Cost Management and Billing) in the Azure portal to analyze your workload costs. This tool is available for the Azure resource group that contains your migrated workloads. You'll find the tool in the **Costs analysis** > **Cost Management** section. The following screenshot shows cost analysis for the last billable period for the ContosoResourceGroup resource group. The results display the costs according to service name, region, and resource. You can customize the display results to meet your needs.



To help reduce your costs, you can use the Azure Advisor features by choosing **Advisor recommendations**. After you analyze your current costs and review the recommendations, you can determine your options for improving your workload performance.

Stage 4: Monitor your workloads

You can use Azure Monitor to capture health and performance information from your Azure virtual machines. Install the Azure Monitor Logs (formerly known as Log Analytics) agent on target virtual machines, and then set up alerting and reporting.

Note

You can install the Azure Monitor Logs agent on machines running Windows or Linux.

You can set up alerts based on a range of data sources:

- Specific metric values like CPU usage
- Specific text in log files
- Health metrics
- Autoscale metrics

Assess your workloads

Determine what to migrate

Migrate and modernize all your mission-critical workloads to Azure.

Scenario	Description
Windows Server workloads	• On-premises Windows virtual machines (not databases)
SQL Server workloads	• Databases and other functionality running on SQL Server virtual machines
Linux workloads	• RedHat or SUSE VMs, and Hadoop and Linux containers
ASP.NET-PHP-Java apps	• Customer-facing and internal-facing apps at the SaaS level
SAP HANA	• Enterprise resource planning with a centralized database
Specialized compute	• High-performance computing (HPC)

Things to know about migration tools and services

There are a range of tools and services that can help you plan and complete the four stages of your migration. Most migrations require several procedures and services. For some migrations, you might need only one or two services or tools.

https://learn.microsoft.com/en-us/training/modules/design-migrations/4-assess-your-premises-workloads

Service or tool	Stage(s)	Description
Service Map	*Assess*	The Service Map feature of Azure Monitor maps communication between application components on Windows or Linux. Use this feature to identify dependencies when determining what data to migrate. Service Map requires another agent to be installed on the source environment virtual machines.
Azure TCO Calculator	*Assess*	The Azure Total Cost of Ownership (TCO) Calculator estimates the cost savings you can realize by migrating your workloads to Azure.
Azure Migrate	*Assess* & *Migrate*	Azure Migrate performs assessment and migration to Azure of virtual machines (Hyper-V and VMware), cloud-based virtual machines, physical servers, databases, data, virtual desktop infrastructure, and web applications.
Data Migration Assistant (DMA)	*Assess* & *Migrate*	SQL Server Data Migration Assistant helps you upgrade to a modern data platform. It detects compatibility issues that might impact database functionality in newer versions of SQL Server or Azure SQL Database.
Database Migration Service	*Assess* & *Migrate*	The Azure Database Migration Service performs assessment and migration for several different databases, not just Azure SQL Database.
Data Migration tool	*Migrate*	The Azure Cosmos DB Data Migration tool migrates your existing databases to Azure Cosmos DB.
Microsoft Cost Management	*Optimize*	Microsoft Cost Management (formerly known as Azure Cost Management and Billing) helps you monitor, optimize, and control your ongoing Azure costs.
Advisor	*Monitor*	Azure Advisor helps optimize your Azure resources for reliability, performance, cost, security, and operational excellence.
Monitor	*Monitor*	Azure Monitor collects monitoring telemetry from both on-premises and Azure resources that help you analyze data, set up alerts, and identify problems.
Microsoft Sentinel	*Monitor*	Microsoft Sentinel provides intelligent security analytics for your applications that enable you to collect, detect, investigate, and respond to incidents.

Compare migration tools

Identify migration tools

Tool	Usage
Azure Migrate: Server Assessment	• Physical servers and on-premises VMs running in Hyper-V and VMware environments as preparation for migrating to Azure.
Azure Migrate: Server Migration	• Physical servers and on-premises VMs running in Hyper-V, VMware environments, and other public cloud VMs.
Azure Migrate: Database Assessment	• Performs an assessment of on-premises Microsoft SQL Server databases as preparation for migration to Azure SQL Database, an Azure SQL Managed Instance, or Azure VMs running Microsoft SQL Server.
Azure Migrate: Database Migration	• Migrates data from your existing on-premises databases to databases running in Azure.
Azure Migrate: Web App Assessment	• Assessment of on-premises web apps and migrates them to Azure.
Azure Migrate: Data Box	• Move of large amounts of offline data to Azure by using Azure Data Box.

https://learn.microsoft.com/en-us/training/modules/design-migrations/5-select-migration-tool

Migrate your databases

Select a database migration type

Database migrations can be performed offline and online

Migration type	Migration scenario
Offline	• Requires shutting down the server at the start of the migration. • Application downtime begins when the migration starts.
Online	• To limit downtime to the time required to cut over to the new environment when the migration completes, use an online migration. • Uses a continuous synchronization of live data, allowing a cutover to the Azure replica database at any time.

Each migration type supports different source and target database pairs

- Check for support of your migration scenario as migration tools are updated frequently

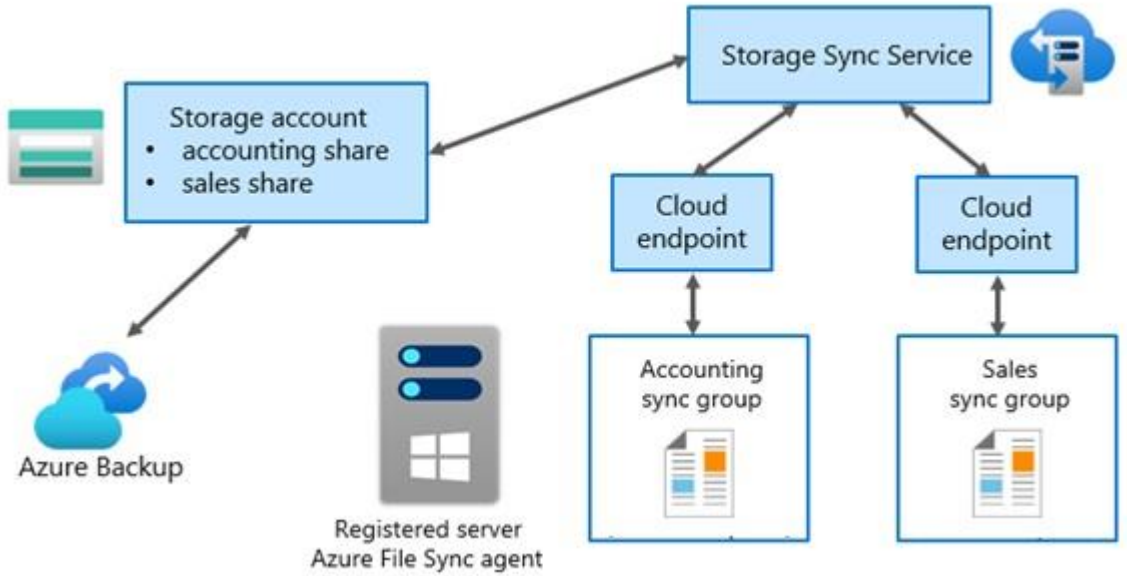
https://learn.microsoft.com/en-us/training/modules/design-migrations/6-migrate-your-databases

Select an online migration tool

Consider using Azure File Sync

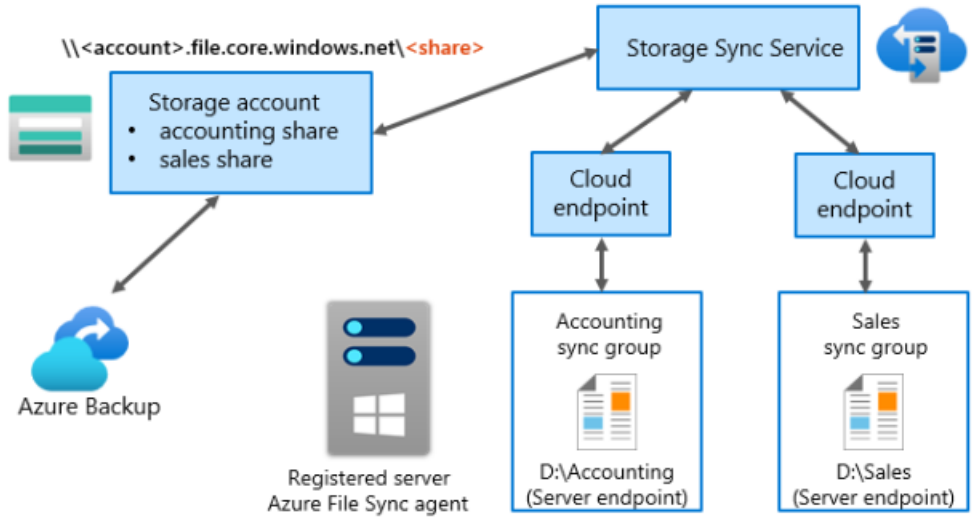
Azure File Sync can be used specifically for migration

- Works in both hybrid and cloud migrations
- Transfers both the data stream and file metadata
- Combines with other products like Azure Data Box
- Supports tiering options



Things to know about Azure File Sync

Let's take a closer look at how Azure File Sync works by using the Storage Sync Service.



- In the diagram, the server running Windows Server has the Azure File Sync agent and is registered with Azure File Sync.
- Next to this server are two sync groups: Accounting and Sales.
- The Accounting sync group has `D:\Accounting` as the server endpoint. The Sales sync group has `D:\Sales` as the server endpoint.
- Each sync group has a two-way interaction with the cloud endpoint. The server endpoint syncs its content with the cloud endpoint content. (The Azure file share is the cloud endpoint.)
- Both cloud endpoints have a two-way interaction with the same Storage Sync Service.
- Azure File Sync uses the Storage Sync Service.
- The Storage Sync Service has a two-way interaction with the Azure storage account. The cloud endpoints (Azure file shares) are created in the Azure storage account.
- The storage account has two-way interaction with Azure Backup. The Azure storage account can be backed up by using Backup.

Things to consider when using Azure Files and Azure File Sync

There are several common scenarios for working with Azure File Sync and Azure Files.

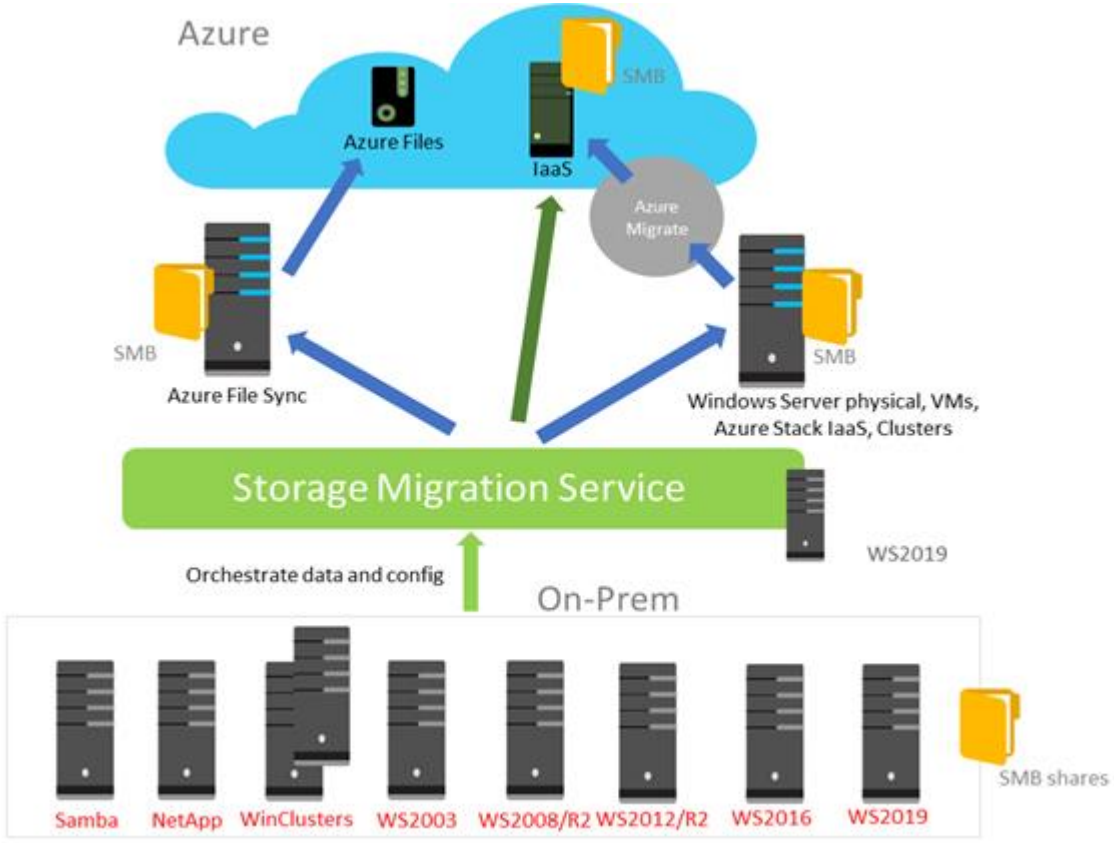
Expand table

Scenario	Description
Replace or supplement on-premises file servers	Virtually all companies use file servers. Azure Files can completely replace or supplement traditional on-premises file servers or Network Attached Storage (NAS) devices. With Azure file shares and Microsoft Entra Domain Services authentication, you can migrate data to Azure Files and utilize high availability and scalability while minimizing client changes.
Lift and shift (rehome)	Azure Files makes it easy to lift-and-shift applications that expect a file share to store application or user data to the cloud.
Backup and disaster recovery	You can use Azure file shares as storage for backups, or for disaster recovery to improve business continuity. You can use Azure file shares to back up your data from existing file servers while preserving configured Windows discretionary access control lists (ACLs). Data that's stored on Azure file shares isn't affected by disasters that might affect on-premises locations.
Azure File Sync	With Azure File Sync, Azure file shares can replicate to Windows Server, either on-premises or in the cloud, for performance and distributed caching of data where it's being used. Consider using Azure File Sync when you want to migrate shared folder content to Azure. This method is especially useful as a means for replacing the Distributed File System on your Windows Servers in your on-premises datacenters.

Consider the Storage Migration Service

Storage Migration Service migrates storage to Windows Server or to Azure.

- Inventory multiple servers and their data
- Rapidly transfer files, file shares, and security configuration from the source servers
- Optionally, cut over to the new servers.



Azure Storage Migration Service

The Azure Storage Migration Service in the Windows Admin Center is helpful when you need to move servers to newer hardware or virtual machines. You can use the Migration Service to assist with migrating your unstructured data in several ways, including:

- Conduct an inventory of your servers and their data
- Rapidly transfer files, file shares, and security configuration from the source servers
- Take over the identity of the source servers (or *cut over*)
- Manage one or multiple migrations from the Windows Admin Center interface

Migrating online on-premises unstructured data

The Azure Storage Migration Service implements three steps to move your online on-premises unstructured data:

1. **Inventory servers**: The Migration Service inventories your servers to gather information about their files and configuration.
2. **Transfer data**: The Migration Service transfers your data from the source to the destination servers.
3. **Cut over (option)**: As an option, the Migration Service cuts over to the new servers.

Things to consider when using the Migration Service

To migrate your unstructured data with the Azure Storage Migration Service, you need to prepare the following configuration:

- Select the source server or failover cluster containing the data to migrate
- Select a destination server or failover cluster to receive the migrated data
- Identify an orchestrator server to manage the migration
- Prepare your PC or server with Windows Admin Center to run the Migration Service user interface
- Satisfy requirements for security, the Migration Service proxy service, and firewall port settings

ⓘ **Important**

During migration

When you use the **cut over** option, the destination servers assume the former identities of the source servers. This option enables users and apps to access your existing data without making any changes.

After migration

When migration is complete, your source servers enter a maintenance state. While the servers are in this state, the servers still contain their original files, but the data isn't available to users and apps.

Decommision

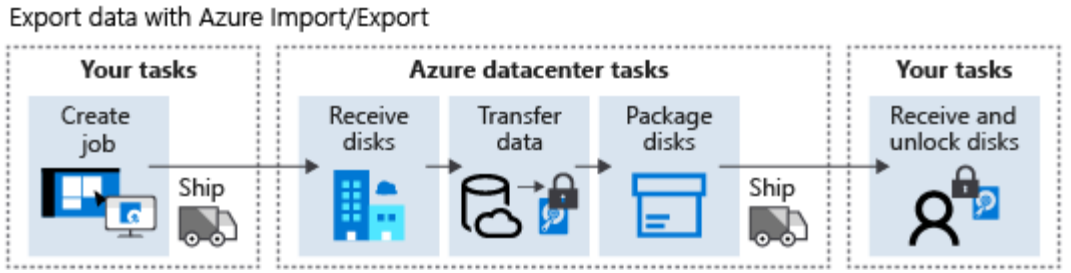
Don't remove files from your source servers until you're ready to completely decommission the servers. The decommission process can be completed at your convenience.

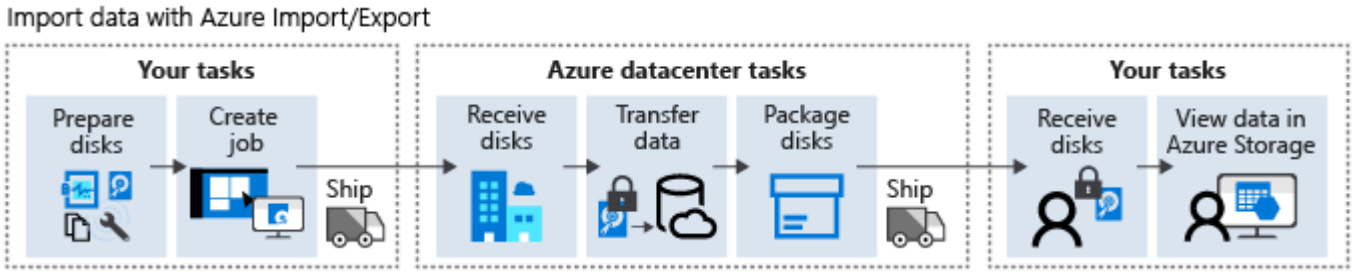
Select an offline migration tool

Consider the import/export service

Import/Export migrates on-premises locations and Azure Storage accounts.

- Migrate large amounts of data from on-premises to Azure, as a one-time task
- Back up your data on-premises in Azure Storage
- Recover large amounts of data that you previously stored in Azure Storage
- Distribute data from Azure Storage to customer site





Things to know about the Import/Export service

To use the Azure Import/Export service, you create a job that specifies the data that you want to import or export. You then prepare the disks to use to transfer the data. For an import job, you write your data to these disks and ship them to an Azure datacenter. Microsoft uploads the data for you. For an export job, you prepare a set of blank disks and ship them to an Azure datacenter. Microsoft copies the data to these disks and ships them back to you.

Here are a few more points about working with the Import/Export service:

- You can use the Azure Import/Export service to export data from Azure Blob Storage only.
- You can't export data that's stored in Azure Files.
- To use the Import/Export service, BitLocker must be enabled on the Windows system.
- You need an active shipping carrier account like FedEx or DHL for shipping drives to an Azure datacenter.
- For exporting, you need a set of disks that you can send to an Azure datacenter. The datacenter uses these disks to copy the data from Azure Storage.

Things to consider when using the Import/Export service

The Azure Import/Export service is ideal for uploading and downloading large amounts of data when the network backbone doesn't have sufficient capacity or reliability to support large-scale transfers. The Import/Export service can be helpful in other scenarios, including:

Expand table

Scenario	Description
Migration	Use the Import/Export service to migrate large amounts of data from on-premises to Azure, as a one-time task.
Backup	You can back up your data on-premises in Azure Storage with the Import/Export service.
Recovery	With the Import/Export service, you can recover large amounts of data that you previously stored in Azure Storage.
Distribution	The Import/Export service helps you distribute data from Azure Storage to customer sites.

Consider the Data Box family of products

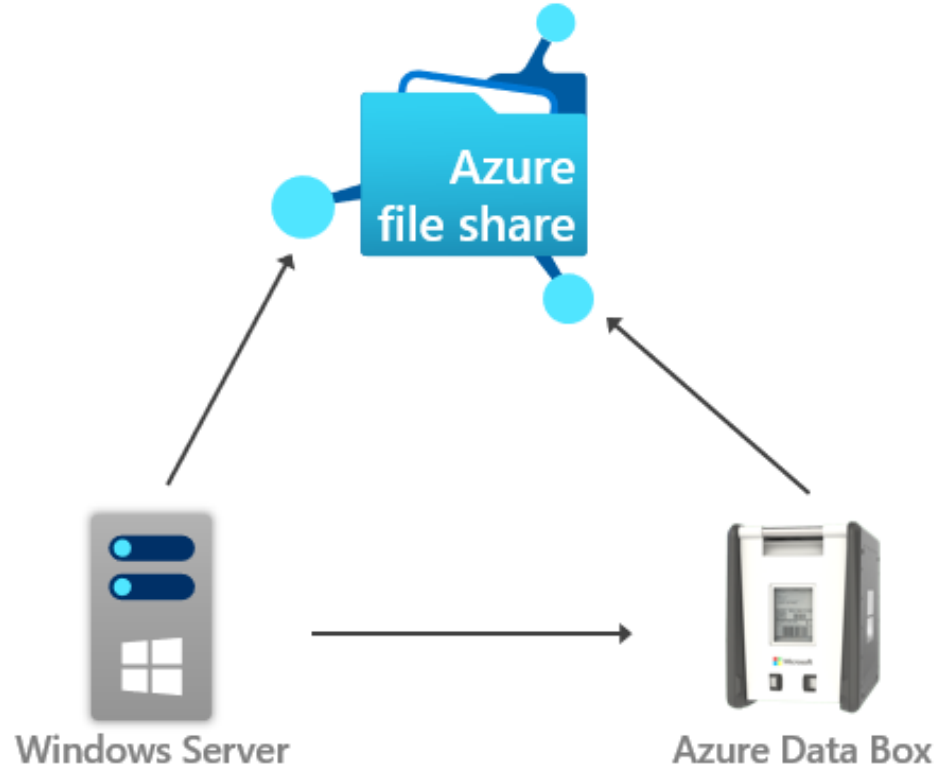
Data Box provides offline and online data transfer.

Scenarios to import data to Azure

- One time migration
- Initial bulk transfer
- Periodic uploads

Scenarios to export data from Azure

- Disaster recovery
- Security requirements
- Migrate back to on-premises or to another cloud service provider



Azure Data Box

Azure Data Box provides a quick, reliable, and inexpensive method for moving large volumes of data to Azure. By using Data Box, you can send terabytes of data into and out of Azure. The solution is based on a secure storage device that's shipped to your organization. Your Data Box can include various devices, such as disks, ruggedized server chassis, or mobile disks.

Azure offers several products to fit different scenarios: Data Box, Data Box Disk, and Data Box Heavy. The configuration process is basically the same across all the products.

After you receive your storage device, you can quickly set it up by using the local web-based management interface. If you're exporting data to Azure, copy the required data to the storage device, and then return it to Azure.

Things to know about Azure Data Box

Azure Data Box includes the following components:

- **Data Box device**: A physical device that provides primary storage, manages communication with cloud storage, and helps to ensure the security and confidentiality of all data stored on the device. The Data Box device has a usable storage capacity of 80 TB.
- **Data Box service**: An extension of the Azure portal that lets you manage a Data Box device by using a web interface that you can access from different geographical locations. Use the Data Box service to perform daily administration of your Data Box device. The service tasks include how to create and manage orders, view, and manage alerts, and manage shares.
- **Data Box local web-based user interface**: A web-based UI that's used to configure the device so it can connect to the local network, and then register the device with the Data Box service. You can also use the local web UI to shut down and restart the Data Box device, view copy logs, and contact Microsoft Support to file a service request.

Things to consider when using Azure Data Box

Data Box is ideally suited for transferring data sizes larger than 40 TBs. The service is especially useful in scenarios with limited internet connectivity. You could consider using Data Box in the following situations.

Expand table

Scenario	Description
One time migration	Use Azure Data Box to migrate a large amount of on-premises data to Azure. Move a media library from offline tapes into Azure to create an online media library. Migrate your virtual machine farm, SQL server, and applications to Azure. Move historical data to Azure for in-depth analysis and reporting by using Azure HDInsight.
Initial bulk transfer	You can perform an initial bulk transfer with Azure Data Box and follow it with incremental transfers over the network. Move large volumes of historical backup to Azure. After this data is added, you can continue to maintain the archive with incremental data transfers by network to Azure Storage.
Periodic uploads	Use Azure Data Box to move large volumes of data that's generated periodically to Azure. Move data generated by sensors from customer connected IoT devices.

Compare Azure Import/Export and Azure Data Box

The following table provides a comparison of Azure Import/Export and Azure Data Box. Think about how you can implement these services to support your migration solution for Tailwind Traders.

Expand table

Compare	Azure Import/Export	Azure Data Box
Form factor	Internal SATA HDDs or SDDs	Secure, tamper-proof, single hardware appliance
Microsoft manages shipping logistics	No	Yes
Integrates with partner products	No	Yes
Custom appliance	No	Yes

Tip

If you want to import or export more moderate volumes of data to and from Azure Blob Storage, consider using other tools like AzCopy or Azure Storage Explorer.

Compare data migration solutions

Dataset	Network bandwidth	Solution to use
Large dataset	Low-bandwidth network or direct connectivity to on-premises storage is limited by organization policies	Azure Import/Export or Data Box for export; Data Box Disk or Data Box for import where supported; otherwise use Azure Import/Export
Large dataset	High-bandwidth network: 1 gigabit per second (Gbps) - 100 Gbps	AZCopy for online transfers; or to import data, Azure Data Factory, Azure Stack Edge, or Azure Data Box Gateway
Large dataset	Moderate-bandwidth network: 100 megabits per second (Mbps) - 1 Gbps	Azure Import/Export or Azure Data Box family where it is supported
Small dataset: a few GBs to a few TBs	Low to moderate-bandwidth network: up to 1 Gbps	If transferring only a few files, use Azure Storage Explorer, Azure portal, AZCopy, or AZ CLI

Review

Discussion (activity)

What strategies or tooling would you suggest for these situations?

- Media and corporate files
- Product catalog that uses a database
- On-premises virtual machines
- On-premises NAS server
- Cloud based blob storage