Azure Migrate Preview

PREVIEW USER GUIDE FOR HYPER-V

Last Updated on: May 31, 2019

Overview

Azure Migrate helps you discover and assess your on-premise workloads for migration to Azure. The service assesses the migration suitability of on-premises machines, provides performance-based sizing, and cost estimations for running your on-premises machines in Azure. This Private Preview release of Azure Migrate is an update to the existing Azure Migrate service and enables new functionalities that are listed below.

If you have any queries or have any feedback on the preview, please reach out to azmigprv@microsoft.com. If you face any technical issue and need help, please create a support ticket using Help + Support in the Azure portal.

What's new in this Preview?

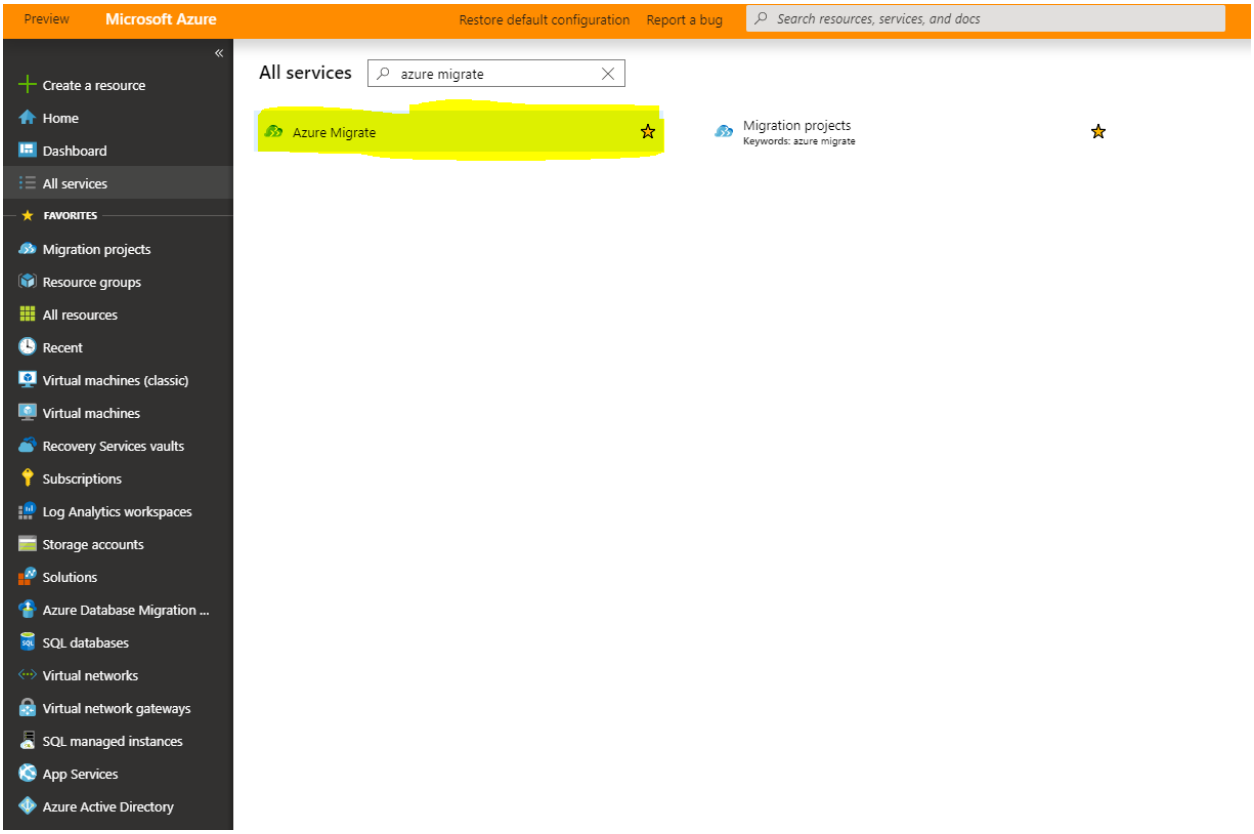
This Preview comes with the following new functionality:

1. **Enhanced assessment and migration capabilities:**
    - *Hyper-V assessments*: Get Azure suitability analysis, right-sizing recommendations and cost estimates for migration of Hyper-V virtual machines to Azure
    - Improved VMware assessment capabilities: Greater assessment scale (up to 35K VMware VMs) that can incorporate your entire datacenter
    - Agentless migration of *VMware virtual machines* to Azure
2. **Unified assessment, migration, & progress tracking -** A single centralized user experience to track your migration journey using Microsoft and ISV tools.
3. **Extensible approach with ISV integration** – Cloudamize integration with Azure Migrate to enable additional assessment capabilities

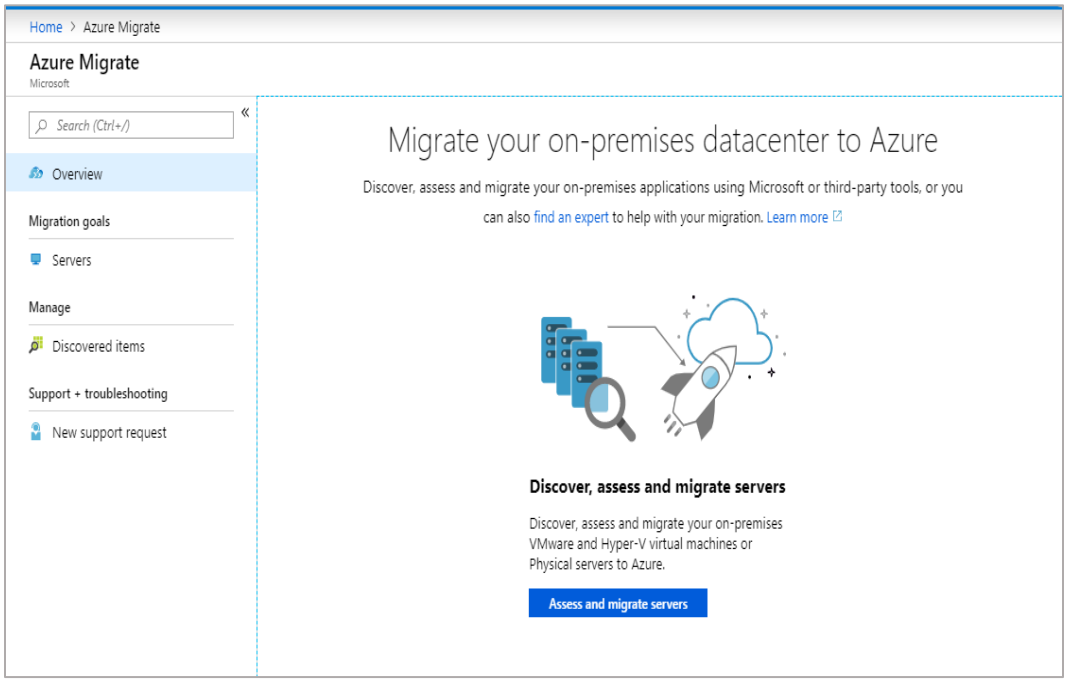
Getting started with Azure Migrate

Azure Migrate provides a one-stop, dedicated experience to track your migration journey across the phases of assessment and migration to Azure. It provides you the option to use the tools of your choice and track the progress of migration across these tools. We provide you with the ability to choose among Cloudamize and first-party tools – Azure Migrate: Server Migration (for migration) and Azure Migrate: Server Assessment (for assessment). Going forward, we would be integrating with more tools across assessment and migration.

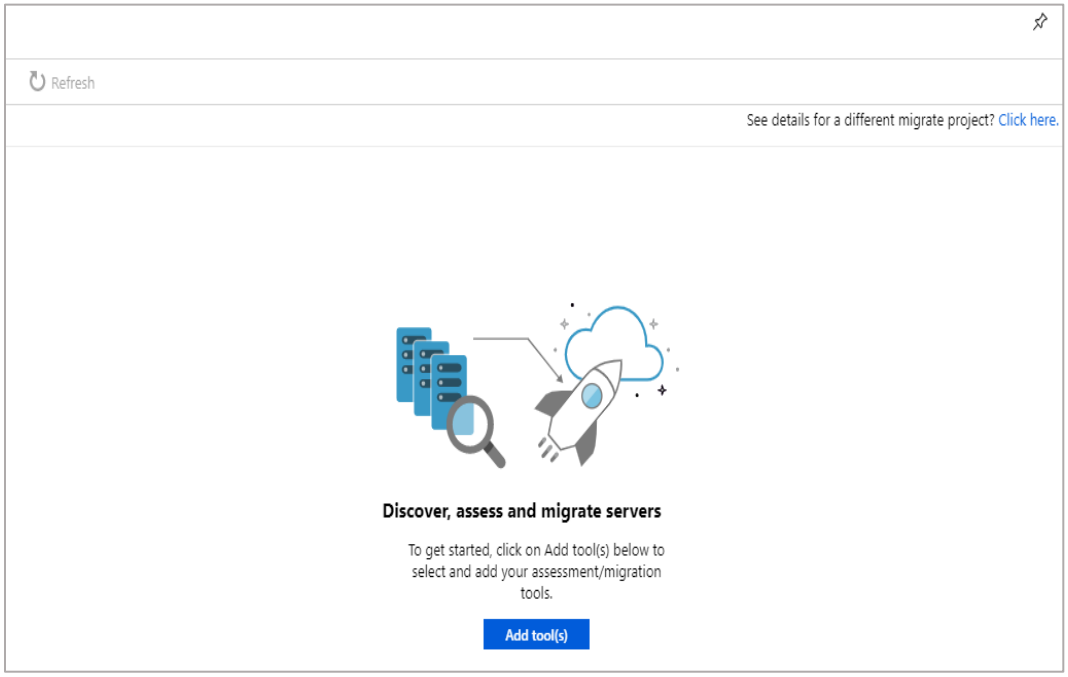
1. Go to http://aka.ms/migrate/preview to access Azure Migrate preview. Note that you can only access the preview using this special URL. Do not use this URL to access Azure Migrate migration projects that is generally available; you can go to http://portal.azure.com to access your existing migration projects.
2. Start with searching for Azure Migrate under "All Services". Select Azure Migrate to continue.



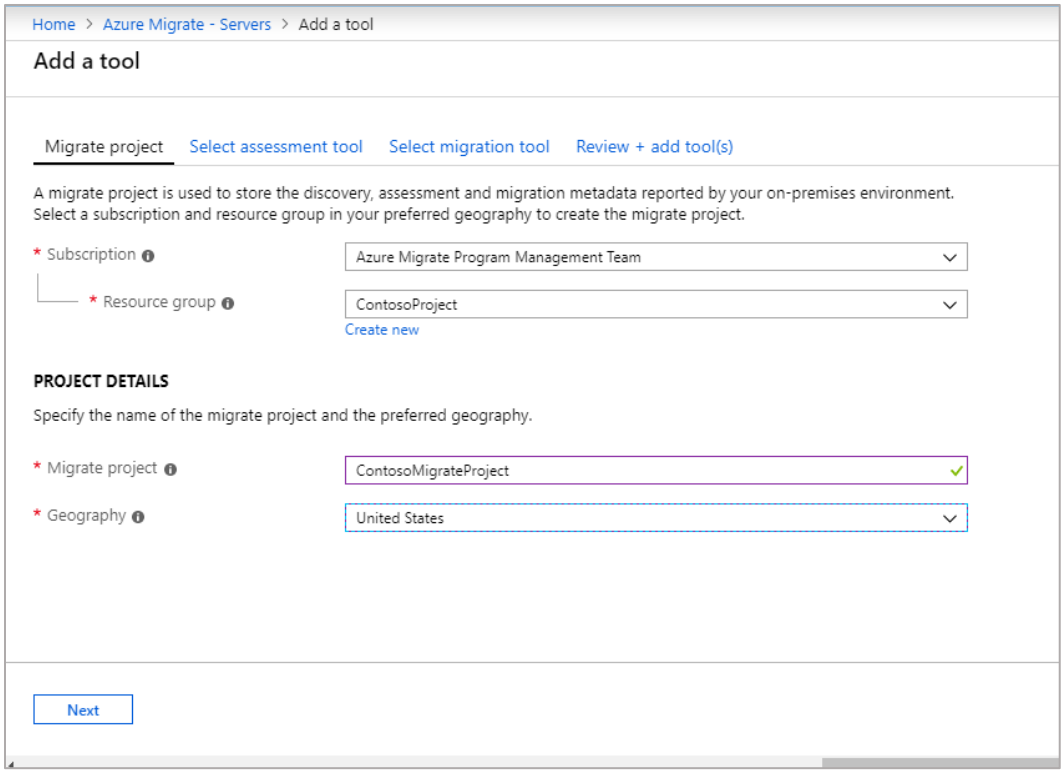
3. You now land in the "Overview" section of Azure Migrate. As shown in the screenshot below, this preview provides you the ability to discover, assess and migrate **server** workloads. Going forward, we will be introducing more such journeys starting with **database** assessment and migration.



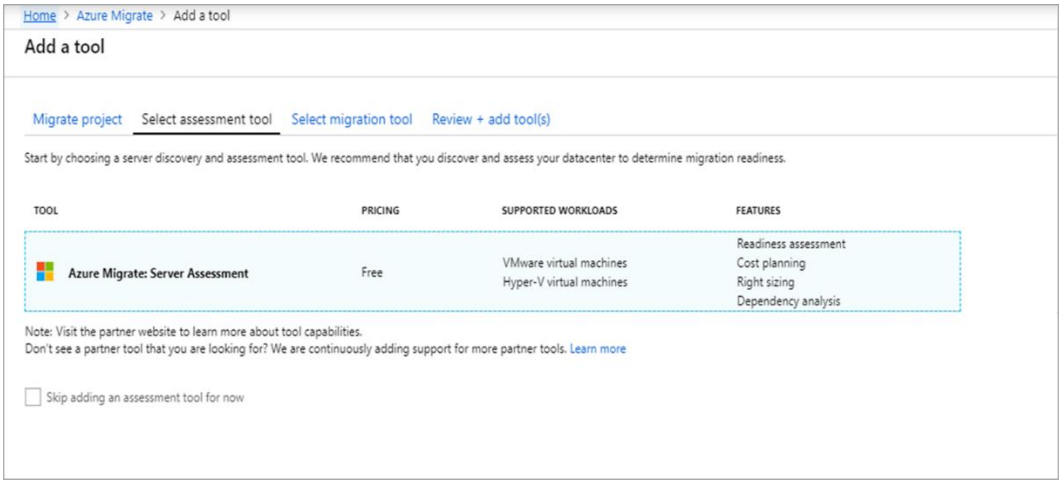
4. Click **Assess and migrate servers** to get started with server assessment and migration. Click on **Add Tools** to get started with selecting tools and creating a migrate project.



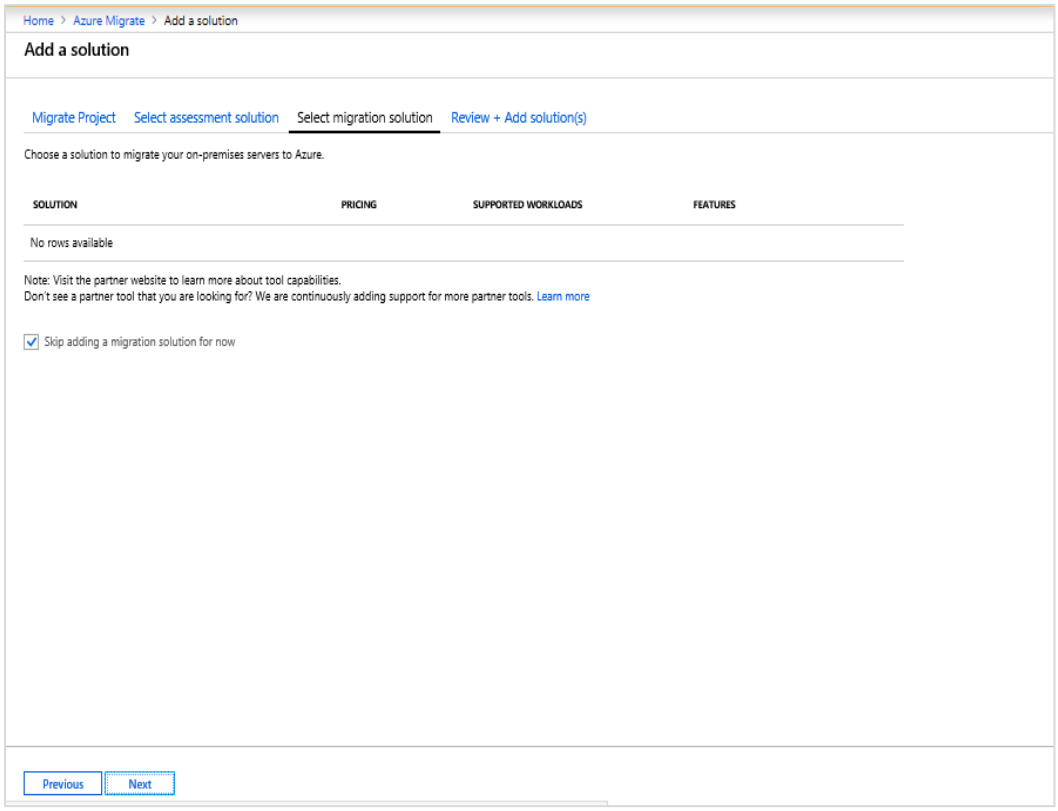
5. **Migrate project** is used to store the discovery, assessment and migration metadata reported by your on-premises environment. Specify the subscription and resource group along with the project name and geography where the **Migrate project** needs to be created. Click on “Next” to continue.



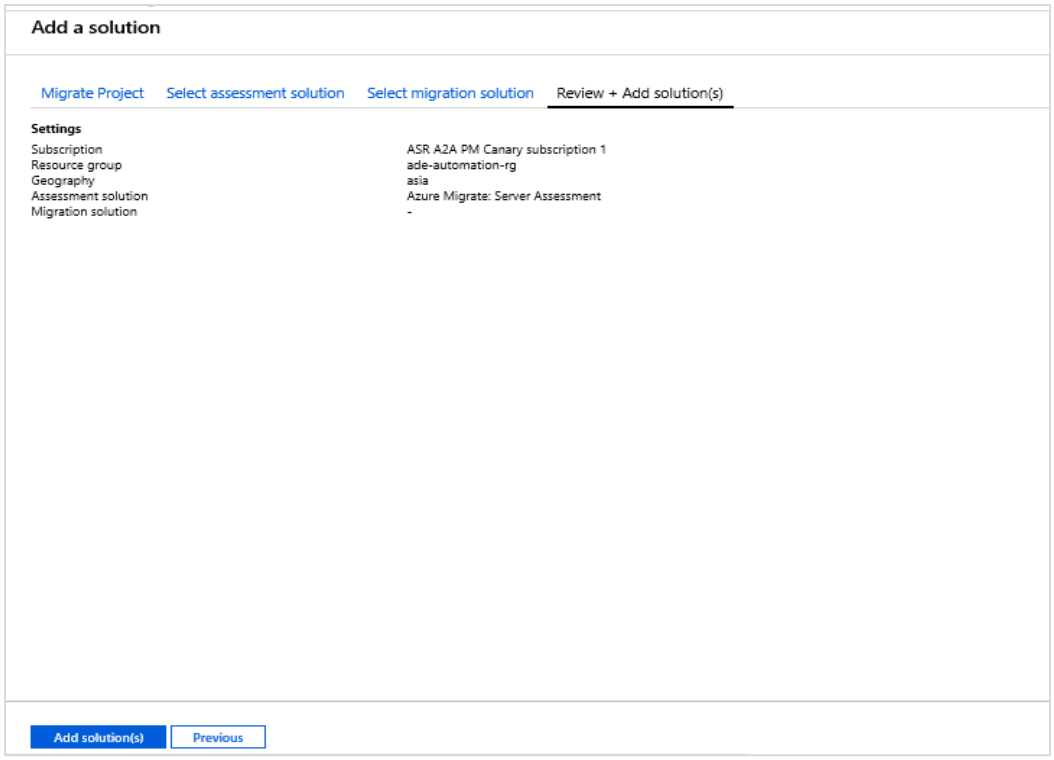
6. If you are planning to perform assessment of your on-premises VMware or Hyper-V environments to get a cost estimation and to determine readiness of migrating your server workloads to Azure, select “Azure Migrate: Server Assessment” tool and click on “Next” to continue.



7. Currently, we don’t have the Azure Migrate: Server Migration tool integrated. For now, select “Skip adding an assessment tool for now” if is not already selected and click on “Next”.

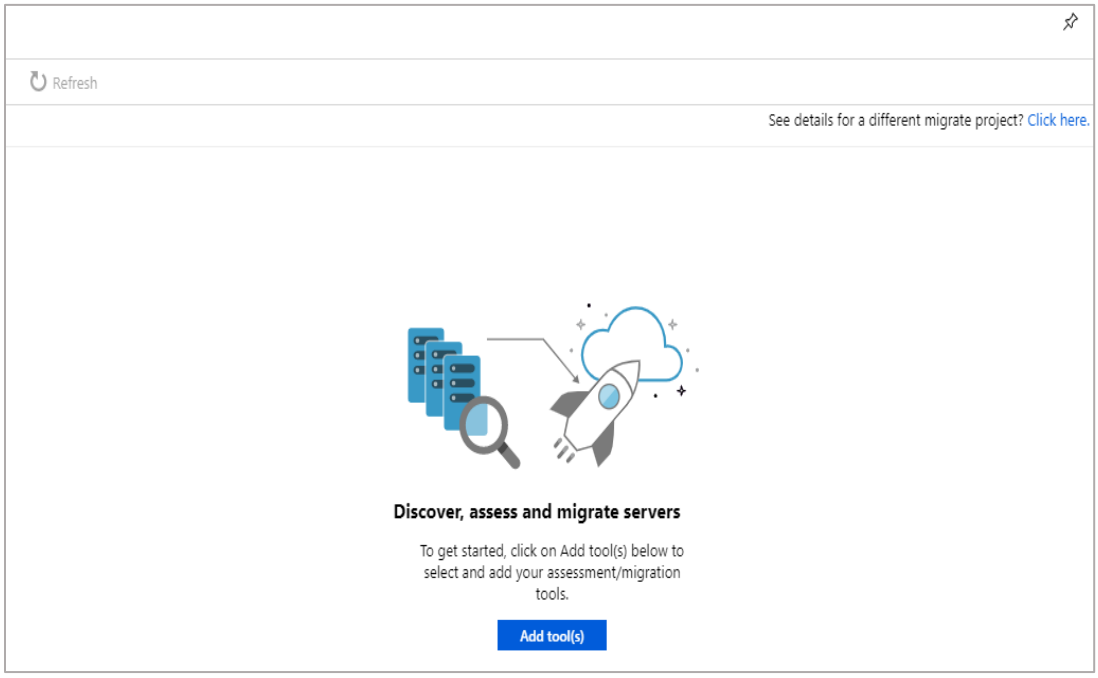


8. Review the selected configuration and click on “Add a solution”. This will kick off a job to create a migrate project and register the selected solutions to it.

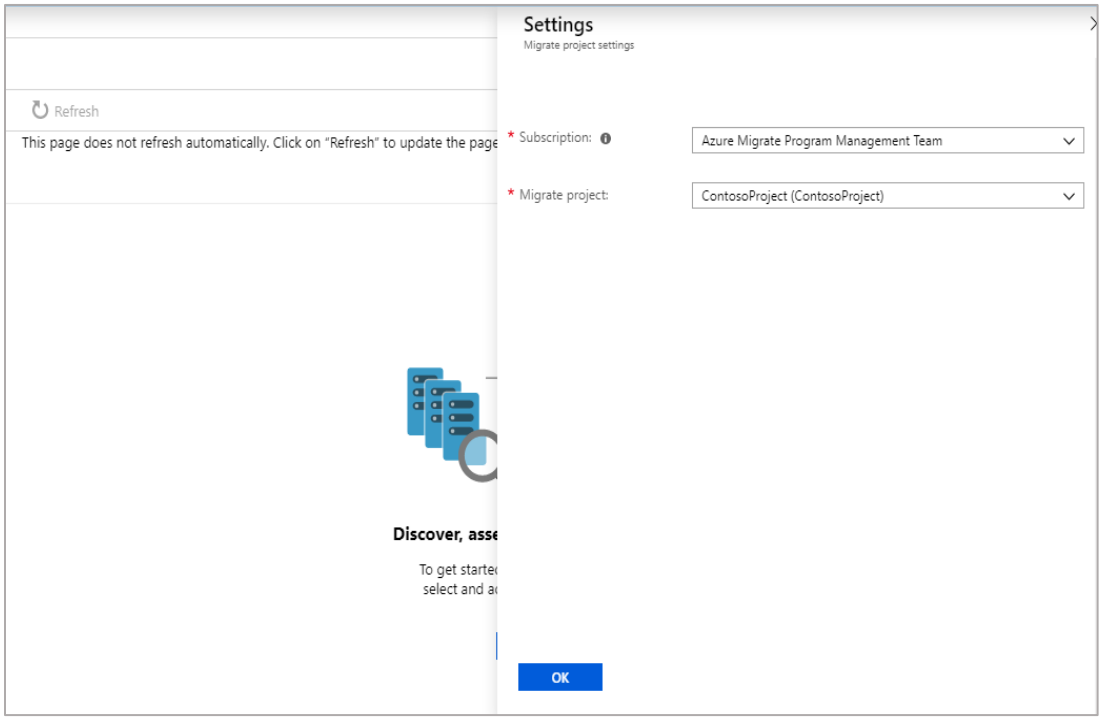


Tracking your migration

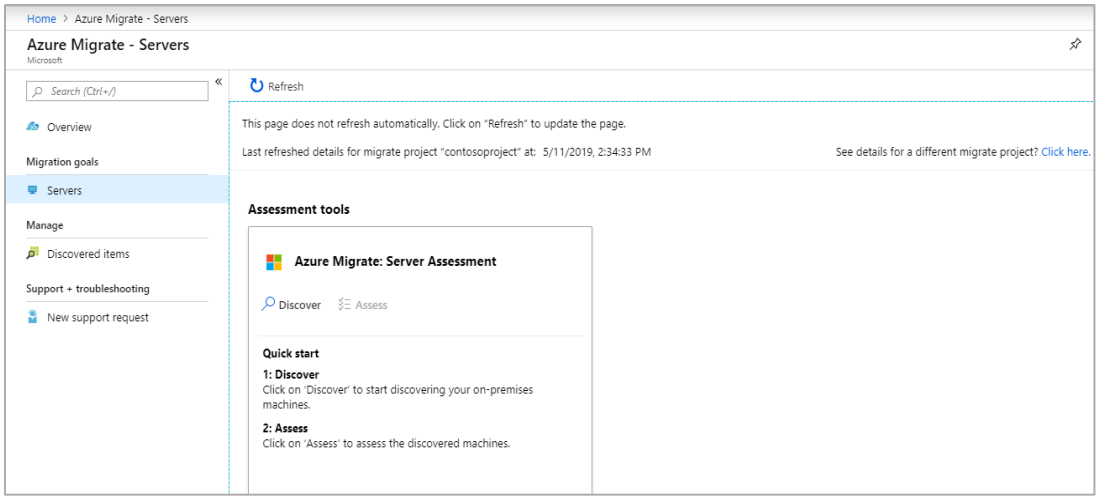
1. After the migrate project has been created, go to the “Table of Content” and click “Servers”. Click on “See details for a different migrate project? Click here”.



2. Choose the subscription and migrate project that got created.



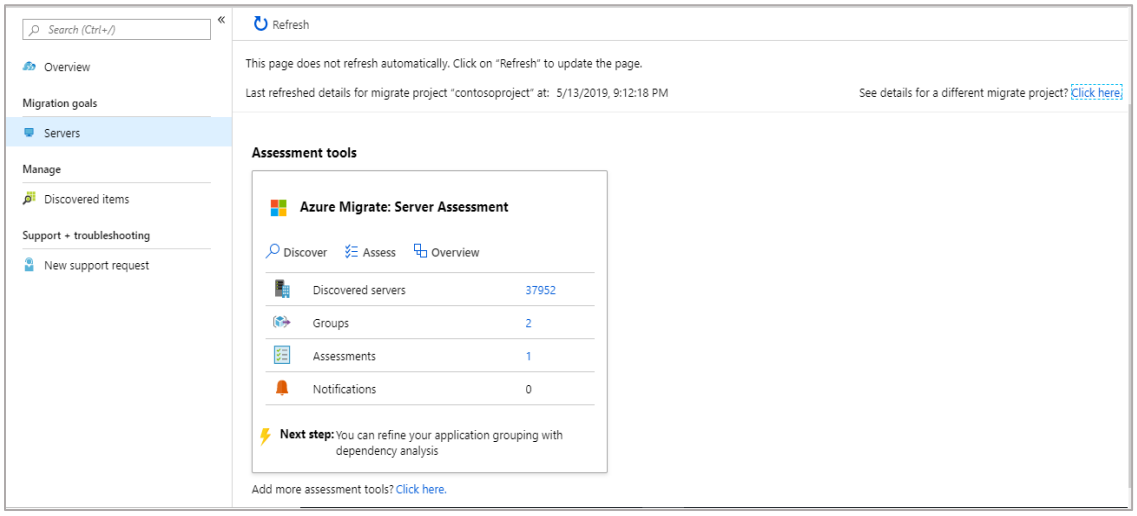
3. You will be able to see the selected tools as shown below.



4. Start with discovering your on-premises environment followed by creating an assessment (Use Section: "Pre-requisites" for your reference on using Azure Migrate: Server Assessment to discover and assess your on-premises environment). After you trigger discovery and complete

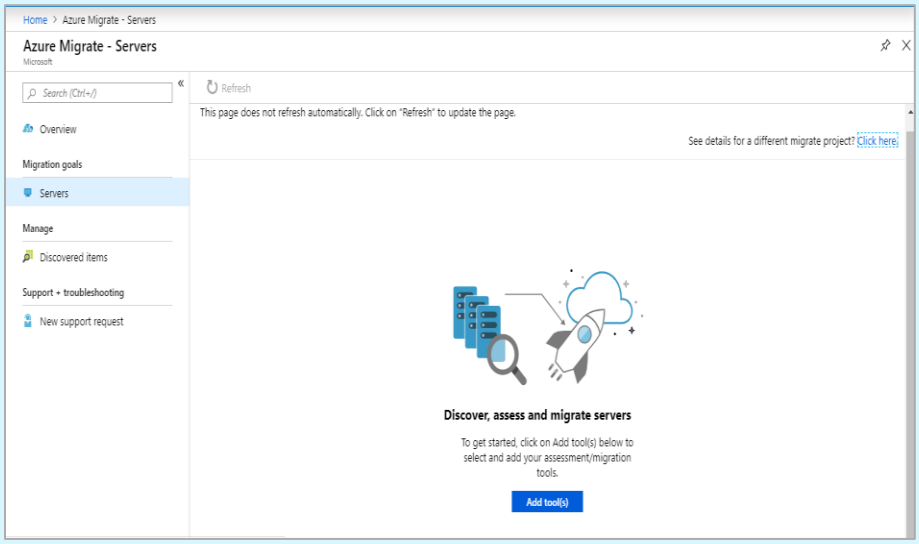
your assessment, you will be able to see assessment related metadata appearing against your solution for tracking.

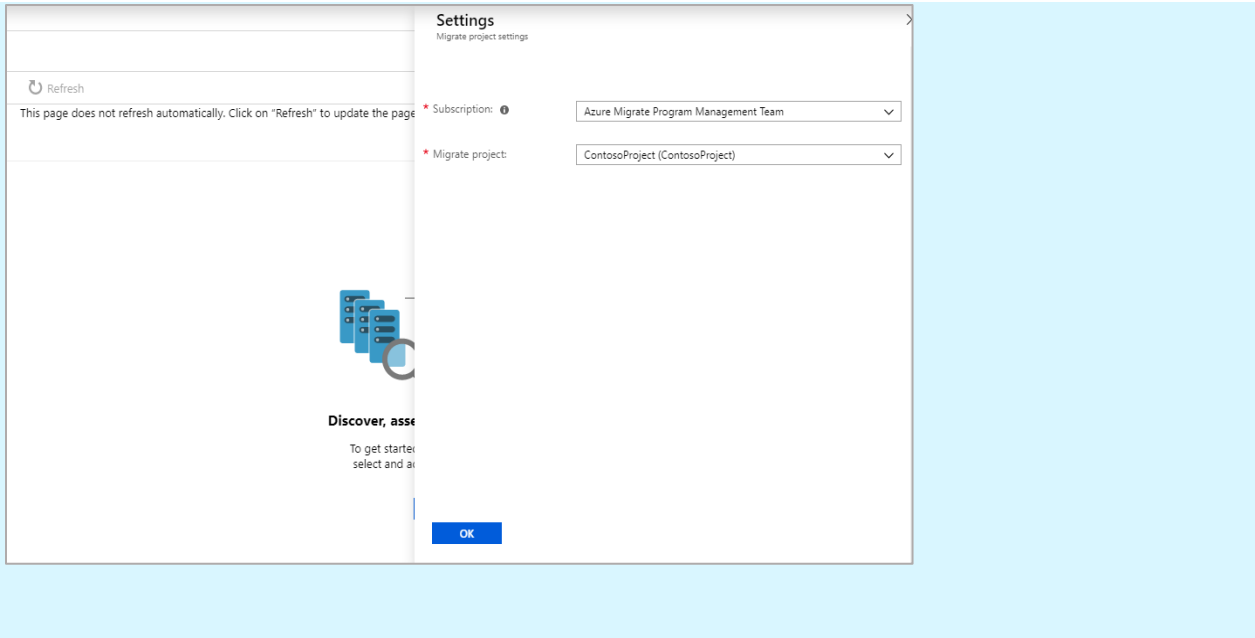
Note: Use the "Refresh" button on the command bar of the servers page to see updated values for the various values within the tools.



Note

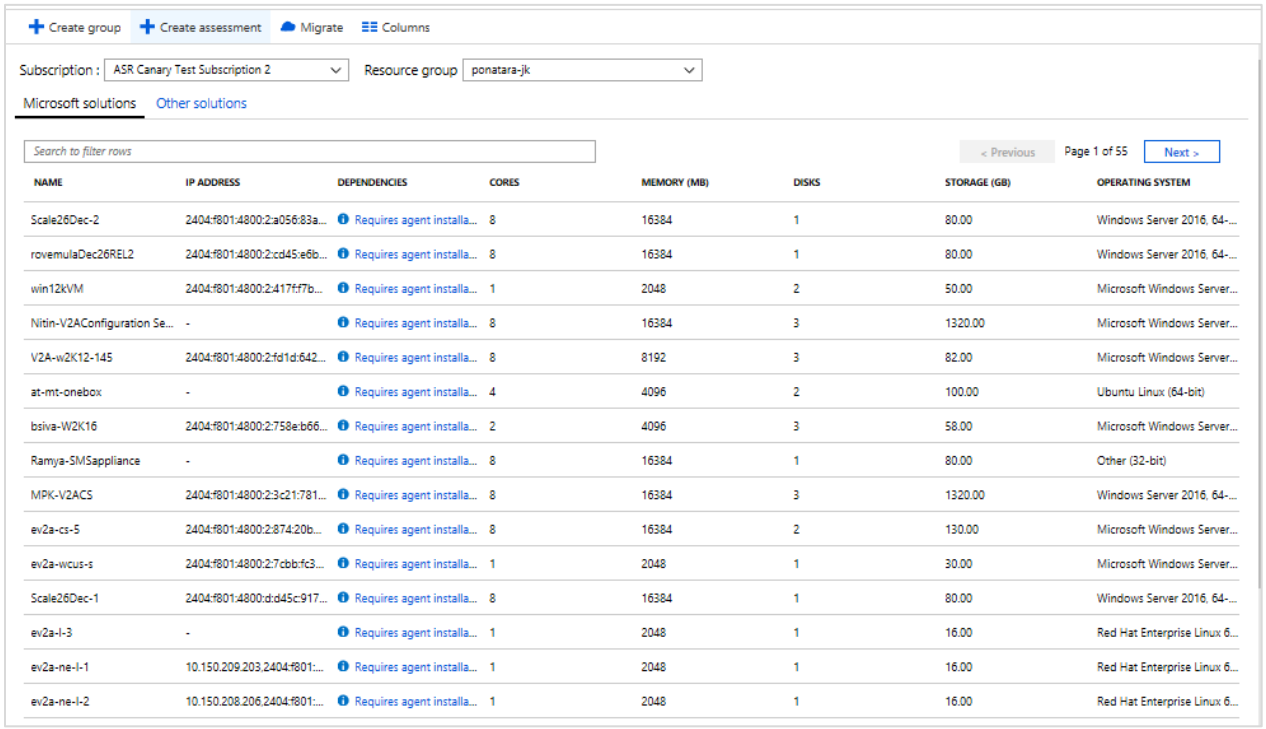
If you have an existing project and want to use it, Click on "See details for a different migrate project" and choose the subscription and migrate project (Migrate project name would be that of the Resource group specified during project creation).





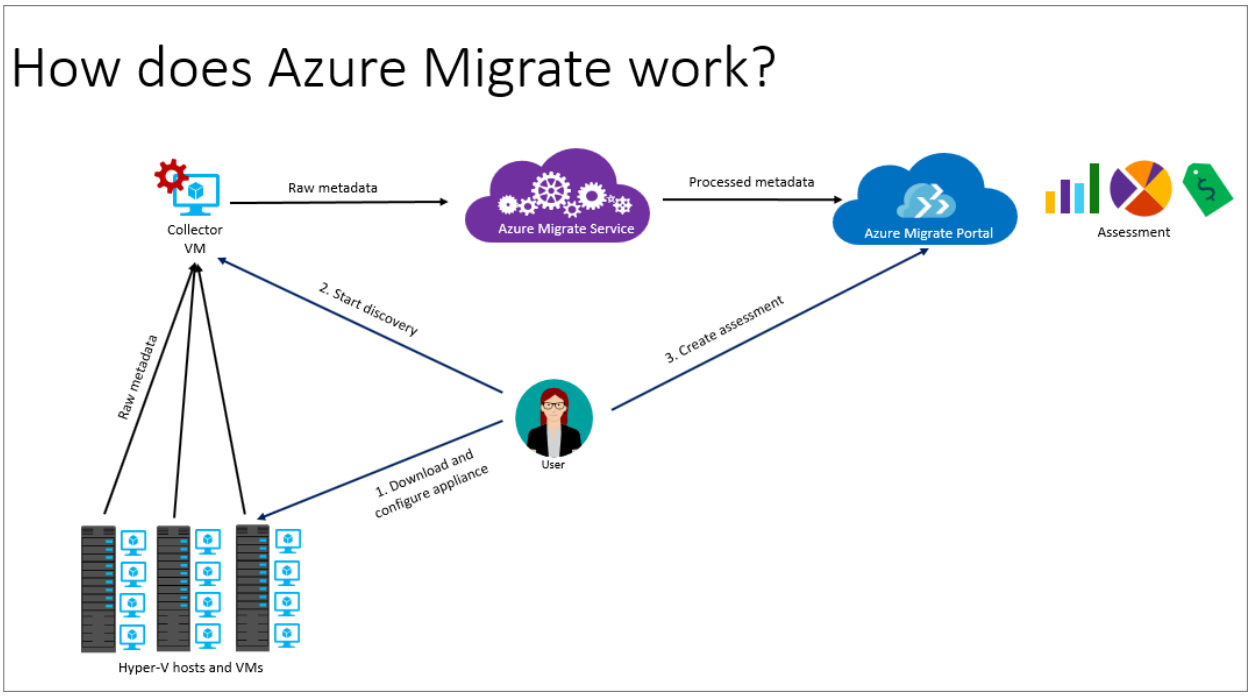
Review discovered Items

1. Discovered items gives you a list of the server inventory discovered by the selected tools along with properties of the discovered items. Server inventory discovered by third-party tools like Cloudamize are available under “Other solutions”. Select the subscription and resource group of your migrate project to see the server inventory.



How does Azure Migrate: Server Assessment work?

1. Azure Migrate: Server Assessment uses an on-premises VM called the Azure Migrate appliance to discover information about your on-premises machines. To create the Azure Migrate appliance, you download a VM available in a compressed format and import it as a VM on your on-premises Hyper-V host.
2. You connect to the VM, specify a new password for the administrator user and initiate discovery using the discovery web wizard on the VM. In the discovery wizard, you can provide a list of hosts or clusters from which to discover VMs. If you provide a host that is part a cluster, Azure Migrate: Server Assessment determines the cluster and ensures all the hosts in the cluster are added for discovery.
3. The Azure Migrate appliance is always connected to the Azure Migrate: Server Assessment service and continuously sends configuration and performance data of the VMs discovered on the added hosts and clusters.
4. Discovery is agentless and doesn't install anything on Hyper-V hosts or VMs. The appliance uses CIM sessions to connect to Hyper-V hosts / clusters and collects VM information from the hosts.
5. Once the discovery is done, you can create groups of VMs that you plan to migrate together and assess these for suitability, sizing and cost estimation.



Appliance connection and port details

Connection source	Connection destination	Port details	Connection usage
Azure Migrate appliance	Azure Migrate: Server Assessment Service	TCP 443 at destination	This connection is used to send discovered configuration and performance data
Azure Migrate appliance	Hyper-V host or cluster	Default WinRM ports at destination. Port 5985 for HTTP, and port 5986 for HTTPS	This connection is used to communicate with the Hyper-V host to pull configuration and performance data; a CIM session is used for this connection.
RDP client	Azure Migrate appliance	TCP 3389 at destination	This is useful to connect to the appliance via remote desktop if you wish to kick off the discovery from the appliance

Limitations

- This Private Preview supports discovery of up to 10000 Hyper-V VMs in a single project. A single appliance supports discovery of up to 5000 Hyper-V VMs from up to 300 Hyper-V hosts. This limit is apart from the 35000 VMware VMs you can discover in the same project.
- This preview is available only in the Central US region. However, this does not restrict your ability to create assessments for other target Azure locations. Note that only the collected metadata is stored in this region. If you use dependency visualization by creating a new Log Analytics workspace, the workspace is created in the same region as the project.
- Azure Migrate: Server Assessment supports only managed disks.
- If you use Hyper-V Replica (or a set up that has multiple VMs with the same VM identifiers) and discover both the original and replicated VMs using Azure Migrate, the assessment generated by Azure Migrate may not be accurate. This gap will be addressed in upcoming releases.

Set up Azure Migrate: Server Assessment

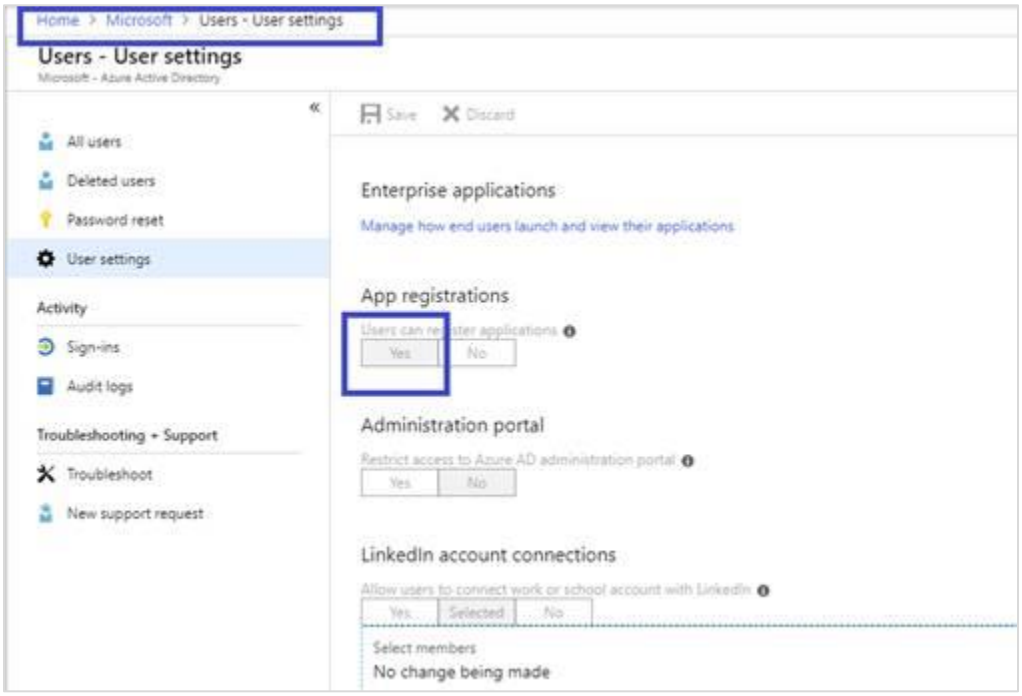
In this section, you will learn about how you can discover and assess a Hyper-V environment.

Prerequisites

- **Azure subscription**: To get started with Azure Migrate: Server Assessment, you need a Microsoft Azure account. If you do not have an Azure account, you can start with a free trial.
- **Azure user privileges:** You will be required to log in to Azure when setting up the appliance. The Azure user used requires the following permissions.
  Permission to register subscription with Azure Migrate resource providers: It is required the user has at least Contributor role at subscription level. This permission is required to be able to create Azure resources necessary to set up Azure Migrate in your subscription.

Permission to create Azure Active Directory (AAD) apps: Azure Migrate creates two AAD applications. One app is used for communication between Azure Migrate agents on the appliance and Azure Migrate services; this app is used purely for identity purposes. The other app is used by the appliance to create an Azure Key Vault. The key vault is created to hold AAD app information, Azure Migrate appliance configuration and to persist certain appliance related details. Both the AAD apps have no Azure RBAC configured.
This privilege can be obtained using one of the two methods below. Note that this privilege is required only at the time of setting up discovery for the appliance and can be revoked once discovery is set up.

- Privilege to register applications is to be granted by the tenant / global admin. Below is a screenshot on how the admin can grant it by navigating to User settings section under Azure Active Directory. You can be assured that this is not a sensitive privilege, as is documented here.

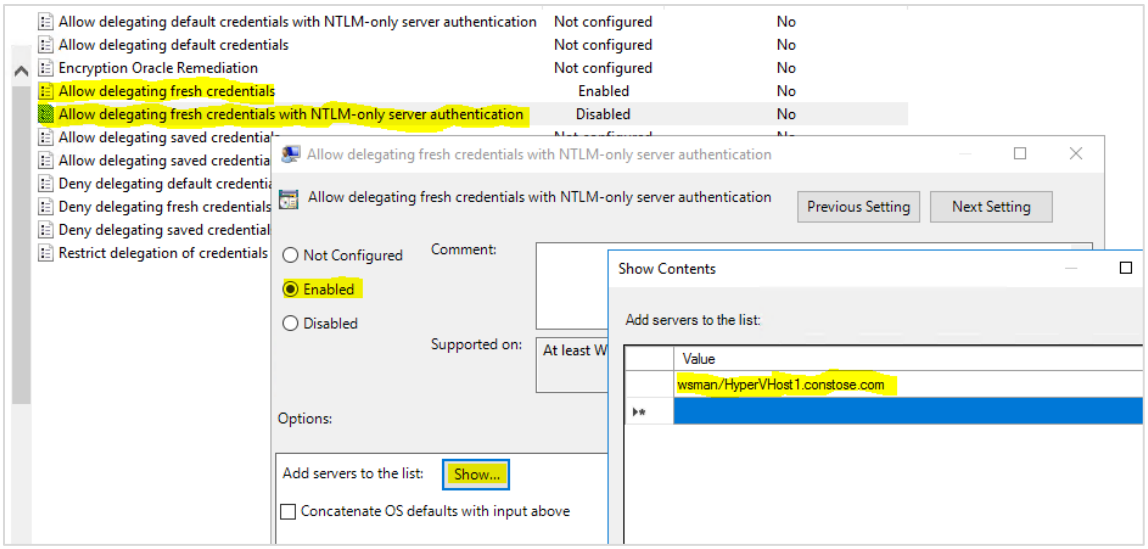


- Alternately, you can assign an Application Developer role to your Azure user account; this will enable your account to create AAD apps. Your tenant admin should have the privileges to assign this role. Refer to this documentation for guidance on how roles can be assigned.

- **Hyper-V host requirements**: The VMs that you plan to assess must be set up on host OS of Windows Server 2012 R2 or Windows Server 2016.
  - *Required credentials on discovered hosts*: Create a domain user or a local user with administrator privileges on the hosts and clusters running the VMs you wish to discover. This is to enable the Azure Migrate: Server Assessment VMs discover the on-premises VMs. Note that a single credential is required for all the hosts and clusters you wish to discover.
  - Enable Powershell Remoting on all hosts by running the following command in a power shell console as Administrator.
    "Enable-PSRemoting –force"

- **Hyper-V host for appliance:** The VM appliance can be set up on a host running Windows Server 2012 R2 or above. The appliance VM provided is Hyper-V VM version 5.0. You need permissions to import a VM on this host. Ensure you have sufficient capacity to allocate 16 GB RAM, 4 virtual processors and 1 external virtual switch for this VM. It is required that the appliance VM has a static or a dynamic IP and is able to access the internet.
- **Integration Services enabled on VMs to be discovered:** Ensure Hyper-V Integration Services is enabled and current on the virtual machines. This is necessary to ensure Azure Migrate: Server Assessment is able to capture the OS information of the virtual machines.
- **Enable CredSSP authentication on the appliance:** Note that this is only required if there are VHDs on SMB in your on-premises environment. To capture all necessary information of the discovered servers, it is required you enable delegation of credentials from the appliance to the Hyper-V hosts being discovered. Use the following steps to set up this delegation:
    - Run the following command on the appliance; HyperVHost1.contoso.com and HyperVHost2.contoso.com are used as sample host names in this command. "*Enable-WSManCredSSP -Role Client -DelegateComputer HyperVHost1.contoso.com HyperVHost2.contoso.com -Force*"
    - On the appliance, open 'Local Group Policy Editor'
        - Click Computer Configuration > Administrative Templates > System > Credentials Delegation > Allow Delegating Fresh Credentials. Enable the option to "Allow delegating fresh credentials". In the Options section, add each Hyper-V host to discover with "wsman/" as prefix as shown in the image below
        - Click Computer Configuration > Administrative Templates > System > Credentials Delegation > Allow Delegating Fresh Credentials. Enable the option to "Allow delegating fresh credentials with NTLM-only server authentication". In the Options section, add each Hyper-V host to discover with "wsman/" as prefix as shown in the image below
    - On every Hyper-V host to be discovered, run the following command. "Enable-WSManCredSSP -Role Server -Force"
      For your convenience, you may opt to run the command remotely on all Hyper-V hosts.

  If you have added clusters for discovery, new hosts added to the cluster will automatically be added for discoery by Azure Migrate: Server Assessment. Please ensure CredSSP authentication is in place for the newly added hosts

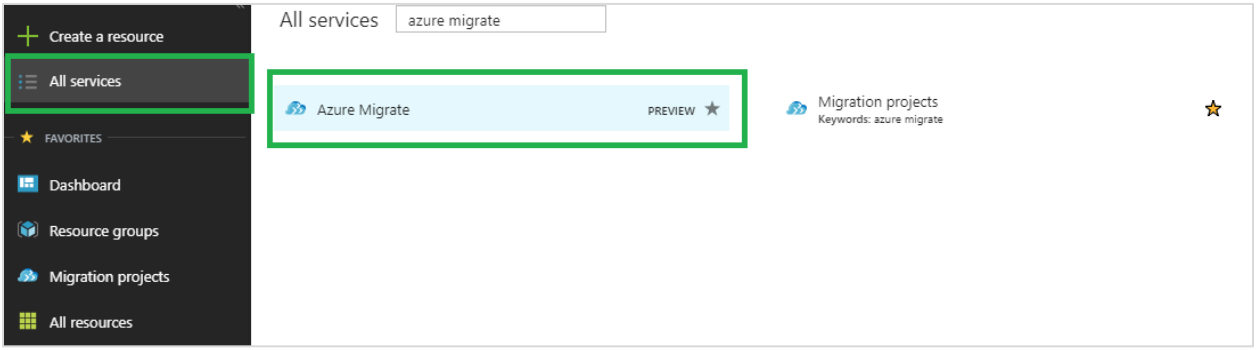


- **Whitelisting URLs for internet connection:** The Azure Migrate appliance needs connectivity to the internet to be able to discover VMs. The connectivity check to internet is validated by connecting to a list of URLs as given in the following table. If you are using any URL-based firewall proxy to control outbound connectivity, be sure to whitelist these required URLs:

URL	**Whitelisting required for**
*.portal.azure.com	Navigation to Azure Migrate portal
*.windows.net *.microsoftonline.com	Logging in to Azure. Creation of Active Directory application and Service Principal objects for agent to service communication
management.azure.com	Communication with Azure Resource Manager to set up the necessary Azure Migrate: Server Assessment artifacts
dc.services.visualstudio.com	Uploading application logs used for internal monitoring
*.vault.azure.net	Persisting secrets used for communication between agent and service

Access Azure Migrate in Azure portal

9. Log in to the special Azure portal using the link: http://aka.ms/migrate/preview. Note this URL is only applicable to the private preview. Do not use this URL to access Azure Migrate migration projects that is generally available; go to http://portal.azure.com to access your existing migration projects.
10. In the special Azure portal, click **All services.**
11. Search for **Azure Migrate** and select the service **Azure Migrate** marked as **Preview** in the search results.
12. This will take you to the new Azure Migrate dashboard.



Plan your appliance set up

Based on the number of VMs you are planning to discover, you can create multiple projects and deploy multiple appliances in your environment. A single appliance can be connected to a single project and can discover up to 5000 machines from up to 300 Hyper-V hosts.

Plan your discoveries and assessments based on the following limits:

Entity	Machine limit
Project	10000 Hyper-V VMs You can discover 35000 VMware VMs in addition to the Hyper-V VMs in the same project
Appliance	5000 Hyper-V VMs from up to 300 Hyper-V hosts
Group	35000 VMs These VMs can be a mix of VMware and Hyper-V servers
Assessment	35000 VMs These VMs can be a mix of VMware and Hyper-V servers

Keep these planning considerations in mind:

- When you do a discovery by using the Azure Migrate appliance, you have to provide information on the underlying Hyper-V hosts.
- You will need one Azure Migrate appliance for every 5000 VMs you want to discover.
- You will need one Azure Migrate appliance for every 300 hosts you want to discover. The total no. of discovered VMs supported across appliances is 10000; you can discover any no. of Hyper-V hosts by deploying an appliance for every 300 hosts.

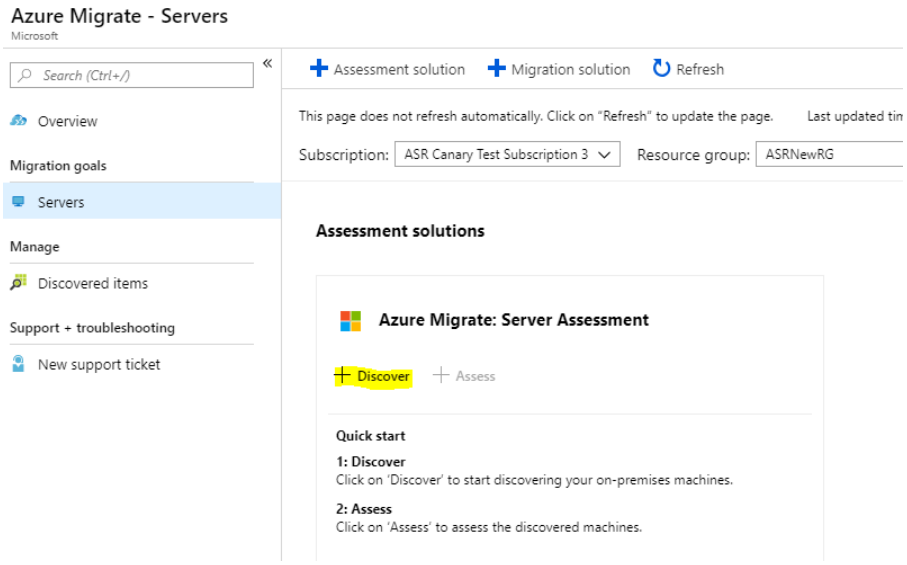
- Note that you can discover both VMware and Hyper-V VMs in a single Azure Migrate project.

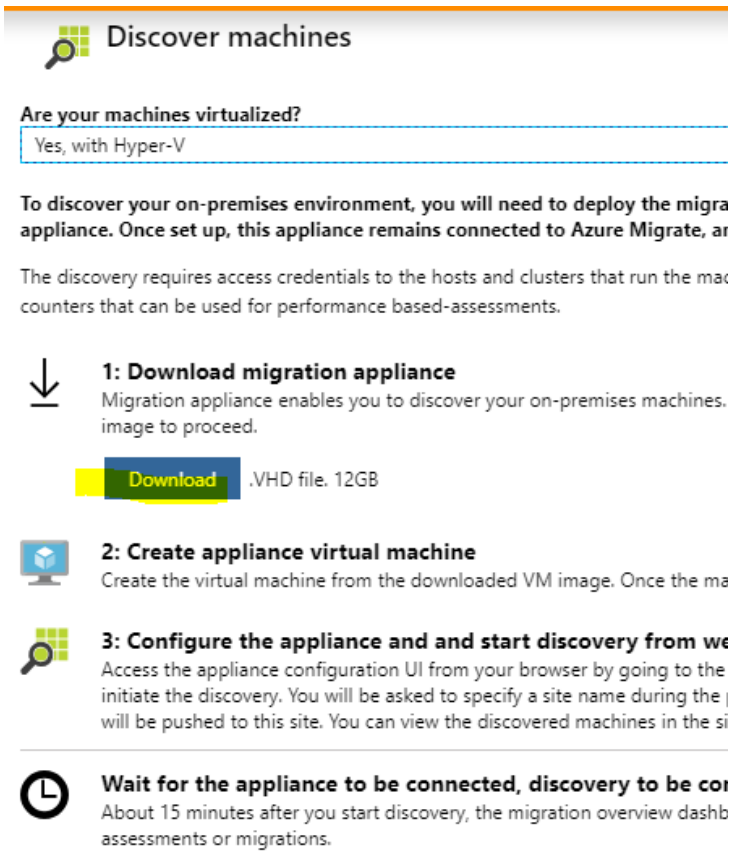
Discover Hyper-V VMs

Azure Migrate uses a virtual appliance, called Azure Migrate appliance, to discover the on-premises Hyper-V environment. To set up the appliance, you need to download a VM available in a compressed format and import it on a Hyper-V host to create a VM.

Download the Azure Migrate appliance

1. In the Azure Migrate dashboard, in the context of the **Azure Migrate: Server Assessment** solution click on +**Discover** option.
2. In the Discover machines page, in the **Are your machines virtualized?** dropdown, specify **Yes, with Hyper-V**
3. Click **Download** to download the appliance.





Verify the Azure Migrate appliance

Ensure that zipped file containing the appliance is secure before you deploy it.

1. On the machine to which you downloaded the file, open an administrator command window.
2. Run the following command to generate the hash for the OVA. The generated hash should match the values provided below
   - `C:\>CertUtil -HashFile <file_location> [Hashing Algorithm]`
   - Example usage: `C:\>CertUtil -HashFile C:\AzureMigrate\AzureMigrate.ova SHA256`

Appliance version 1.0.8.215

Algorithm	Hash value
SHA256	874d47132cc386c04b361917a7ab07b0cc5f35e8b2f9a08cb46908247c537608

Appliance version 1.0.8.218

Algorithm	Hash value
SHA256	a7ccd7c931f66ea1cff1fbd62364fd2c47f44cb575e2a9f02a18d78cfd57c661

Appliance version 1.0.8.219

Algorithm	Hash value
SHA256	560926686095b38849e7a06af6c0d4bee1a03628475bd54faf610cc6feac5ed2

Appliance version 1.19.04.16

Algorithm	Hash value
SHA256	35e6839c185884e556fdda051015bc62a00b4b77837153e919432beb5bcfdf02

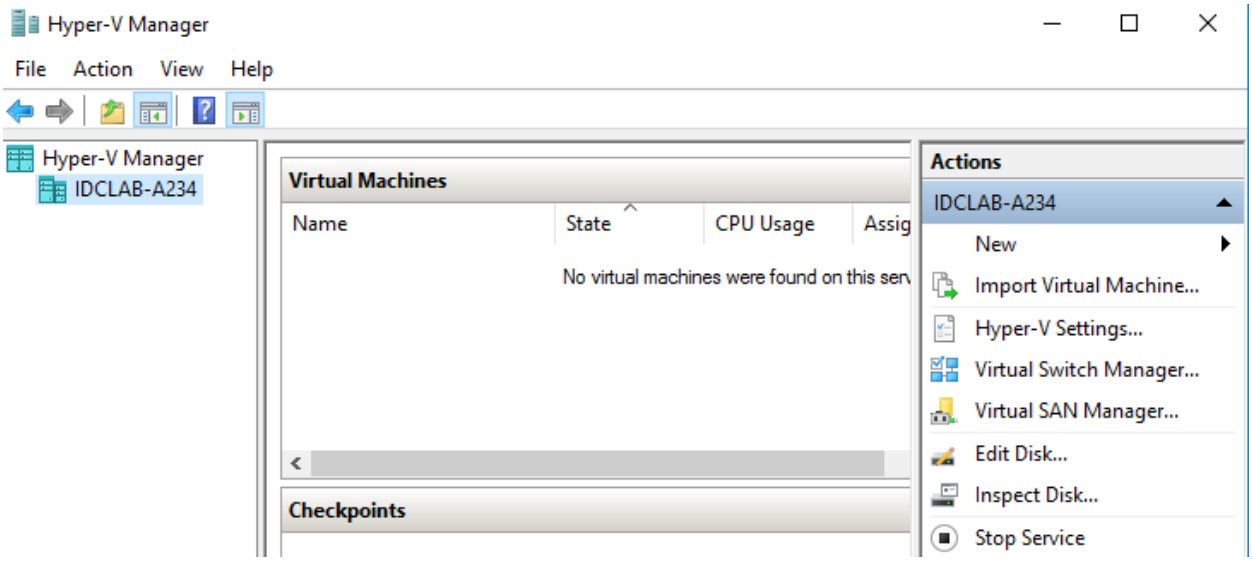
Appliance version 1.19.05.10

Algorithm	Hash value
SHA256	598d2e286f9c972bb7f7382885e79e768eddedfe8a3d3460d6b8a775af7d7f79

Create the Azure Migrate appliance VM

Import the downloaded file to the Hyper-V host to create a VM from it.

1. Extract the downloaded .zip file to a folder on the Hyper-V host where you will be setting up the appliance. This folder will have three folders in it.
2. Open Hyper-V Manager. In **Actions** pane on the right, click **Import Virtual Machine**



3. In the Import Virtual Machine Wizard, on the 'Before You Begin' page, click **Next**.
4. On Locate Folder page, specify the folder where you extracted the downloaded VM. Click **Next**.
5. On Select Virtual Machine page, click **Next**
6. On Choose Import Type page, choose **Copy the virtual machine (create a new unique ID).** Click **Next**
7. In Choose Destination page, retain the defaults or override as you prefer. Click **Next**.
8. In Choose Storage Folders page, retain the defaults or override as you prefer. Click **Next**.
9. In Choose Network page, specify the virtual switch you want the VM to use. Ensure that this switch has internet access. Click **Next**.
10. On Summary page, click **Finish.** The import operation will take a few minutes to finish. Once done, move to the next step.
11. In Hyper-V Manager, in the Virtual Machines pane, start the virtual machine.

Start discovery

The Azure Migrate appliance is a connected appliance and will continuously discover the on-premises environment. It will automatically reflect any changes that are done to the on-prem environment. Along with discovering the configuration changes (disk, NIC addition or removal, addition or removal of VMs

etc.), it will also continuously collect performance data of VMs and send it to Azure Migrate. The appliance will start collecting performance data from the day you set it up. To start discovery, you need to do the following:

Kickstart appliance

1. In Hyper-V Manager, in the virtual machines pane, right-click the VM, and click **Connect**.
2. Provide the language, time zone, and password preferences for the appliance.
   Further steps to set up discovery require are to be completed using a web app. You can remotely access the web app using the URL https://<appliance-ip-or-name>:44368. Alternately, you can also use the web app from the appliance itself; to access the discovery web app, click **Start discovery** shortcut on the desktop.

Verify discovery prerequisites

In the web app, the first step to configure discovery is to complete the prerequisites.

Accept license agreements: After you review the End User License Agreement and the Third Party Notice Agreement, click on the checkbox indicating you accept the license terms.

Internet connectivity: The Azure Migrate appliance needs to be connected to the internet to send the discovered machines information. Once the appliance is set up, you can connect the machine to the internet in one of the two following ways. Ensure you have whitelisted the URLs listed in the Prerequisites section.

1. You can configure the appliance to have direct internet connectivity.
2. Or you can configure the appliance to connect via a proxy server.
   - If the proxy server requires authentication, you can specify the username and password in the connection settings.
   - The IP address/FQDN of the Proxy server should be of the form http://IPaddress or http://FQDN. Only http proxy is supported.

Note
HTTPS-based proxy servers are not supported by the Azure Migrate appliance.

Time sync with internet time: This step ensures the time on your appliance is correct. For the discovery to function correctly, we require the time is in sync with the internet time.

Register to Azure Migrate

1. Click on log in. You will see a new tab open. Ensure you have disabled the pop-up blocker.
2. Log in using your Azure credentials. After logging in successfully, close this tab and go back to the discovery app.
3. Select the subscription in which Azure Migrate project was created.
4. Select the Migrate project, next to the project, you can see the resource group in which the project is created (in parentheses).
5. Specify a name for the appliance. Note the appliance name is to be alphanumeric with a maximum length of 14 characters. Click Register.

Note

You can register multiple appliances to one Azure Migrate project. Across all appliances, discovery of up to 10000 Hyper-V VMs is supported. A maximum of 5000 Hyper-V VMs is supported per appliance.

Provide Hyper-V server details

1. In **User name** and **Password**, specify the host / cluster account details to be used to discover VMs. See prerequisites section to learn about the permissions required on this account.
2. Specify a friendly name for the credential. Click **Save details** to save these credentials.
3. Click **Add**. Enter the list of clusters or hosts you want to discover in the pop up. Click **Validate.**
4. Once the added hosts are validated, you will see the no. of VMs found in each host or cluster.
5. If you would like to remove any host or cluster at this point, use **Delete** option to delete the cluster or host.
   Note that you cannot remove individual hosts from a cluster. You can only remove a cluster in its entirety.
6. If validation fails on any host / cluster, review the error by hovering over the icon in the status column.
7. You can fix the issues and validate the hosts again by clicking **Validate.**
8. If there are problems with a few hosts in a cluster, you can still proceed with adding the cluster for discovery
9. After you are done with validation, click **Save and start discovery.**

In some time – approximately 1.5 minutes per every Hyper-V host added, you will be able to review the discovered inventory in the portal and create as-on premises assessments on the portal. It is recommended to wait for at least a day before you create performance-based assessments.

What data is collected by the Azure Migrate appliance?

The Azure Migrate appliance collects metadata about the on-premises VMs that helps in assessing the VMs for migration to Azure. The complete list of metadata collected by the appliance is listed below:

Configuration data of the VM

- VM display name
- IP address
- MAC address
- Operating system
- Number of cores, disks, NICs
- Memory size, Disk sizes

Performance data of the VM

- CPU usage
- Memory usage
- For each disk attached to the VM:
  - Disk read throughput

  - Disk writes throughput
  - Disk read operations per sec
  - Disk writes operations per sec
- For each network adapter attached to the VM:
  - Network in
  - Network out

For performance data, the appliance collects real time utilization data every 30 second for each of the above metrics and then rolls up the 30 second data points to create a single data point for 10 minutes. It selects the peak utilization value (out of all the 30 seconds data points) and sends it to Azure for assessment calculation. Based on the percentile value specified in the assessment properties (50^{th}, 90^{th}, 95^{th} or 99^{th}), the appropriate value is then selected from all the 10 minutes data points for assessment computation.

Verify VMs in the portal

The discovery of the configuration data of the VMs takes around 15 minutes and you can then view the VMs in the Azure portal. To view the VMs:

1. Go to Azure Migrate dashboard
2. In the Server Assessment Service tile, click on the VM icon that displays the count of the machines discovered.

Assess Hyper-V VMs

Once the VMs are discovered, you can create assessments in Azure portal. Assessments are created on a group of machines that you plan to migrate together. Assessments are point in time snapshot of the data available with Azure Migrate: Server Assessment and are not automatically updated with latest data. If you want to update an assessment with the latest data, you can do so by Recalculating the assessment.

Note that you can assess both Hyper-V and VMware servers in a single assessment.

There are two kinds of assessments you can create in Azure Migrate: Server Assessment service:

a. **Performance-based assessments**: For performance-based assessments, the service looks at the utilization data for CPU and memory to recommend a VM size in Azure. For disk type recommendation, it considers the IOPS and throughput of the on-prem disks and recommends a disk type accordingly (Standard/Premium managed disks).
b. **As on-premises assessments**: For as on-premises assessments, the service does not consider the performance data and recommends a VM size based on the on-prem configuration of the VM and standard disks for every on-prem disk.

For example, if you have an on-premises VM with 4 cores (20% utilization), 8GB (10% utilization) memory, a performance-based assessment will look at the utilization number to find out the effective number of cores (0.8 cores) and memory (0.8GB), it will then apply a comfort factor (default is 30%) to these numbers to ensure there is headroom for growth and then recommend a size in Azure. So in this example, in a performance-based assessment, the service will recommend a

VM SKU in Azure with ~1.4 cores (0.8x1.3) and ~1.4GB memory. Whereas, in an as on-premises assessment, a VM SKU with 4 cores and 8GB memory would be recommended.

Recommendation: Collection of performance data takes time and performance metrics of each VM is updated every hour. We recommend that you wait for at least a day before creating *performance-based* assessments to ensure there are enough performance data points. However, you can create *as on-premises* assessments immediately after configuration data of the VM has arrived.

To create an assessment:

1. In the **Azure Migrate** dashboard, in the context of the **Azure Migrate: Server Assessment** solution click on +**Assess** option.
2. Click **Assess servers** on the Server Assessment Service tile
3. Click **View all** to review the assessment properties, close the page.
4. To create a group of VMs, specify a group name.
5. Select the machines that you want to add to the group. For example, you might group VMs that run the same application.
6. Click **Create Assessment**, to create the group and the assessment.
7. After the assessment is created, view it in **Overview** in **Azure Migrate: Server Assessment** solution
8. Click **Export assessment**, to download it as an Excel file.

Review assessment report

An assessment includes information about whether the on-premises VMs are compatible for Azure, what would be the right VM size for running the VM in Azure and the estimated monthly Azure costs for running the VMs in Azure.

Azure readiness

The Azure readiness view in the assessment shows the readiness status of each VM. Depending on the properties of the VM, each VM can be marked as:

- Ready for Azure
- Conditionally ready for Azure
- Not ready for Azure
- Readiness unknown

For VMs that are ready, Azure Migrate: Server Assessment recommends a VM size in Azure. The size recommendation done by the service depends on the sizing criterion specified in the assessment properties. If the sizing criterion is performance-based sizing, the size recommendation is done by considering the performance history of the VMs (CPU and memory) and disks (IOPS and throughput). If the sizing criterion is 'as on-premises', Azure Migrate: Server Assessment does not consider the performance data for the VM and disks. The recommendation for the VM size in Azure is done by looking at the size of the VM on-premises and the disk sizing is done based on the Storage type specified in the assessment properties (default is premium disks).

Learn more about how sizing is done in Azure Migrate: Server Assessment.

For VMs that aren't ready or conditionally ready for Azure, Azure Migrate: Server Assessment explains the readiness issues, and provides remediation steps.

The VMs for which Azure Migrate:Server Assessment cannot identify Azure readiness (due to data unavailability) are marked as readiness unknown.

Monthly cost estimate

This view shows the total compute and storage cost of running the VMs in Azure along with the details for each machine. Cost estimates are calculated considering the size recommendations done by Azure Migrate: Server Assessment for a machine, its disks, and the assessment properties.

Note

The cost estimation provided by Azure Migrate: Server Assessment is for running the on-premises VMs as Azure Infrastructure as a service (IaaS) VMs. Azure Migrate: Server Assessment does not consider any Platform as a service (PaaS) or Software as a service (SaaS) costs.

Estimated monthly costs for compute and storage are aggregated for all VMs in the group.

Customize an assessment

Azure Migrate: Server Assessment creates assessments with default properties. After creating an assessment, you can modify the default properties using the instructions in this article.

1. In the **Azure Migrate - Servers** page, within the context of the **Azure Migrate: Server Assessment** solution click on +**Assess** option, click on the icon that shows the count of **Assessments.**
2. Click the assessment that you want to customize.
3. On the assessment **Overview** page, click **Edit properties**.
4. Modify the properties in accordance with the following table:

Setting	Details	Default
Target location	The Azure location to which you want to migrate. Azure Migrate currently supports 30 regions including Australia East, Australia Southeast, Brazil South, Canada Central, Canada East, Central India, Central US, China East, China North, East Asia, East US, Germany Central, Germany Northeast, East US 2, Japan East, Japan West, Korea Central, Korea South, North Central US, North Europe, South Central US, Southeast Asia, South India, UK South, UK	West US 2 is the default location.

Setting	Details	Default
	West, West Central US, West Europe, West India, West US, and West US2.	
Pricing tier	You can specify the pricing tier (Basic/Standard) for the target Azure VMs. For example, if you are planning to migrate a production environment, you would like to consider the Standard tier, which provides VMs with low latency but may cost more. On the other hand, if you have a Dev-Test environment, you may want to consider the Basic tier that has VMs with higher latency and lower costs.	By default the Standard tier is used.
Sizing criterion	The criterion to be used by Azure Migrate: Server Assessment to right-size VMs for Azure. You can do either do *performance-based* sizing or size the VMs *as on-premises*, without considering the performance history.	Performance-based sizing is the default option.
Performance history	The duration to consider for evaluating the performance of the VMs. This property is only applicable when sizing criterion is *performance-based sizing*.	Default is one day.
Percentile utilization	The percentile value of the performance sample set to be considered for right-sizing. This property is only applicable when sizing criterion is *performance-based sizing*.	Default is 95th percentile.
Comfort factor	Azure Migrate: Server Assessment considers a buffer (comfort factor) during assessment. This buffer is applied on top of machine utilization data for VMs (CPU, memory, disk, and network). The comfort factor accounts for issues such as seasonal usage, short	Default setting is 1.3x.

Setting	Details	Default
	performance history, and likely increases in future usage. For example, 10-core VM with 20% utilization normally results in a 2-core VM. However, with a comfort factor of 2.0x, the result is a 4-core VM instead.	
Offer	Azure Offer that you are enrolled to.	Pay-as-you-go is the default.
Currency	Billing currency.	Default is US dollars.
Discount (%)	Any subscription-specific discount you receive on top of the Azure offer.	The default setting is 0%.
Azure Hybrid Benefit	Specify if you have software assurance and are eligible for Azure Hybrid Benefit. If set to Yes, non-Windows Azure prices are considered for Windows VMs.	Default is Yes.

5. Click **Save** to update the assessment.

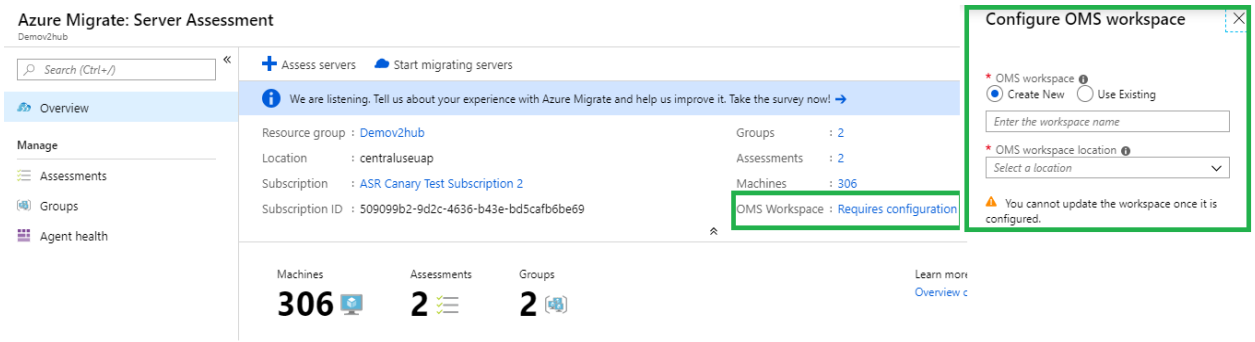
Dependency Visualization in Azure Migrate

Dependency visualization in Azure Migrate allows you to create high-confidence groups for migration assessments. Using dependency visualization you can view network dependencies of machines and identify related machines that needed to be migrated together to Azure. This functionality is useful in scenarios where you are not completely aware of the machines that constitute your application and need to be migrated together to Azure

How does it work?

Azure Migrate uses the Service Map solution in Log Analytics for dependency visualization.

- To leverage dependency visualization, you need to associate a Log Analytics workspace, either new or existing, with an Azure Migrate project.
- You can only create or attach a workspace in the same subscription where the migration project is created.
- To attach a Log Analytics workspace to a project, go to **Essentials** section of the project **Overview** page and click **Requires configuration**



- While associating a workspace, you will get the option to create a new workspace or attach an existing one:
  - When you create a new workspace, you need to specify a name for the workspace. The workspace is then created in a region in the same Azure geography as the migration project.
  - When you attach an existing workspace, you can pick from all the available workspaces in the same subscription as the migration project. Note that only those workspaces are listed which were created in a region where Service Map is supported. To be able to attach a workspace, ensure that you have 'Reader' access to the workspace.

  Note

  Once you have attached a workspace to a project, you cannot change it later.

- The associated workspace is tagged with the key **Migration Project**, and value **Project name**, which you can use to search in the Azure portal.
- To navigate to the workspace associated with the project, you can go to **Essentials** section of the project **Overview** page and access the workspace

To use dependency visualization, you need to download and install agents on each on-premises machine that you want to analyze.

- Microsoft Monitoring agent(MMA) needs to be installed on each machine.
- The Dependency agent needs to be installed on each machine.
- In addition, if you have machines with no internet connectivity, you need to download and install Log Analytics gateway on them.

You don't need these agents on machines you want to assess unless you're using dependency visualization.

Do I need to pay for it?

Azure Migrate is available at no additional charge. Use of the dependency visualization feature in Azure Migrate requires Service Map and requires you to associate a Log Analytics workspace, either new or existing, with the Azure Migrate project. The dependency visualization functionality in Azure Migrate is free for the first 180 days in Azure Migrate.

1. Use of any solutions other than Service Map within this Log Analytics workspace will incur standard Log Analytics charges.
2. To support migration scenarios at no additional cost, the Service Map solution will not incur any charges for the first 180 days from the day of associating the Log Analytics workspace with the Azure Migrate project. After 180 days, standard Log Analytics charges will apply.

When you register agents to the workspace, use the ID and the Key given by the project on the install agent steps page.

When the Azure Migrate project is deleted, the workspace is not deleted along with it. Post the project deletion, the Service Map usage will not be free, and each node will be charged as per the paid tier of Log Analytics workspace.

Note:

The dependency visualization feature uses Service Map via a Log Analytics workspace. Since 28 February 2018, with the announcement of Azure Migrate general availability, the feature is now available at no extra charge. You will need to create a new project to make use of the free usage workspace. Existing workspaces before general availability are still chargeable, hence we recommend you to move to a new project.

How do I use the feature?

You can use the dependency visualization functionality to view network dependencies of machines and identify machines that belong to the same application. This requires installation and configuration of agents on the on-premises machine. Once you have installed agents on your on-premises machine, you can view dependencies of the machine, select the dependent machines on the dependency map view and create a group which you can assess with high-confidence. Additionally, once you have created the group, you can also view the dependencies of the entire group to ensure that the group is complete and you are not leaving out any dependent machine.

How do I manage the workspace?

You can use the Log Analytics workspace outside Azure Migrate. It's not deleted if you delete the migration project in which it was created. If you no longer need the workspace, delete it manually.

Don't delete the workspace created by Azure Migrate, unless you delete the migration project. If you do, the dependency visualization functionality will not work as expected.

How do I manage the workspace?

You can use the Log Analytics workspace outside Azure Migrate. It's not deleted if you delete the migration project in which it was created. If you no longer need the workspace, delete it manually.

Don't delete the workspace created by Azure Migrate, unless you delete the migration project. If you do, the dependency visualization functionality will not work as expected.

What happens to the OMS Log Analytics workspace when I delete the migration project?

Since you may use the OMS Log Analytics workspace outside of Azure Migrate, the workspace is not deleted when the migration project is deleted. If you no longer need the workspace, you need to manually delete it. Learn more about how to delete an OMS Log Analytics workspace in the Azure portal.

What happens to the migration project if I delete the workspace?

If you are using the dependency visualization functionality, you will no longer be able to view the dependencies of the machines/groups. This is not reversible and you may have to start from scratch.

If you are not using the dependency visualization functionality, there will be no immediate impact. However, this will block you from using the dependency visualization functionality for the project in future.

We recommend you to not delete the OMS Log Analytics workspace created by Azure Migrate until you delete the migration project.

Create machine groups

Azure Migrate assesses machines in the group to check whether they're suitable for migration to Azure, and provides sizing and cost estimations for running the machine in Azure. If you know the machines that need be migrated together, you can manually create the group in Azure Migrate without dependency visualization. If you are not very sure about the machines that need to be grouped together, you can create groups using the dependency visualization functionality in Server Assessment

Create a group using machine dependency visualization

You can create groups with higher confidence using machine dependency mapping and refine it later using group dependency mapping.

Prepare for dependency visualization

To view dependencies of machines, you need to download and install the Microsoft Monitoring Agent (MMA), and the Dependency agent, on each machine you want to evaluate. In addition, if you have machines with no internet connectivity, you need to download and install OMS gateway. Learn more about installation of OMS gateway.

Download and install the MMA and dependency agents

1. In **Azure Migrate – Servers** page in the Migrate project, within the context of the **Azure Migrate: Server Assessment** solution, click on **Solution Overview**.
2. In **Overview**, click **Machines**, and select the required machine

3. In the **Dependencies** column, click **Install agents**.
4. On the **Dependencies** page, download and install the Microsoft Monitoring Agent (MMA), and the Dependency agent on each VM you want to evaluate.
5. Copy the workspace ID and key. You need these when you install the MMA on the on-premises machine.

Install the MMA

To install the MMA on a Windows machine:

1. Double-click the downloaded agent.
2. On the **Welcome** page, click **Next**. On the **License Terms** page, click **I Agree** to accept the license.
3. In **Destination Folder**, keep or modify the default installation folder > **Next**.
4. In **Agent Setup Options**, select **Azure Log Analytics (OMS)** > **Next**.
5. Click **Add** to add a new OMS workspace. Paste in workspace ID and key that you copied from the portal. Click **Next**.

You can install the agent from the command line or using an automated method such as Azure Automation DSC, System Center Configuration Manager, or with an Azure Resource Manager template if you have deployed Microsoft Azure Stack in your datacenter. Learn more about using these methods to install the MMA agent.

To install the MMA agent on a Linux machine:

1. Transfer the appropriate bundle (x86 or x64) to your Linux computer using scp/sftp.
2. Install the bundle by using the `--install` argument.

```
sudo sh ./omsagent-<version>.universal.x64.sh --install -w <workspace id> -s
<workspace key>
```

Install the agent on a machine monitored by SCOM:

For machines monitored by System Center Operations Manager 2012 R2 or later, there is no need to install the MMA agent. Service Map has an integration with SCOM that leverages the SCOM MMA to gather the necessary dependency data. You can enable the integration using the guidance here. Note, however, that the dependency agent will need to installed on these machines.

Install the Dependency agent

To install the Dependency agent on a Windows machine, double-click the setup file and follow the wizard.

To install the Dependency agent on a Linux machine, install as root using the following command:
`sh InstallDependencyAgent-Linux64.bin`

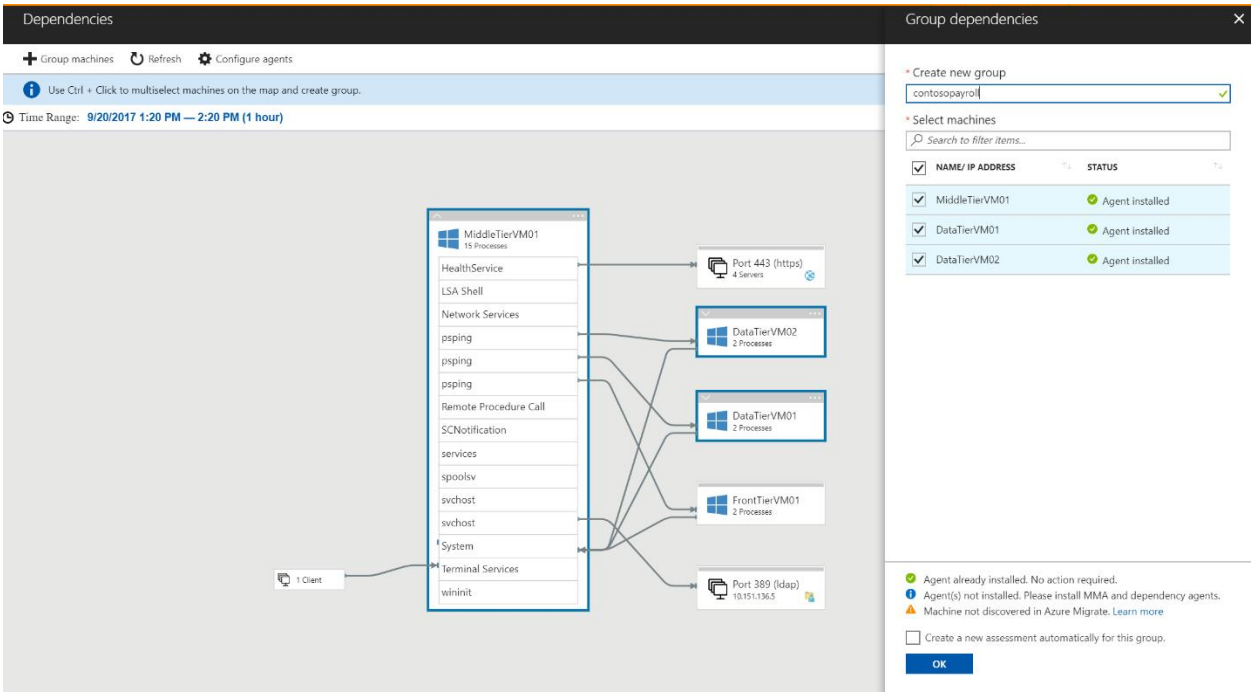
Learn more about the Operating Systems supported by the dependency agent.

Create a group

1. After you install the agents, go back to the portal to the **Azure Migrate: Server Assessment** solution in Migrate project. Click on **Solution Overview**.
2. The **Dependencies** column should now show as **View Dependencies**. Click the column to view the dependencies.
3. For each machine you can review the following settings:

    - Whether the MMA and the dependency agent are installed, and whether the machine has been discovered.
    - The guest operating system running on the machine.
    - Incoming and outbound IP connections and ports.
    - Processes running on machines
    - Dependencies between machines

4. You can get more granular dependencies by clicking the time range to modify it. By default, the range is an hour. You can modify the time range, or specify start and end dates, and duration.
5. After you've identified dependent machines that you want to group together, select the machines on the map, and click **Group machines**.
6. Specify a group name. Verify that the machine is discovered by Azure Migrate. If it isn't run the discover process on-premises again.
7. Click **OK** to save.

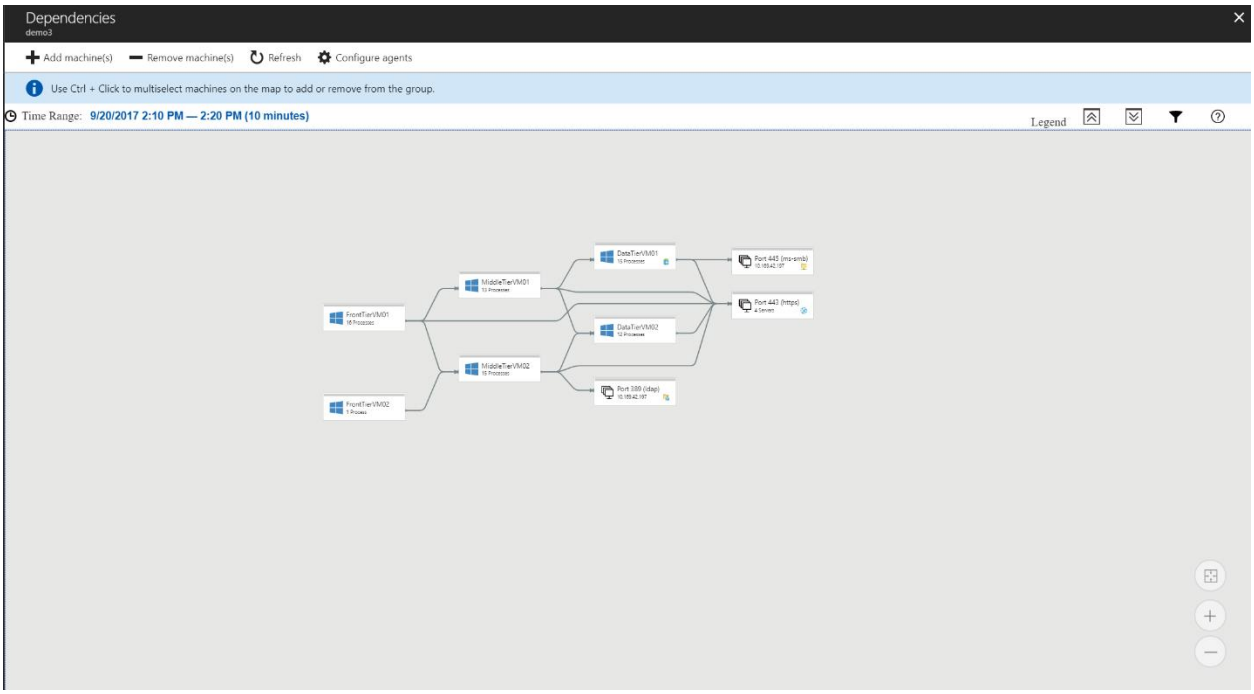


Modify a group using group dependency visualization

Once you have created the group by viewing the dependencies of a single machine, you can then view the dependencies of the entire group to refine it further. It is recommended to install the MMA and the dependency agent on all machines of the group to ensure all dependent machines are added to the group. Learn more about installation of MMA and dependency agent.

Note: The group shouldn't contain more than 10 machines if you want to view dependency mapping of the group. If a group has more than 10 VMs, you can view the dependencies of each machine and refine the group.

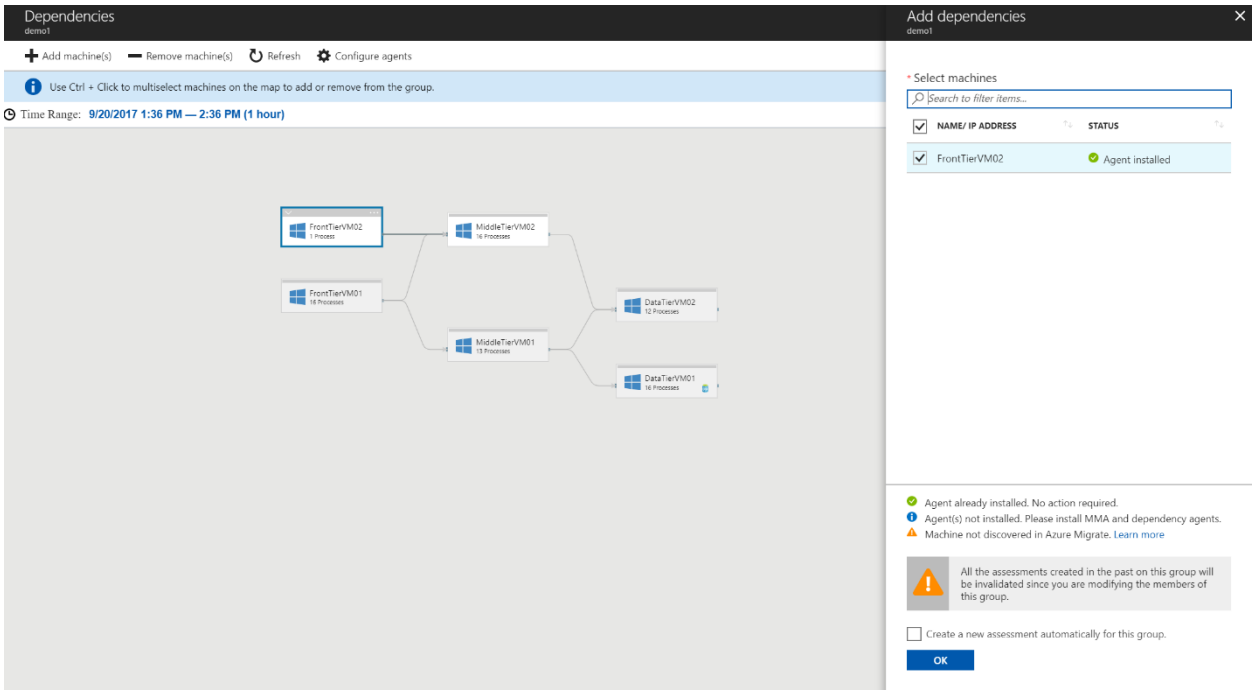
1. In **Azure Migrate: Server Assessment** solution **Overview**, click **Groups** > select the **Group.**
2. On the group page, click **View Dependencies**, to open the dependency map for the group.



3. Click the time range to get a more granular view. By default, an hour is used.
4. Review the dependency map and add or remove machines as required.
   - Use Ctrl+Click to select machines on the dependency map, and then click **Add machines**. You can only add machines that are discovered by the collector.
   - To remove machines from the group, use Ctrl+Click to select machines, and click **Remove machines**.

   Note that adding/removing machines from a group invalidates past assessments created on it. You can optionally create a new assessment when you modify the group.

5. Click **OK** to save the group.



Query dependency data from Log Analytics

Dependency data captured by Service Map is available for querying in Log Analytics workspace associated with your Azure Migrate project. Learn more about the Service Map data tables to query in Log Analytics.

To run the Log Analytics queries:

1. After you install the agents, go to the **Azure Migrate – Servers** page in your Migrate project on Azure portal. Within the context of **Azure Migrate: Server Assessment** solution, click **Solution Overview**.
2. In **Overview**, go to **Essentials** section of the project and click on workspace name provided next to **OMS Workspace**.
3. On the Log Analytics workspace page, click **General** > **Logs**.
4. Write your query to gather dependency data using Log Analytics. Sample queries to gather dependency data are available here.
5. Run your query by clicking on Run.

Learn more about how to write Log Analytics queries.

Sample Azure Monitor logs queries

Following are sample queries you can use to extract dependency data. You can modify the queries to extract your preferred data points. An exhaustive list of the fields in dependency data records is available here. Find more sample queries here.

Summarize inbound connections on a set of machines

Note that the records in the table for connection metrics, VMConnection, do not represent individual physical network connections. Multiple physical network connections are grouped into a logical connection. Learn more about how physical network connection data is aggregated into a single logical record in VMConnection.

```
// the machines of interest
let ips=materialize(ServiceMapComputer_CL
| summarize ips=makeset(todynamic(Ipv4Addresses_s)) by MonitoredMachine=ResourceName_s
| mvexpand ips to typeof(string));
let StartDateTime = datetime(2019-03-25T00:00:00Z);
let EndDateTime = datetime(2019-03-30T01:00:00Z);
VMConnection
| where Direction == 'inbound'
| where TimeGenerated > StartDateTime and TimeGenerated  < EndDateTime
| join kind=inner (ips) on $left.DestinationIp == $right.ips
| summarize sum(LinksEstablished) by Computer, Direction, SourceIp, DestinationIp, DestinationPort
```

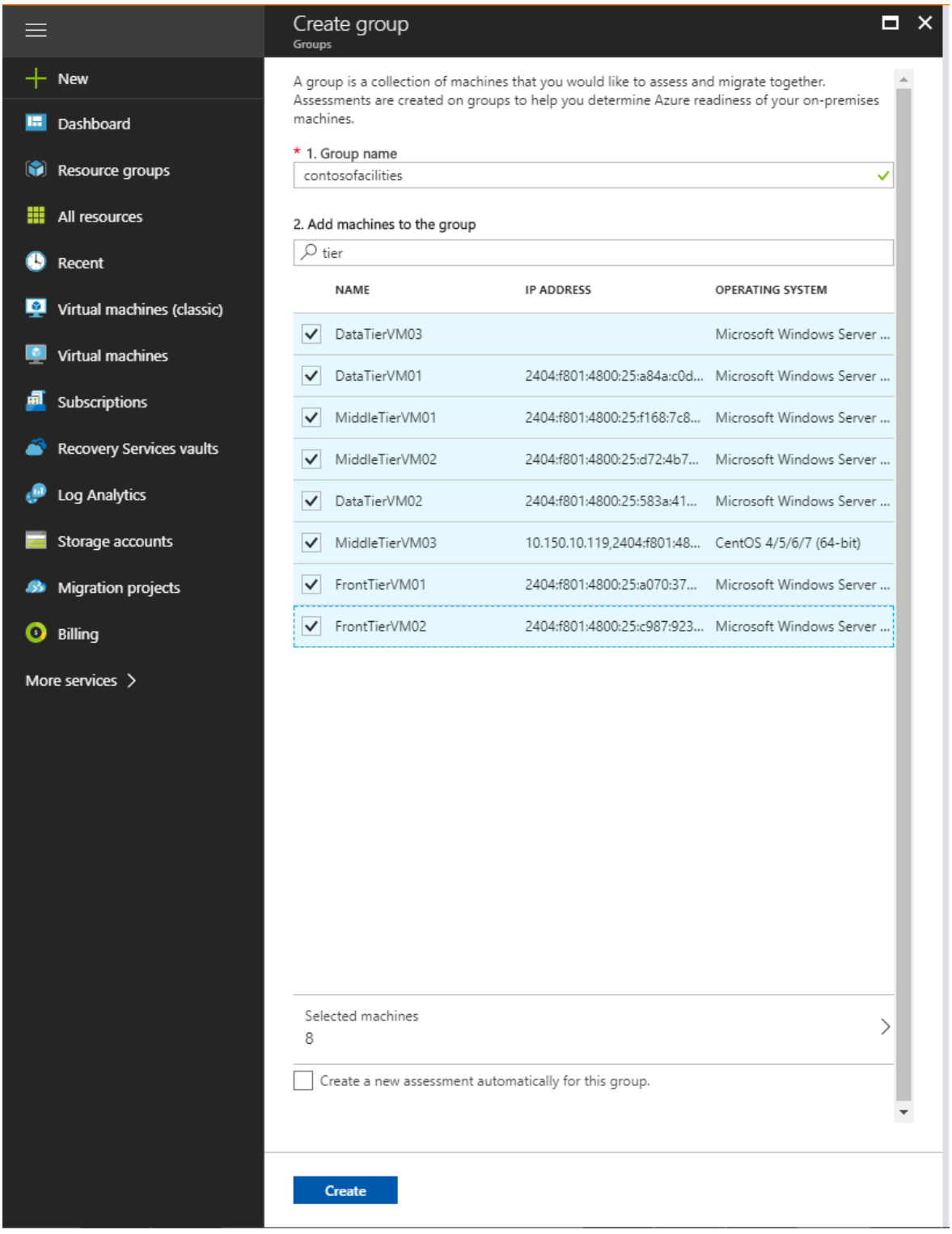
Summarize volume of data sent and received on inbound connections between a set of machines

```
// the machines of interest
let ips=materialize(ServiceMapComputer_CL
| summarize ips=makeset(todynamic(Ipv4Addresses_s)) by MonitoredMachine=ResourceName_s
| mvexpand ips to typeof(string));
let StartDateTime = datetime(2019-03-25T00:00:00Z);
let EndDateTime = datetime(2019-03-30T01:00:00Z);
VMConnection
| where Direction == 'inbound'
| where TimeGenerated > StartDateTime and TimeGenerated  < EndDateTime
| join kind=inner (ips) on $left.DestinationIp == $right.ips
| summarize sum(BytesSent), sum(BytesReceived) by Computer, Direction, SourceIp, DestinationIp,
DestinationPort
```

Create a group without viewing machine dependencies

If you do not want to view dependencies and create groups, you can do it as below:

1. Go to the **Azure Migrate – Servers** page in your Migrate project on Azure portal. Within the context of **Azure Migrate: Server Assessment** solution, click **Solution Overview**.
2. In the solution **Overview** section, click **Groups** > **+ Group**.
3. Specify a group name.
4. Select one or more machines that will be included in the group, and click **Create**. After the group is created, you can add or remove machines from it.

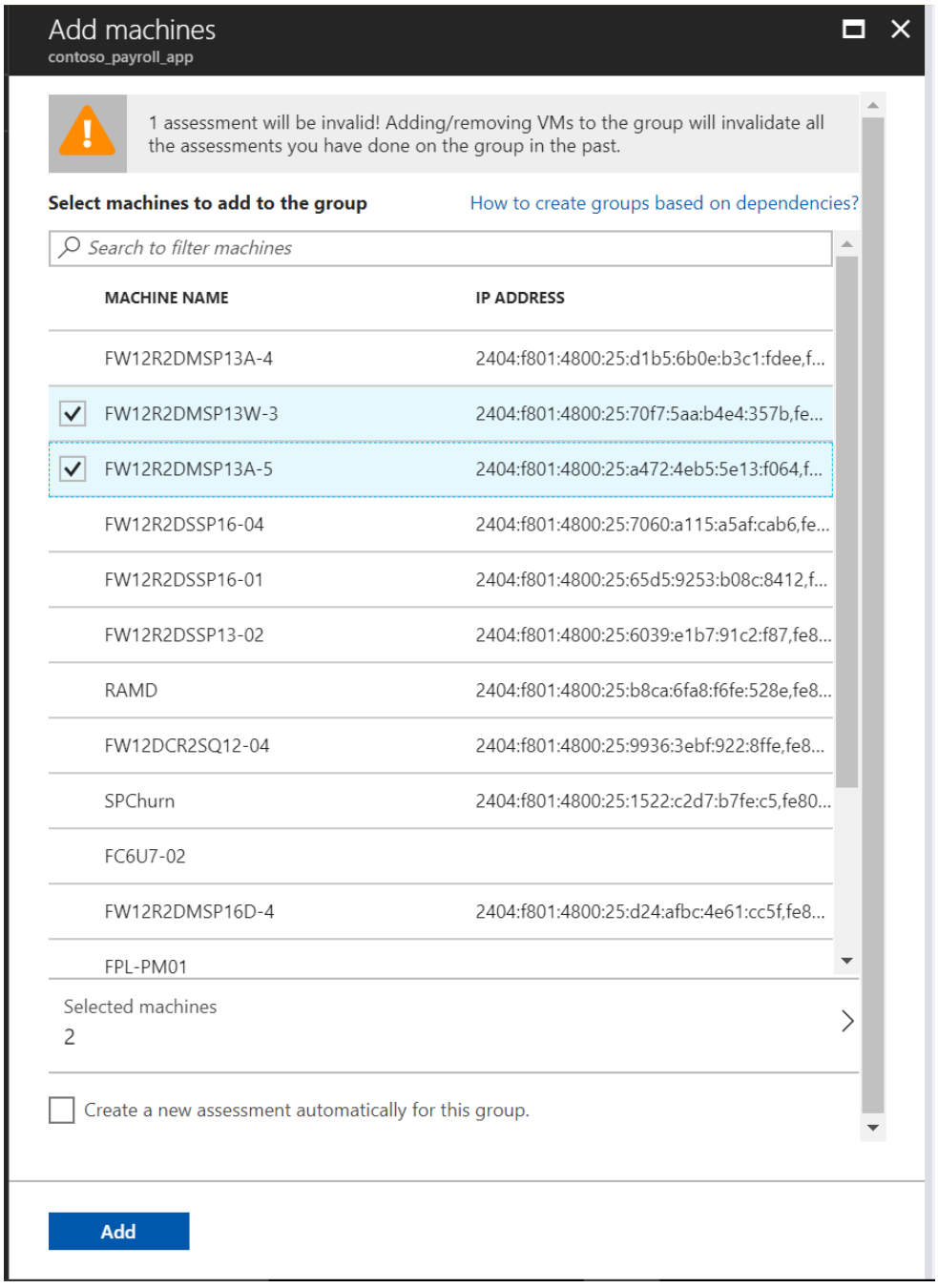


Modify a group without viewing dependencies

Once you have created the group, you can add/remove machines from the group without viewing its dependencies by following the below steps.

1. Navigate to the **Azure Migrate: Server Assessment** solution **Overview**, click **Groups.**

2. Select the Group you want to modify.
3. Click **Add Machines** or **Remove Machines.**
4. Select the machines that you want to add/remove to/from the group.
5. Click **Add** or **Remove.**



Troubleshooting and reporting issues

Use this section to troubleshoot issues when deploying and using Azure Migrate: Server Assessment. If your issue is not resolved with the following guidance, please write to the Azure Migrate preview support group at azmigratev2psup@microsoft.com

Troubleshoot appliance errors

Appliance is not able to connect to the internet

This can happen when the machine you are using is behind a proxy. Make sure you provide the authorization credentials if the proxy needs one. If you are using any URL-based firewall proxy to control outbound connectivity, be sure to whitelist the URLs listed in the Prerequisites section of this document

Date and time synchronization error

The server clock might be out-of-synchronization with the current time by more than five minutes. Change the clock time on the collector VM to match the current time, as follows:

1. Open an admin command prompt on the VM.
2. To check the time zone, run w32tm /tz.
3. To synchronize the time, run w32tm /resync.

Unable to select location while registering to Azure Migrate

Ensure the subscription you are using is enabled in the regions where Azure Migrate is supported. In the private preview, Azure Migrate is available only in the Central US region.

Validation of Hyper-V hosts fails

This may happen in one of the following scenarios:

1. The host is down or not reachable. If it a standalone host, remove the host from discovery to proceed. If the host is a part of a cluster, you can proceed with the discovery; Azure Migrate: Server Assessment will track all the hosts in the cluster and will be able to discover the host when it is reachable.
2. Hosts in a cluster may not be reachable due to a name resolution issue. It is advised to get the DNS to resolve the host names if it is not an FQDN. If this is not feasible, update the hosts file on the appliance to map the IP address with the host names.

Failure in registering appliance to Azure Migrate

If you see the error “This subscription and resource group does not contain any server assessment or migration solutions”, check your appliance version. If your appliance version is older than 1.19.05.10, you cannot register to any project created after 12-May. Please note that older appliances on which discovery was already kickstarted will work just fine. This is only for users who created project after 12-May but are using an appliance downloaded earlier from an older project to kickstart discovery.

Troubleshoot discovery issues

Machine information on portal is inaccurate

Machine information as shown on portal may be absent out of date in the following scenarios:

1. Discovery has just been triggered from appliance. After you add your Hyper-V hosts and add new machines, it takes 15 minutes for the configuration data of the machines to reflect in the portal
2. You have just made new changes in your infrastructure (such as addition of machines or addition of disks or memory on existing machines) after setting up discovery. It may take at most 15 minutes for these changes to reflect on Azure Migrate portal.

Virtual machine OS information not available

OS information cannot be captured by Azure Migrate: Server Assessment in the following cases:

3. Hyper-V Integration services is not enabled on the virtual machine
4. The virtual machine is not powered on.

Virtual machine IP information not available

OS information cannot be captured by Azure Migrate: Server Assessment in the following cases:

1. Hyper-V Integration services is not enabled on the virtual machine
2. The virtual machine is not powered on.

Troubleshoot VM readiness issues

Issue	**Fix**
Unsupported boot type	Azure does not support VMs with EFI boot type. It is recommended to convert the boot type to BIOS before you run a migration. You can use Azure Site Recovery to do the migration of such VMs as it will convert the boot type of the VM to BIOS during the migration.
Conditionally supported Windows OS	The OS has passed its end of support date and needs a Custom Support Agreement (CSA) for support in Azure, consider upgrading the OS before migrating to Azure.
Unsupported Windows OS	Azure supports only selected Windows OS versions, consider upgrading the OS of the machine before migrating to Azure.
Conditionally endorsed Linux OS	Azure endorses only selected Linux OS versions, consider upgrading the OS of the machine before migrating to Azure.
Unendorsed Linux OS	The machine may boot in Azure, but no OS support is provided by Azure, consider upgrading the OS to an endorsed Linux version before migrating to Azure
Unknown operating system	Azure Migrate: Server Assessment could not retrieve the operating system of the machine. Ensure that the OS running inside the machine is supported by Azure before you migrate the machine.

Issue	Fix
Unsupported OS bitness	VMs with 32-bit OS may boot in Azure, but it is recommended to upgrade the OS of the VM from 32-bit to 64-bit before migrating to Azure.
Requires Visual Studio subscription.	The machines have a Windows client OS running inside it which is supported only in Visual Studio subscription.
VM not found for the required storage performance.	The storage performance (IOPS/throughput) required for the machine exceeds Azure VM support. Reduce storage requirements for the machine before migration.
VM not found for the required network performance	The network performance (in/out) required for the machine exceeds Azure VM support. Reduce the networking requirements for the machine.
VM not found in specified pricing tier.	If the pricing tier is set to Standard, consider downsizing the VM before migrating to Azure. If the sizing tier is Basic, consider changing the pricing tier of the assessment to Standard.
VM not found in the specified location.	Use a different target location before migration.
One or more unsuitable disks.	One or more disks attached to the VM do not meet the Azure requirements. For each disk attached to the VM, ensure that the size of the disk is < 4 TB, if not, shrink the disk size before migrating to Azure. Ensure that the performance (IOPS/throughput) needed by each disk is supported by Azure managed virtual machine disks.
One or more unsuitable network adapters.	Remove unused network adapters from the machine before migration.
Disk count exceeds limit	Remove unused disks from the machine before migration.

Issue	Fix
Disk size exceeds limit	Azure supports disks with up to size 4 TB. Shrink disks to less than 4 TB before migration.
Disk unavailable in the specified location	Make sure the disk is in your target location before you migrate.
Disk unavailable for the specified redundancy	The disk should use the redundancy storage type defined in the assessment settings (LRS by default).
Could not determine disk suitability due to an internal error	Try creating a new assessment for the group.
VM with required cores and memory not found	Azure couldn't find a suitable VM type. Reduce the memory and number of cores of the on-premises machine before you migrate.
Could not determine VM suitability due to an internal error.	Try creating a new assessment for the group.
Could not determine suitability for one or more disks due to an internal error.	Try creating a new assessment for the group.
Could not determine suitability for one or more network adapters due to an internal error.	Try creating a new assessment for the group.

Collect logs

Appliance logs

Please attach logs from the following location while reporting any bugs you see with the appliance or discovery. Logging is enabled by default.

- %PROGRAMDATA%\ASRSetupLogs
- %PROGRAMDATA%\Appliance
- %PROGRAMDATA%\Microsoft Azure Site Recovery

Azure Migrate portal logs

If you face issues with portal, please report the issue to the support group. Provide the network traffic and console logs when reporting. Use the following steps to collect portal network traffic and console logs.

1. Open the browser and navigate and log in to the portal.
2. Press F12 to start the Developer Tools. If needed, clear the setting **Clear entries on navigation**.
3. Click the **Network** tab, and start capturing network traffic:
    - In Chrome, select **Preserve log**. The recording should start automatically. A red circle indicates that traffic is being capture. If it doesn't appear, click the black circle to start
    - In Edge/IE, recording should start automatically. If it doesn't, click the green play button.
4. Try to reproduce the error.
5. After you've encountered the error while recording, stop recording, and save a copy of the recorded activity:
    - In Chrome, right-click and click **Save as HAR with content**. This zips and exports the logs as a .har file.
    - In Edge/IE, click the **Export captured traffic** icon. This zips and exports the log.
6. Navigate to the **Console** tab to check for any warnings or errors. To save the console log:
    - In Chrome, right-click anywhere in the console log. Select **Save as**, to export and zip the log.
    - In Edge/IE, right-click on the errors and select **Copy all**.
7. Close Developer Tools.

Concepts

How are assessments calculated?

An Azure Migrate: Server Assessment assessment has three stages. Assessment starts with a suitability analysis, followed by sizing, and lastly, a monthly cost estimation. A machine only moves along to a later stage if it passes the previous one. For example, if a machine fails the Azure suitability check, it's marked as unsuitable for Azure, and sizing and costing won't be done.

Azure suitability analysis

Not all machines are suitable for running on cloud as cloud has its own limitations and requirements. Azure Migrate assesses each on-premises machine for migration suitability to Azure and categorizes the machines into one of the following categories:

- **Ready for Azure** - The machine can be migrated as-is to Azure without any changes. It will boot in Azure with full Azure support.
- **Conditionally ready for Azure** - The machine may boot in Azure but may not have full Azure support. For example, a machine with an older version of Windows Server OS is not supported in Azure. You need to be careful before migrating these machines to Azure and follow the remediation guidance suggested in the assessment to fix the readiness issues before you migrate.
- **Not ready for Azure** - The machine will not boot in Azure. For example, if an on-premises machine has a disk of size more than 4 TB attached to it, it cannot be hosted on Azure. You need to follow the remediation guidance suggested in the assessment to fix the readiness issue before migrating to Azure. Right-sizing and cost estimation is not done for machines that are marked as not ready for Azure.
- **Readiness unknown** - Azure Migrate: Server Assessment could not find the readiness of the machine due to insufficient data.

Azure Migrate: Server Assessment reviews the machine properties and guest operating system to identify the Azure readiness of the on-premises machine.

Machine properties

Azure Migrate: Server Assessment reviews the following properties of the on-premises VM to identify whether a VM can run on Azure.

Property	Details	Azure readiness status
Boot type	Azure supports VMs with boot type as BIOS, and not UEFI.	Conditionally ready for Azure if boot type is UEFI.
Cores	The number of cores in the machines must be equal to or less than the maximum number of cores supported for an Azure VM. If performance history is available, Azure Migrate considers the utilized cores for comparison. If a comfort factor is specified in the assessment settings, the number of utilized cores is multiplied by the comfort factor. If there's no performance history, Azure Migrate: Server Assessment uses the allocated cores, without applying the comfort factor.	Not ready if number of cores is greater than 128.

Property	Details	Azure readiness status
Memory	The machine memory size must be equal to or less than the maximum memory allowed for an Azure VM. If performance history is available, Azure Migrate: Server Assessment considers the utilized memory for comparison. If a comfort factor is specified, the utilized memory is multiplied by the comfort factor. If there's no history the allocated memory is used, without applying the comfort factor.	Not ready if memory size is greater than 3892 GB.
Storage disk	Allocated size of a disk must be 4 TB (4096 GB) or less. The number of disks attached to the machine must be 65 or less, including the OS disk.	Not ready if any disk has size greater than 4 TB or if there are more than 65 disks attached to the machine.
Networking	A machine must have 32 or less NICs attached to it.	Not ready if the machine has more than 32 NICs

Guest operating system

Along with VM properties, Azure Migrate: Server Assessment also looks at the guest OS of the on-premises VM to identify if the VM can run on Azure.

The following logic is used by Azure Migrate: Server Assessment to identify the Azure readiness of the VM based on the operating system.

Operating System	Details	Azure readiness status
Windows Server 2016 & all SPs	Azure provides full support.	Ready for Azure
Windows Server 2012 R2 & all SPs	Azure provides full support.	Ready for Azure
Windows Server 2012 & all SPs	Azure provides full support.	Ready for Azure
Windows Server 2008 R2 with all SPs	Azure provides full support.	Ready for Azure
Windows Server 2008 (32-bit and 64-bit)	Azure provides full support.	Ready for Azure
Windows Server 2003, 2003 R2	These operating systems have passed their end of support date and need a Custom Support Agreement (CSA) for support in Azure.	Conditionally ready for Azure, consider upgrading the OS before migrating to Azure.
Windows 2000, 98, 95, NT, 3.1, MS-DOS	These operating systems have passed their end of support date, the machine may boot in Azure, but no OS support is provided by Azure.	Conditionally ready for Azure, it is recommended to upgrade the OS before migrating to Azure.
Windows Client 7, 8 and 10	Azure provides support with Visual Studio subscription only.	Conditionally ready for Azure
Windows 10 Pro Desktop	Azure provides support with Multitenant Hosting Rights.	Conditionally ready for Azure

Operating System	Details	Azure readiness status
Windows Vista, XP Professional	These operating systems have passed their end of support date, the machine may boot in Azure, but no OS support is provided by Azure.	Conditionally ready for Azure, it is recommended to upgrade the OS before migrating to Azure.
Linux	Azure endorses these Linux operating systems. Other Linux operating systems may boot in Azure, but it is recommended to upgrade the OS to an endorsed version before migrating to Azure.	Ready for Azure if the version is endorsed. Conditionally ready if the version is not endorsed.
Other operating systems e.g., Oracle Solaris, Apple Mac OS etc., FreeBSD, etc.	Azure does not endorse these operating systems. The machine may boot in Azure, but no OS support is provided by Azure.	Conditionally ready for Azure, it is recommended to install a supported OS before migrating to Azure.
32-bit operating systems	The machine may boot in Azure, but Azure may not provide full support.	Conditionally ready for Azure, consider upgrading the OS of the machine from 32-bit OS to 64-bit OS before migrating to Azure.

Sizing

After a machine is marked as ready for Azure, Azure Migrate: Server Assessment sizes the VM and its disks for Azure. If the sizing criterion specified in the assessment properties is to do performance-based sizing, Azure Migrate: Server Assessment considers the performance history of the machine to identify the VM size and disk type in Azure. This method is helpful in scenarios where you have over-allocated the on-premises VM but the utilization is low and you would like to right-size the VMs in Azure to save cost.

If you do not want to consider the performance history for VM-sizing and want to take the VM as-is to Azure, you can specify the sizing criterion as *as on-premises* and Azure Migrate: Server Assessment will then size the VMs based on the on-premises configuration without considering the utilization data. For as on-premises sizing, Azure Migrate: Server Assessment recommends Standard disks for each on-prem disk.

Performance-based sizing

For performance-based sizing, Azure Migrate: Server Assessment starts with the disks attached to the VM, followed by network adapters and then maps an Azure VM based on the compute requirements of the on-premises VM.

- **Storage**: Azure Migrate: Server Assessment tries to map every disk attached to the machine to a disk in Azure.

  Note

  Azure Migrate: Server Assessment supports only managed disks for assessment.

  - To get the effective disk I/O per second (IOPS) and throughput (MBps), Azure Migrate: Server Assessment multiplies the disk IOPS and the throughput with the comfort factor. Based on the effective IOPS and throughput values, Azure Migrate: Server Assessment identifies if the disk should be mapped to a standard or premium disk in Azure.
  - If Azure Migrate: Server Assessment can't find a disk with the required IOPS & throughput, it marks the machine as unsuitable for Azure. Learn more about Azure limits per disk and VM.
  - If it finds a set of suitable disks, Azure Migrate: Server Assessment selects the ones that support the storage redundancy method, and the location specified in the assessment settings.
  - If there are multiple eligible disks, it selects the one with the lowest cost.
  - If performance data for disks in unavailable, all the disks are mapped to standard disks in Azure.
- **Network**: Azure Migrate: Server Assessment tries to find an Azure VM that can support the number of network adapters attached to the on-premises machine and the performance required by these network adapters.
  - To get the effective network performance of the on-premises VM, Azure Migrate: Server Assessment aggregates the data transmitted per second (MBps) out of the machine (network out), across all network adapters, and applies the comfort factor. This number is used to find an Azure VM that can support the required network performance.
  - Along with network performance, it also considers if the Azure VM can support the required the number of network adapters.
  - If no network performance data is available, only the network adapters count is considered for VM sizing.
- **Compute**: After storage and network requirements are calculated, Azure Migrate: Server Assessment considers CPU and memory requirements to find a suitable VM size in Azure.
  - Azure Migrate: Server Assessment looks at the utilized cores and memory, and then applies the comfort factor to get the effective cores and memory. Based on that number, it tries to find a suitable VM size in Azure.
  - If no suitable size is found, the machine is marked as unsuitable for Azure.
  - If a suitable size is found, Azure Migrate: Server Assessment applies the storage and networking calculations. It then applies location and pricing tier settings, for the final VM size recommendation.
  - If there are multiple eligible Azure VM sizes, the one with the lowest cost is recommended.

As on-premises sizing

If the sizing criterion is *as on-premises sizing*, Azure Migrate: Server Assessment does not consider the performance history of the VMs and disks and allocates a VM SKU in Azure based on the size allocated on-premises. For each disk attached to the on-prem VM, it recommends a Standard disk in Azure.

Monthly cost estimation

After sizing recommendations are complete, Azure Migrate: Server Assessment calculates post-migration compute and storage costs.

- **Compute cost**: Using the recommended Azure VM size, Azure Migrate: Server Assessment uses the Billing API to calculate the monthly cost for the VM. The calculation takes the operating system, software assurance, location, and currency settings into account. It aggregates the cost across all machines, to calculate the total monthly compute cost.
- **Storage cost**: The monthly storage cost for a machine is calculated by aggregating the monthly cost of all disks attached to the machine. Azure Migrate: Server Assessment calculates the total monthly storage costs by aggregating the storage costs of all machines. Currently, the calculation doesn't take offers specified in the assessment settings into account.

Costs are displayed in the currency specified in the assessment settings.

Confidence rating of an assessment

Each performance-based assessment in Azure Migrate: Server Assessment is associated with a confidence rating that ranges from 1 star to 5 star (1 star being the lowest and 5 star being the highest). Confidence rating is not applicable to *as on-premises* assessments. The confidence rating is assigned to an assessment based on the availability of data points needed to compute the assessment. The confidence rating of an assessment helps you estimate the reliability of the size recommendations provided by Azure Migrate: Server Assessment.

For performance-based sizing, Azure Migrate: Server Assessment needs the utilization data for CPU, memory of the VM. Additionally, for every disk attached to the VM, it needs the disk IOPS and throughput data. Similarly, for each network adapter attached to a VM, Azure Migrate: Server Assessment needs the network in/out to do performance-based sizing. If any of the above utilization numbers are not available for the required duration, the size recommendation done by Azure Migrate: Server Assessment may not be reliable. Depending on the percentage of data points available, the confidence rating for the assessment is provided as below:

Availability of data points	**Confidence rating**
0%-20%	1 Star
21%-40%	2 Star

Availability of data points	Confidence rating
41%-60%	3 Star
61%-80%	4 Star
81%-100%	5 Star

An assessment may not have all the data points available due to one of the following reasons:

- The assessment was created immediately after starting the discovery. If you are creating an assessment for a performance duration of 1 week, you need to wait for a week after kicking off discovery for the profiling to be done to gather the required performance data, before creating the assessment. If you create an assessment without waiting for the required time period (1 day, 1 week or 1 month), the assessment will not get a 5-star rating.
- Few VMs were shut down during the period for which the assessment is calculated. If any VMs were powered off for some duration, Azure Migrate: Server Assessment will not have the performance data for that period and this may impact the confidence rating of the assessment.
- Few VMs were created in between the period for which the assessment is calculated. For example, if you are creating an assessment for the performance history of last one month, but few VMs were created in the environment only a week ago. In such cases, the performance history of the new VMs will not be there for the entire duration.

Out-of-sync assessments

If you add or remove machines from a group, after creating an assessment, the assessment will be marked as out-of-sync. You can use the *Recalculate* command to update the assessment with the group membership changes.

Outdated assessments

If there are configuration changes (core addition/removal, memory size changes, NIC changes, disk addition/removal etc.) in the on-premises environment for the VMs that are part of an assessment, Azure Migrate: Server Assessment marks the assessment as outdated and provides an option in the assessment to *Recalculate* the assessment. When you recalculate the assessment, the assessment is updated with the latest configuration and performance data for the VMs.