



## **Azure**

### **Setup and administration**

NetApp  
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# Azure

## Connector installation options in Azure

There are a few different ways to create a Connector in Azure. Directly from BlueXP is the most common way.

The following installation options are available:

- [Create a Connector directly from BlueXP](#) (this is the standard option)

This action launches a VM running Linux and the Connector software in a VNet of your choice.

- [Create a Connector from the Azure Marketplace](#)

This action also launches a VM running Linux and the Connector software, but the deployment is initiated directly from the Azure Marketplace, rather than from BlueXP.

- [Download and manually install the software on your own Linux host](#)

The installation option that you choose impacts how you prepare for installation. This includes how you provide BlueXP with the required permissions that it needs to authenticate and manage resources in Azure.

## Create a Connector in Azure from BlueXP

To create a Connector in Azure from BlueXP, you need to set up your networking, prepare Azure permissions, and then create the Connector.

### Before you begin

You should review [Connector limitations](#).

### Step 1: Set up networking

Ensure that the network location where you plan to install the Connector supports the following requirements. Meeting these requirements enables the Connector to manage resources and processes within your hybrid cloud environment.

#### Azure region

If you use Cloud Volumes ONTAP, the Connector should be deployed in the same Azure region as the Cloud Volumes ONTAP systems that it manages, or in the [Azure region pair](#) for the Cloud Volumes ONTAP systems. This requirement ensures that an Azure Private Link connection is used between Cloud Volumes ONTAP and its associated storage accounts.

[Learn how Cloud Volumes ONTAP uses an Azure Private Link](#)

#### VNet and subnet

When you create the Connector, you need to specify the VNet and subnet where the Connector should reside.

## Connections to target networks

A Connector requires a network connection to the location where you're planning to create and manage working environments. For example, the network where you plan to create Cloud Volumes ONTAP systems or a storage system in your on-premises environment.

## Outbound internet access

The network location where you deploy the Connector must have an outbound internet connection to contact specific endpoints.

## Endpoints contacted from the Connector

The Connector requires outbound internet access to contact the following endpoints in order to manage resources and processes within your public cloud environment for day-to-day operations.

Endpoints	Purpose
<a href="https://management.azure.com">https://management.azure.com</a> <a href="https://login.microsoftonline.com">https://login.microsoftonline.com</a> <a href="https://blob.core.windows.net">https://blob.core.windows.net</a> <a href="https://core.windows.net">https://core.windows.net</a>	To manage resources in Azure public regions.
<a href="https://management.chinacloudapi.cn">https://management.chinacloudapi.cn</a> <a href="https://login.chinacloudapi.cn">https://login.chinacloudapi.cn</a> <a href="https://blob.core.chinacloudapi.cn">https://blob.core.chinacloudapi.cn</a> <a href="https://core.chinacloudapi.cn">https://core.chinacloudapi.cn</a>	To manage resources in Azure China regions.
<a href="https://support.netapp.com">https://support.netapp.com</a>	To obtain licensing information and to send AutoSupport messages to NetApp support.
<a href="https://*.api.blueexp.netapp.com">https://*.api.blueexp.netapp.com</a> <a href="https://api.blueexp.netapp.com">https://api.blueexp.netapp.com</a> <a href="https://*.cloudmanager.cloud.netapp.com">https://*.cloudmanager.cloud.netapp.com</a> <a href="https://cloudmanager.cloud.netapp.com">https://cloudmanager.cloud.netapp.com</a> <a href="https://netapp-cloud-account.auth0.com">https://netapp-cloud-account.auth0.com</a>	To provide SaaS features and services within BlueXP.  Note that the Connector is currently contacting "cloudmanager.cloud.netapp.com" but it will start contacting "api.blueexp.netapp.com" in an upcoming release.
<a href="https://*.blob.core.windows.net">https://*.blob.core.windows.net</a> <a href="https://cloudmanagerinfraprod.azurecr.io">https://cloudmanagerinfraprod.azurecr.io</a>	To upgrade the Connector and its Docker components.

## Endpoints contacted from the BlueXP console

As you use the BlueXP web-based console that's provided through the SaaS layer, it contacts several endpoints to complete data management tasks. This includes endpoints that are contacted to deploy the Connector from the BlueXP console.

[View the list of endpoints contacted from the BlueXP console.](#)

## Proxy server

If your organization requires deployment of a proxy server for all outgoing internet traffic, obtain the following information about your HTTP or HTTPS proxy. You'll need to provide this information during installation.

- IP address
- Credentials
- HTTPS certificate

## Ports

There's no incoming traffic to the Connector, unless you initiate it or if the Connector is used as a proxy to send AutoSupport messages from Cloud Volumes ONTAP to NetApp Support.

- HTTP (80) and HTTPS (443) provide access to the local UI, which you'll use in rare circumstances.
- SSH (22) is only needed if you need to connect to the host for troubleshooting.
- Inbound connections over port 3128 are required if you deploy Cloud Volumes ONTAP systems in a subnet where an outbound internet connection isn't available.

If Cloud Volumes ONTAP systems don't have an outbound internet connection to send AutoSupport messages, BlueXP automatically configures those systems to use a proxy server that's included with the Connector. The only requirement is to ensure that the Connector's security group allows inbound connections over port 3128. You'll need to open this port after you deploy the Connector.

## Step 2: Create a custom role

Create an Azure custom role that you can assign to your Azure account or to an Azure AD service principal. BlueXP authenticates with Azure and uses these permissions to create the Connector instance on your behalf.

Note that you can create an Azure custom role using the Azure portal, Azure PowerShell, Azure CLI, or REST API. The following steps show how to create the role using the Azure CLI. If you would prefer to use a different method, refer to [Azure documentation](#)

### Steps

1. Copy the required permissions for a new custom role in Azure and save them in a JSON file.



This custom role contains only the permissions needed to launch the Connector VM in Azure from BlueXP. Don't use this policy for other situations. When BlueXP creates the Connector, it applies a new set of permissions to the Connector VM that enables the Connector to manage the resources in your public cloud environment.

```
{
  "Name": "Azure SetupAsService",
  "Actions": [
    "Microsoft.Compute/disks/delete",
    "Microsoft.Compute/disks/read",
    "Microsoft.Compute/disks/write",
    "Microsoft.Compute/locations/operations/read",
    "Microsoft.Compute/operations/read",
    "Microsoft.Compute/virtualMachines/instanceView/read",
```

```
"Microsoft.Compute/virtualMachines/read",
"Microsoft.Compute/virtualMachines/write",
"Microsoft.Compute/virtualMachines/delete",
"Microsoft.Compute/virtualMachines/extensions/write",
"Microsoft.Compute/virtualMachines/extensions/read",
"Microsoft.Compute/availabilitySets/read",
"Microsoft.Network/locations/operationResults/read",
"Microsoft.Network/locations/operations/read",
"Microsoft.Network/networkInterfaces/join/action",
"Microsoft.Network/networkInterfaces/read",
"Microsoft.Network/networkInterfaces/write",
"Microsoft.Network/networkInterfaces/delete",
"Microsoft.Network/networkSecurityGroups/join/action",
"Microsoft.Network/networkSecurityGroups/read",
"Microsoft.Network/networkSecurityGroups/write",

"Microsoft.Network/virtualNetworks/checkIpAddressAvailability/read",
"Microsoft.Network/virtualNetworks/read",
"Microsoft.Network/virtualNetworks/subnets/join/action",
"Microsoft.Network/virtualNetworks/subnets/read",

"Microsoft.Network/virtualNetworks/subnets/virtualMachines/read",
"Microsoft.Network/virtualNetworks/virtualMachines/read",
"Microsoft.Network/publicIPAddresses/write",
"Microsoft.Network/publicIPAddresses/read",
"Microsoft.Network/publicIPAddresses/delete",
"Microsoft.Network/networkSecurityGroups/securityRules/read",
"Microsoft.Network/networkSecurityGroups/securityRules/write",
"Microsoft.Network/networkSecurityGroups/securityRules/delete",
"Microsoft.Network/publicIPAddresses/join/action",

"Microsoft.Network/locations/virtualNetworkAvailableEndpointServices/read",
"Microsoft.Network/networkInterfaces/ipConfigurations/read",
"Microsoft.Resources/deployments/operations/read",
"Microsoft.Resources/deployments/read",
"Microsoft.Resources/deployments/delete",
"Microsoft.Resources/deployments/cancel/action",
"Microsoft.Resources/deployments/validate/action",
"Microsoft.Resources/resources/read",
"Microsoft.Resources/subscriptions/operationresults/read",
"Microsoft.Resources/subscriptions/resourceGroups/delete",
"Microsoft.Resources/subscriptions/resourceGroups/read",

"Microsoft.Resources/subscriptions/resourcegroups/resources/read",
"Microsoft.Resources/subscriptions/resourceGroups/write",
```

```

        "Microsoft.Authorization/roleDefinitions/write",
        "Microsoft.Authorization/roleAssignments/write",

        "Microsoft.MarketplaceOrdering/offertypes/publishers/offers/plans/agreements/read",

        "Microsoft.MarketplaceOrdering/offertypes/publishers/offers/plans/agreements/write",
        "Microsoft.Network/networkSecurityGroups/delete",
        "Microsoft.Storage/storageAccounts/delete",
        "Microsoft.Storage/storageAccounts/write",
        "Microsoft.Resources/deployments/write",
        "Microsoft.Resources/deployments/operationStatuses/read",
        "Microsoft.Authorization/roleAssignments/read"
    ],
    "NotActions": [],
    "AssignableScopes": [],
    "Description": "Azure SetupAsService",
    "IsCustom": "true"
}

```

2. Modify the JSON by adding your Azure subscription ID to the assignable scope.

#### Example

```

"AssignableScopes": [
  "/subscriptions/d333af45-0d07-4154-943d-c25fbzzzzzzz"
],

```

3. Use the JSON file to create a custom role in Azure.

The following steps describe how to create the role by using Bash in Azure Cloud Shell.

- a. Start [Azure Cloud Shell](#) and choose the Bash environment.
- b. Upload the JSON file.



c. Enter the following Azure CLI command:

```
az role definition create --role-definition  
Policy_for_Setup_As_Service_Azure.json
```

You should now have a custom role called *Azure SetupAsService*. You can now apply this custom role to your user account or to a service principal.

### Step 3: Set up authentication

When creating the Connector from BlueXP, you need to provide a login that enables BlueXP to authenticate with Azure and deploy the VM. You have two options:

1. Sign in with your Azure account when prompted. This account must have specific Azure permissions. This is the default option.
2. Provide details about an Azure AD service principal. This service principal also requires specific permissions.

Follow the steps to prepare one of these authentication methods for use with BlueXP.



## Azure account

Assign the custom role to the user who will deploy the Connector from BlueXP.

### Steps

1. In the Azure portal, open the **Subscriptions** service and select the user's subscription.
2. Click **Access control (IAM)**.
3. Click **Add > Add role assignment** and then add the permissions:
  - a. Select the **Azure SetupAsService** role and click **Next**.



Azure SetupAsService is the default name provided in the Connector deployment policy for Azure. If you chose a different name for the role, then select that name instead.

- b. Keep **User, group, or service principal** selected.
- c. Click **Select members**, choose your user account, and click **Select**.
- d. Click **Next**.
- e. Click **Review + assign**.

### Result

The Azure user now has the permissions required to deploy the Connector from BlueXP.

## Service principal

Rather than logging in with your Azure account, you can provide BlueXP with the credentials for an Azure service principal that has the required permissions.

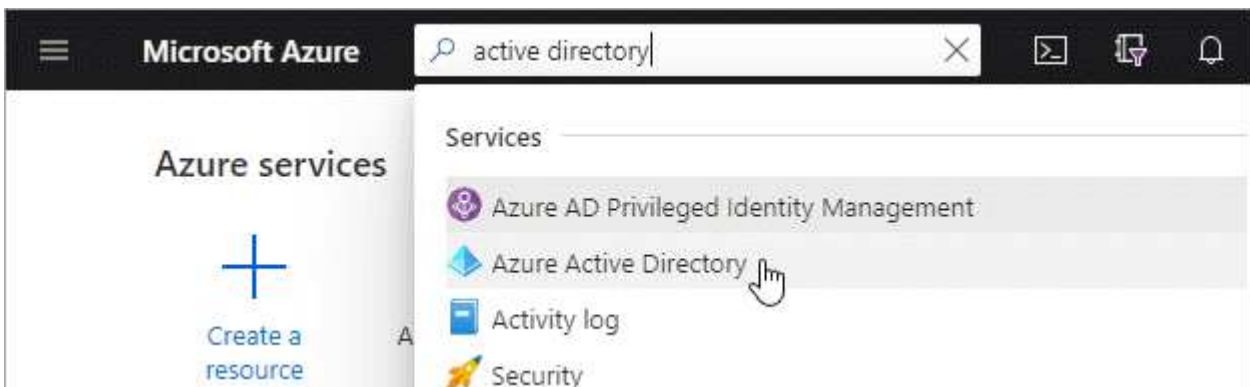
Create and set up a service principal in Azure Active Directory and obtain the Azure credentials that BlueXP needs.

### Create an Azure Active Directory application for role-based access control

1. Ensure that you have permissions in Azure to create an Active Directory application and to assign the application to a role.

For details, refer to [Microsoft Azure Documentation: Required permissions](#)

2. From the Azure portal, open the **Azure Active Directory** service.



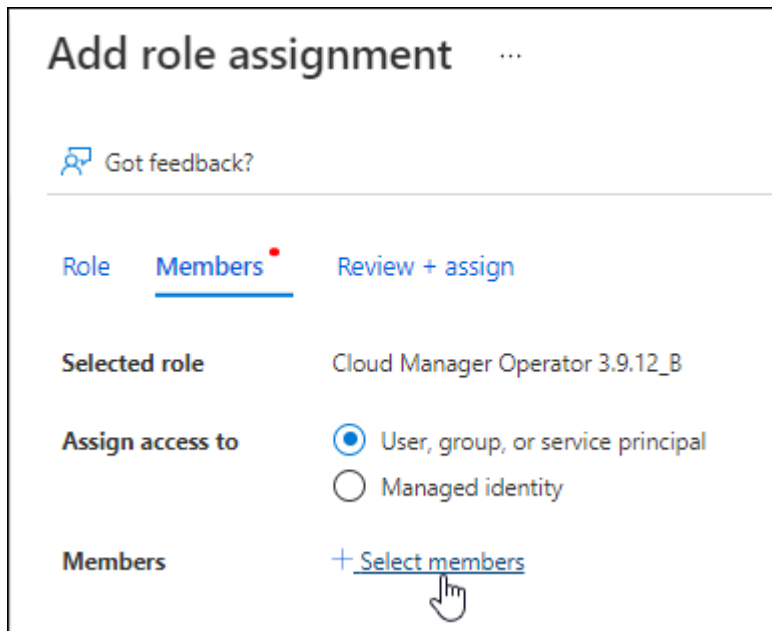
3. In the menu, select **App registrations**.

4. Select **New registration**.
5. Specify details about the application:
  - **Name**: Enter a name for the application.
  - **Account type**: Select an account type (any will work with BlueXP).
  - **Redirect URI**: You can leave this field blank.
6. Select **Register**.

You've created the AD application and service principal.

#### Assign the custom role to the application

1. From the Azure portal, open the **Subscriptions** service.
2. Select the subscription.
3. Click **Access control (IAM) > Add > Add role assignment**.
4. In the **Role** tab, select the **BlueXP Operator** role and click **Next**.
5. In the **Members** tab, complete the following steps:
  - a. Keep **User, group, or service principal** selected.
  - b. Click **Select members**.



- c. Search for the name of the application.

Here's an example:



- d. Select the application and click **Select**.
  - e. Click **Next**.
6. Click **Review + assign**.

The service principal now has the required Azure permissions to deploy the Connector.

If you want to manage resources in multiple Azure subscriptions, then you must bind the service principal to each of those subscriptions. For example, BlueXP enables you to select the subscription that you want to use when deploying Cloud Volumes ONTAP.

#### **Add Windows Azure Service Management API permissions**

1. In the **Azure Active Directory** service, select **App registrations** and select the application.
2. Select **API permissions > Add a permission**.
3. Under **Microsoft APIs**, select **Azure Service Management**.

## Request API permissions

### Select an API

Microsoft APIs [APIs my organization uses](#) [My APIs](#)

#### Commonly used Microsoft APIs

**Microsoft Graph**  
Take advantage of the tremendous amount of data in Office 365, Enterprise Mobility + Security, and Windows 10. Access Azure AD, Excel, Intune, Outlook/Exchange, OneDrive, OneNote, SharePoint, Planner, and more through a single endpoint.



**Azure Batch**  
Schedule large-scale parallel and HPC applications in the cloud

**Azure Data Catalog**  
Programmatic access to Data Catalog resources to register, annotate and search data assets

**Azure Data Explorer**  
Perform ad-hoc queries on terabytes of data to build near real-time and complex analytics solutions

**Azure Data Lake**  
Access to storage and compute for big data analytic scenarios

**Azure DevOps**  
Integrate with Azure DevOps and Azure DevOps server

**Azure Import/Export**  
Programmatic control of import/export jobs

**Azure Key Vault**  
Manage your key vaults as well as the keys, secrets, and certificates within your Key Vaults

**Azure Rights Management Services**  
Allow validated users to read and write protected content

**Azure Service Management**  
Programmatic access to much of the functionality available through the Azure portal

**Azure Storage**  
Secure, massively scalable object and data lake storage for unstructured and semi-structured data

**Customer Insights**  
Create profile and interaction models for your products

**Data Export Service for Microsoft Dynamics 365**  
Export data from Microsoft Dynamics CRM organization to an external destination

4. Select **Access Azure Service Management as organization users** and then select **Add permissions**.

## Request API permissions

[< All APIs](#)



Azure Service Management

<https://management.azure.com/> [Docs](#) [🔗](#)

What type of permissions does your application require?

### Delegated permissions

Your application needs to access the API as the signed-in user.

### Application permissions

Your application runs as a background service or daemon without a signed-in user.

Select permissions

[expand all](#)

Type to search

PERMISSION

ADMIN CONSENT REQUIRED



user\_impersonation

Access Azure Service Management as organization users (preview) ⓘ

## Get the application ID and directory ID for the application

1. In the **Azure Active Directory** service, select **App registrations** and select the application.
2. Copy the **Application (client) ID** and the **Directory (tenant) ID**.



When you add the Azure account to BlueXP, you need to provide the application (client) ID and the directory (tenant) ID for the application. BlueXP uses the IDs to programmatically sign in.

## Create a client secret

1. Open the **Azure Active Directory** service.
2. Select **App registrations** and select your application.
3. Select **Certificates & secrets > New client secret**.
4. Provide a description of the secret and a duration.
5. Select **Add**.
6. Copy the value of the client secret.

## Client secrets

A secret string that the application uses to prove its identity when requesting a token. Also can be referred to as application password.

[+ New client secret](#)

DESCRIPTION	EXPIRES	VALUE	Copy to clipboard
test secret	8/16/2020	*sZ1jSe2By:D*-ZRoV4NLfdAcY7:+0vA	

You now have a client secret that BlueXP can use it to authenticate with Azure AD.

### Result

Your service principal is now setup and you should have copied the application (client) ID, the directory (tenant) ID, and the value of the client secret. You need to enter this information in BlueXP when you create the Connector.

## Step 4: Create the Connector

Create the Connector directly from the BlueXP web-based console.

### About this task

Creating the Connector from BlueXP deploys a virtual machine in Azure using a default configuration. [Learn about the default configuration for the Connector.](#)

### Before you begin

You should have the following:

- An Azure subscription.
- A VNet and subnet in your Azure region of choice.
- Details about a proxy server, if your organization requires a proxy for all outgoing internet traffic:
  - IP address
  - Credentials
  - HTTPS certificate
- An SSH public key, if you want to use that authentication method for the Connector virtual machine. The other option for the authentication method is to use a password.

[Learn about connecting to a Linux VM in Azure](#)

- If you don't want BlueXP to automatically create an Azure role for the Connector, then you'll need to create your own [using the policy on this page](#).

These permissions are for the Connector instance itself. It's a different set of permissions than what you previously set up to deploy the Connector VM.

### Steps

1. Select the **Connector** drop-down and select **Add Connector**.



2. Choose **Microsoft Azure** as your cloud provider.
3. On the **Deploying a Connector** page:
  - a. Under **Authentication**, select the authentication option that matches how you set up Azure permissions:
    - Select **Azure user account** to log in to your Microsoft account, which should have the required permissions.

The form is owned and hosted by Microsoft. Your credentials are not provided to NetApp.



If you're already logged in to an Azure account, then BlueXP will automatically use that account. If you have multiple accounts, then you might need to log out first to ensure that you're using the right account.

- Select **Active Directory service principal** to enter information about the Azure Active Directory service principal that grants the required permissions:
  - Application (client) ID
  - Directory (tenant) ID
  - Client Secret

[Learn how to obtain these values for a service principal.](#)

4. Follow the steps in the wizard to create the Connector:
  - **VM Authentication:** Choose an Azure subscription, a location, a new resource group or an existing resource group, and then choose an authentication method for the Connector virtual machine that you're creating.

The authentication method for the virtual machine can be a password or an SSH public key.

[Learn about connecting to a Linux VM in Azure](#)

- **Details:** Enter a name for the instance, specify tags, and choose whether you want BlueXP to create a new role that has the required permissions, or if you want to select an existing role that you set up with [the required permissions](#).

Note that you can choose the Azure subscriptions associated with this role. Each subscription that you choose provides the Connector permissions to manage resources in that subscription (for example, Cloud Volumes ONTAP).

- **Network:** Choose a VNet and subnet, whether to enable a public IP address, and optionally specify a proxy configuration.
- **Security Group:** Choose whether to create a new security group or whether to select an existing security group that allows the required inbound and outbound rules.

[View security group rules for Azure.](#)

- **Review:** Review your selections to verify that your set up is correct.

5. Click **Add**.

The virtual machine should be ready in about 7 minutes. You should stay on the page until the process is complete.

## Result

After the process is complete, the Connector is available for use from BlueXP.

# Create a Connector from the Azure Marketplace

To create a Connector from the Azure Marketplace, you need to set up your networking, prepare Azure permissions, review instance requirements, and then create the Connector.

## Before you begin

You should review [Connector limitations](#).

## Step 1: Set up networking

Ensure that the network location where you plan to install the Connector supports the following requirements. Meeting these requirements enables the Connector to manage resources and processes within your hybrid cloud environment.

### Azure region

If you use Cloud Volumes ONTAP, the Connector should be deployed in the same Azure region as the Cloud Volumes ONTAP systems that it manages, or in the [Azure region pair](#) for the Cloud Volumes ONTAP systems. This requirement ensures that an Azure Private Link connection is used between Cloud Volumes ONTAP and its associated storage accounts.

[Learn how Cloud Volumes ONTAP uses an Azure Private Link](#)

### VNet and subnet

When you create the Connector, you need to specify the VNet and subnet where the Connector should reside.

### Connections to target networks

A Connector requires a network connection to the location where you're planning to create and manage working environments. For example, the network where you plan to create Cloud Volumes ONTAP systems or a storage system in your on-premises environment.

### Outbound internet access

The network location where you deploy the Connector must have an outbound internet connection to contact specific endpoints.



## Endpoints contacted from the Connector

The Connector requires outbound internet access to contact the following endpoints in order to manage resources and processes within your public cloud environment for day-to-day operations.

Endpoints	Purpose
<a href="https://management.azure.com">https://management.azure.com</a> <a href="https://login.microsoftonline.com">https://login.microsoftonline.com</a> <a href="https://blob.core.windows.net">https://blob.core.windows.net</a> <a href="https://core.windows.net">https://core.windows.net</a>	To manage resources in Azure public regions.
<a href="https://management.chinacloudapi.cn">https://management.chinacloudapi.cn</a> <a href="https://login.chinacloudapi.cn">https://login.chinacloudapi.cn</a> <a href="https://blob.core.chinacloudapi.cn">https://blob.core.chinacloudapi.cn</a> <a href="https://core.chinacloudapi.cn">https://core.chinacloudapi.cn</a>	To manage resources in Azure China regions.
<a href="https://support.netapp.com">https://support.netapp.com</a>	To obtain licensing information and to send AutoSupport messages to NetApp support.
<a href="https://*.api.blueexp.netapp.com">https://*.api.blueexp.netapp.com</a> <a href="https://api.blueexp.netapp.com">https://api.blueexp.netapp.com</a> <a href="https://*.cloudmanager.cloud.netapp.com">https://*.cloudmanager.cloud.netapp.com</a> <a href="https://cloudmanager.cloud.netapp.com">https://cloudmanager.cloud.netapp.com</a> <a href="https://netapp-cloud-account.auth0.com">https://netapp-cloud-account.auth0.com</a>	To provide SaaS features and services within BlueXP.  Note that the Connector is currently contacting "cloudmanager.cloud.netapp.com" but it will start contacting "api.blueexp.netapp.com" in an upcoming release.
<a href="https://*.blob.core.windows.net">https://*.blob.core.windows.net</a> <a href="https://cloudmanagerinfraprod.azurecr.io">https://cloudmanagerinfraprod.azurecr.io</a>	To upgrade the Connector and its Docker components.

## Proxy server

If your organization requires deployment of a proxy server for all outgoing internet traffic, obtain the following information about your HTTP or HTTPS proxy. You'll need to provide this information during installation.

- IP address
- Credentials
- HTTPS certificate

## Ports

There's no incoming traffic to the Connector, unless you initiate it or if the Connector is used as a proxy to send AutoSupport messages from Cloud Volumes ONTAP to NetApp Support.

- HTTP (80) and HTTPS (443) provide access to the local UI, which you'll use in rare circumstances.
- SSH (22) is only needed if you need to connect to the host for troubleshooting.
- Inbound connections over port 3128 are required if you deploy Cloud Volumes ONTAP systems in a subnet where an outbound internet connection isn't available.

If Cloud Volumes ONTAP systems don't have an outbound internet connection to send AutoSupport messages, BlueXP automatically configures those systems to use a proxy server that's included with the Connector. The only requirement is to ensure that the Connector's security group allows inbound connections over port 3128. You'll need to open this port after you deploy the Connector.

## Step 2: Review VM requirements

When you create the Connector, you need to choose a virtual machine type that meets the following requirements.

### CPU

4 cores or 4 vCPUs

### RAM

14 GB

### Azure VM size

An instance type that meets the CPU and RAM requirements above. We recommend DS3 v2.

## Step 3: Set up permissions

You can provide permissions in the following ways:

- Option 1: Assign a custom role to the Azure VM using a system-assigned managed identity.
- Option 2: Provide BlueXP with the credentials for an Azure service principal that has the required permissions.

Follow these steps to set up permissions for BlueXP.

## Custom role

Note that you can create an Azure custom role using the Azure portal, Azure PowerShell, Azure CLI, or REST API. The following steps show how to create the role using the Azure CLI. If you would prefer to use a different method, refer to [Azure documentation](#)

## Steps

1. If you're planning to manually install the software on your own host, enable a system-assigned managed identity on the VM so that you can provide the required Azure permissions through a custom role.

[Microsoft Azure documentation: Configure managed identities for Azure resources on a VM using the Azure portal](#)

2. Copy the contents of the [custom role permissions for the Connector](#) and save them in a JSON file.
3. Modify the JSON file by adding Azure subscription IDs to the assignable scope.

You should add the ID for each Azure subscription that you want to use with BlueXP.

## Example

```
"AssignableScopes": [  
  "/subscriptions/d333af45-0d07-4154-943d-c25fbzzzzzzz",  
  "/subscriptions/54b91999-b3e6-4599-908e-416e0zzzzzzz",  
  "/subscriptions/398e471c-3b42-4ae7-9b59-ce5bbzzzzzzz"
```

4. Use the JSON file to create a custom role in Azure.

The following steps describe how to create the role by using Bash in Azure Cloud Shell.

- a. Start [Azure Cloud Shell](#) and choose the Bash environment.
- b. Upload the JSON file.



c. Use the Azure CLI to create the custom role:

```
az role definition create --role-definition Connector_Policy.json
```

## Result

You should now have a custom role called BlueXP Operator that you can assign to the Connector virtual machine.

## Service principal

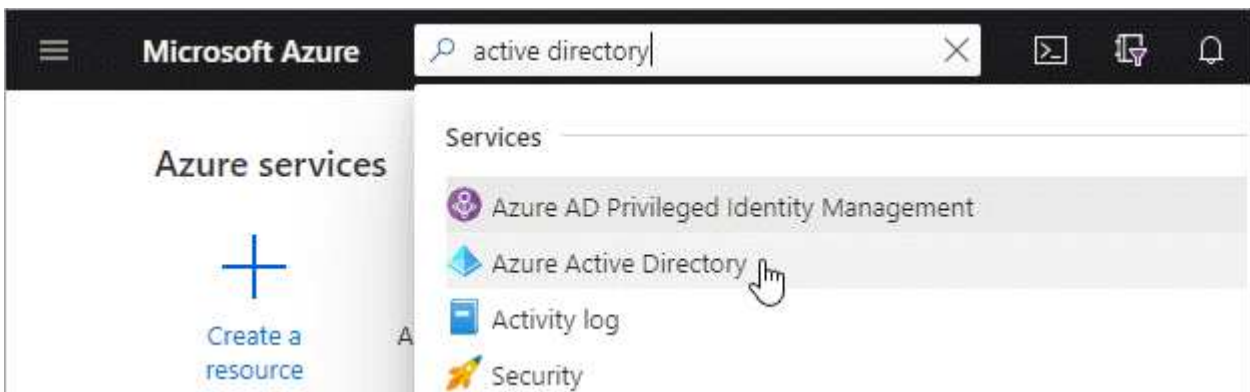
Create and set up a service principal in Azure Active Directory and obtain the Azure credentials that BlueXP needs.

### Create an Azure Active Directory application for role-based access control

1. Ensure that you have permissions in Azure to create an Active Directory application and to assign the application to a role.

For details, refer to [Microsoft Azure Documentation: Required permissions](#)

2. From the Azure portal, open the **Azure Active Directory** service.



3. In the menu, select **App registrations**.
4. Select **New registration**.
5. Specify details about the application:
  - **Name:** Enter a name for the application.
  - **Account type:** Select an account type (any will work with BlueXP).
  - **Redirect URI:** You can leave this field blank.
6. Select **Register**.

You've created the AD application and service principal.

### Assign the application to a role

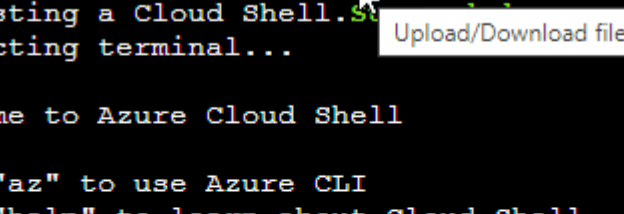
1. Create a custom role:

Note that you can create an Azure custom role using the Azure portal, Azure PowerShell, Azure CLI, or REST API. The following steps show how to create the role using the Azure CLI. If you would prefer to use a different method, refer to [Azure documentation](#)

- You should add the ID for each Azure subscription from which users will create Cloud Volumes ONTAP systems.

```
"AssignableScopes": [
  "/subscriptions/d333af45-0d07-4154-943d-c25fbzzzzzzz",
  "/subscriptions/54b91999-b3e6-4599-908e-416e0zzzzzzz",
  "/subscriptions/398e471c-3b42-4ae7-9b59-ce5bbzzzzzzz"
```

- The following steps describe how to create the role by using Bash in Azure Cloud Shell.

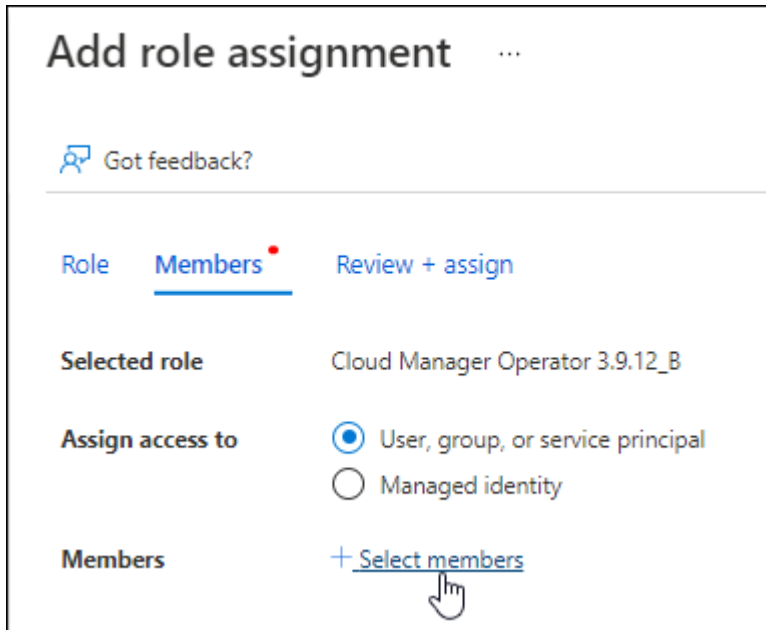
- 
- Bash
- Requesting a Cloud Shell. Success!  
Connecting terminal...
- Welcome to Azure Cloud Shell
- Type "az" to use Azure CLI  
Type "help" to learn about Cloud Shell
- bcammett@Azure:~\$

- ```
az role definition create --role-definition
Connector Policy.json
```

2. Assign the application to the role:

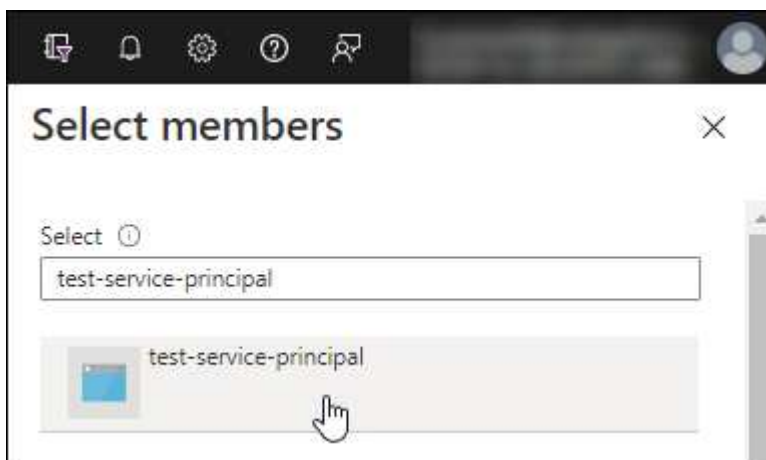
- 19

- b. Select the subscription.
- c. Select **Access control (IAM) > Add > Add role assignment**.
- d. In the **Role** tab, select the **BlueXP Operator** role and select **Next**.
- e. In the **Members** tab, complete the following steps:
  - Keep **User, group, or service principal** selected.
  - Select **Select members**.



- Search for the name of the application.

Here's an example:



- Select the application and select **Select**.
  - Select **Next**.
- f. Select **Review + assign**.

The service principal now has the required Azure permissions to deploy the Connector.

If you want to deploy Cloud Volumes ONTAP from multiple Azure subscriptions, then you must

bind the service principal to each of those subscriptions. BlueXP enables you to select the subscription that you want to use when deploying Cloud Volumes ONTAP.

### Add Windows Azure Service Management API permissions

1. In the **Azure Active Directory** service, select **App registrations** and select the application.
2. Select **API permissions > Add a permission**.
3. Under **Microsoft APIs**, select **Azure Service Management**.


#### Request API permissions


Select an API


Microsoft APIs **APIs my organization uses** My APIs


Commonly used Microsoft APIs


**Microsoft Graph**  
Take advantage of the tremendous amount of data in Office 365, Enterprise Mobility + Security, and Windows 10. Access Azure AD, Excel, Intune, Outlook/Exchange, OneDrive, OneNote, SharePoint, Planner, and more through a single endpoint.





**Azure Batch**  
Schedule large-scale parallel and HPC applications in the cloud


**Azure Data Catalog**  
Programmatic access to Data Catalog resources to register, annotate and search data assets


**Azure Data Explorer**  
Perform ad-hoc queries on terabytes of data to build near real-time and complex analytics solutions


**Azure Data Lake**  
Access to storage and compute for big data analytic scenarios


**Azure DevOps**  
Integrate with Azure DevOps and Azure DevOps server


**Azure Import/Export**  
Programmatic control of import/export jobs


**Azure Key Vault**  
Manage your key vaults as well as the keys, secrets, and certificates within your Key Vaults

**Azure Rights Management Services**  
Allow validated users to read and write protected content

**Azure Service Management**  
Programmatic access to much of the functionality available through the Azure portal

**Azure Storage**  
Secure, massively scalable object and data lake storage for unstructured and semi-structured data

**Customer Insights**  
Create profile and interaction models for your products

**Data Export Service for Microsoft Dynamics 365**  
Export data from Microsoft Dynamics CRM organization to an external destination

4. Select **Access Azure Service Management as organization users** and then select **Add permissions**.

## Request API permissions

[< All APIs](#)



Azure Service Management

<https://management.azure.com/> [Docs](#) [🔗](#)

What type of permissions does your application require?

### Delegated permissions

Your application needs to access the API as the signed-in user.

### Application permissions

Your application runs as a background service or daemon without a signed-in user.

Select permissions

[expand all](#)

Type to search

PERMISSION

ADMIN CONSENT REQUIRED



user\_impersonation

Access Azure Service Management as organization users (preview) ⓘ

## Get the application ID and directory ID for the application

1. In the **Azure Active Directory** service, select **App registrations** and select the application.
2. Copy the **Application (client) ID** and the **Directory (tenant) ID**.



When you add the Azure account to BlueXP, you need to provide the application (client) ID and the directory (tenant) ID for the application. BlueXP uses the IDs to programmatically sign in.

## Create a client secret


1. Open the **Azure Active Directory** service.
2. Select **App registrations** and select your application.
3. Select **Certificates & secrets > New client secret**.
4. Provide a description of the secret and a duration.
5. Select **Add**.
6. Copy the value of the client secret.



## Client secrets

A secret string that the application uses to prove its identity when requesting a token. Also can be referred to as application password.

[+ New client secret](#)

| DESCRIPTION | EXPIRES   | VALUE                            | Copy to clipboard                                                                   |
|-------------|-----------|----------------------------------|-------------------------------------------------------------------------------------|
| test secret | 8/16/2020 | *sZ1jSe2By:D*-ZRoV4NLfdAcY7:+0vA |  |

You now have a client secret that BlueXP can use it to authenticate with Azure AD.

### Result

Your service principal is now setup and you should have copied the application (client) ID, the directory (tenant) ID, and the value of the client secret. You need to enter this information in BlueXP when you add an Azure account.

## Step 4: Create the Connector

Launch the Connector directly from the Azure Marketplace.

### About this task

Creating the Connector from the Azure Marketplace deploys a virtual machine in Azure using a default configuration. [Learn about the default configuration for the Connector.](#)

### Before you begin

You should have the following:

- An Azure subscription.
- A VNet and subnet in your Azure region of choice.
- Details about a proxy server, if your organization requires a proxy for all outgoing internet traffic:
  - IP address
  - Credentials
  - HTTPS certificate
- An SSH public key, if you want to use that authentication method for the Connector virtual machine. The other option for the authentication method is to use a password.

[Learn about connecting to a Linux VM in Azure](#)

- If you don't want BlueXP to automatically create an Azure role for the Connector, then you'll need to create your own [using the policy on this page](#).

These permissions are for the Connector instance itself. It's a different set of permissions than what you previously set up to deploy the Connector VM.

### Steps

1. Go to the NetApp Connector VM page in the Azure Marketplace.

[Azure Marketplace page for commercial regions](#)

2. Select **Get it now** and then select **Continue**.
3. From the Azure portal, select **Create** and follow the steps to configure the virtual machine.

Note the following as you configure the VM:

- **VM size:** Choose a VM size that meets CPU and RAM requirements. We recommend DS3 v2.
- **Disks:** The Connector can perform optimally with either HDD or SSD disks.
- **Network security group:** The Connector requires inbound connections using SSH, HTTP, and HTTPS.

[View security group rules for Azure.](#)

- **Identity:** Under **Management**, select **Enable system assigned managed identity**.

This setting is important because a managed identity allows the Connector virtual machine to identify itself to Azure Active Directory without providing any credentials. [Learn more about managed identities for Azure resources.](#)

4. On the **Review + create** page, review your selections and select **Create** to start the deployment.

Azure deploys the virtual machine with the specified settings. The virtual machine and Connector software should be running in approximately five minutes.

5. Open a web browser from a host that has a connection to the Connector virtual machine and enter the following URL:

`https://ipaddress`

6. After you log in, set up the Connector:
  - a. Specify the BlueXP account to associate with the Connector.
  - b. Enter a name for the system.
  - c. Under **Are you running in a secured environment?** keep restricted mode disabled.

You should keep restricted mode disabled because these steps describe how to use BlueXP in standard mode. You should enable restricted mode only if you have a secure environment and want to disconnect this account from BlueXP backend services. If that's the case, [follow steps to get started with BlueXP in restricted mode.](#)

- d. Select **Let's start**.

The Connector is now installed and is set up with your BlueXP account.

## Step 5: Provide permissions to BlueXP

Now that you've created the Connector, you need to provide BlueXP with the permissions that you previously set up. Providing the permissions enables BlueXP to manage your data and storage infrastructure in Azure.

## Custom role

Go to the Azure portal and assign the Azure custom role to the Connector virtual machine for one or more subscriptions.

### Steps

1. From the Azure Portal, open the **Subscriptions** service and select your subscription.
2. Select **Access control (IAM) > Add > Add role assignment**.
3. In the **Role** tab, select the **BlueXP Operator** role and select **Next**.



BlueXP Operator is the default name provided in the BlueXP policy. If you chose a different name for the role, then select that name instead.

4. In the **Members** tab, complete the following steps:
  - a. Assign access to a **Managed identity**.
  - b. Select **Select members**, select the subscription in which the Connector virtual machine was created, choose **Virtual machine**, and then select the Connector virtual machine.
  - c. Select **Select**.
  - d. Select **Next**.
  - e. Select **Review + assign**.
  - f. If you want to manage resources in additional Azure subscriptions, switch to that subscription and then repeat these steps.

## Result

BlueXP now has the permissions that it needs to perform actions in Azure on your behalf.

## What's next?

Go to the [BlueXP console](#) to start using the Connector with BlueXP.

## Service principal

### Steps

1. In the upper right of the BlueXP console, select the Settings icon, and select **Credentials**.



2. Select **Add Credentials** and follow the steps in the wizard.
  - a. **Credentials Location:** Select **Microsoft Azure > Connector**.
  - b. **Define Credentials:** Enter information about the Azure Active Directory service principal that grants the required permissions:
    - Application (client) ID
    - Directory (tenant) ID
    - Client Secret
  - c. **Marketplace Subscription:** Associate a Marketplace subscription with these credentials by

subscribing now or by selecting an existing subscription.

d. **Review:** Confirm the details about the new credentials and select **Add**.

#### **Result**

BlueXP now has the permissions that it needs to perform actions in Azure on your behalf.

## **Manually install the Connector in Azure**

To manually install the Connector on your own Linux host, you need to review host requirements, set up your networking, prepare Azure permissions, install the Connector, and then provide the permissions that you prepared.

### **Before you begin**

You should review [Connector limitations](#).

### **Step 1: Review host requirements**

The Connector software must run on a host that meets specific operating system requirements, RAM requirements, port requirements, and so on.

#### **Dedicated host**

The Connector is not supported on a host that is shared with other applications. The host must be a dedicated host.

#### **Supported operating systems**

- Ubuntu 22.04
- CentOS 7.6, 7.7, 7.8, and 7.9
- Red Hat Enterprise Linux 7.6, 7.7, 7.8, and 7.9

The host must be registered with Red Hat Subscription Management. If it's not registered, the host can't access repositories to update required 3rd-party software during Connector installation.

The Connector is supported on English-language versions of these operating systems.

#### **Hypervisor**

A bare metal or hosted hypervisor that is certified to run Ubuntu, CentOS, or Red Hat Enterprise Linux is required.

[Red Hat Solution: Which hypervisors are certified to run Red Hat Enterprise Linux?](#)

#### **CPU**

4 cores or 4 vCPUs

#### **RAM**

14 GB

#### **Azure VM size**

An instance type that meets the CPU and RAM requirements above. We recommend DS3 v2.

### Disk space in /opt

100 GiB of space must be available

### Disk space in /var

20 GiB of space must be available

### Docker Engine

Docker Engine version 19.3.1 or later is required on the host before you install the Connector. [View installation instructions](#)

## Step 2: Set up networking

Ensure that the network location where you plan to install the Connector supports the following requirements. Meeting these requirements enables the Connector to manage resources and processes within your hybrid cloud environment.

### Azure region

If you use Cloud Volumes ONTAP, the Connector should be deployed in the same Azure region as the Cloud Volumes ONTAP systems that it manages, or in the [Azure region pair](#) for the Cloud Volumes ONTAP systems. This requirement ensures that an Azure Private Link connection is used between Cloud Volumes ONTAP and its associated storage accounts.

[Learn how Cloud Volumes ONTAP uses an Azure Private Link](#)

### Connections to target networks

A Connector requires a network connection to the location where you're planning to create and manage working environments. For example, the network where you plan to create Cloud Volumes ONTAP systems or a storage system in your on-premises environment.

### Outbound internet access

The network location where you deploy the Connector must have an outbound internet connection to contact specific endpoints.

### Endpoints contacted during manual installation

When you manually install the Connector on your own Linux host, the installer for the Connector requires access to the following URLs during the installation process:

- <https://support.netapp.com>
- <https://mysupport.netapp.com>
- <https://cloudmanager.cloud.netapp.com/tenancy>
- <https://stream.cloudmanager.cloud.netapp.com>
- <https://production-artifacts.cloudmanager.cloud.netapp.com>
- [https://\\*.blob.core.windows.net](https://*.blob.core.windows.net)
- <https://cloudmanagerinfraprod.azurecr.io>

The host might try to update operating system packages during installation. The host can contact different mirroring sites for these OS packages.

## Endpoints contacted from the Connector

The Connector requires outbound internet access to contact the following endpoints in order to manage resources and processes within your public cloud environment for day-to-day operations.

| Endpoints                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Purpose                                                                                                                                                                                                                   |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <a href="https://management.azure.com">https://management.azure.com</a><br><a href="https://login.microsoftonline.com">https://login.microsoftonline.com</a><br><a href="https://blob.core.windows.net">https://blob.core.windows.net</a><br><a href="https://core.windows.net">https://core.windows.net</a>                                                                                                                                                | To manage resources in Azure public regions.                                                                                                                                                                              |
| <a href="https://management.chinacloudapi.cn">https://management.chinacloudapi.cn</a><br><a href="https://login.chinacloudapi.cn">https://login.chinacloudapi.cn</a><br><a href="https://blob.core.chinacloudapi.cn">https://blob.core.chinacloudapi.cn</a><br><a href="https://core.chinacloudapi.cn">https://core.chinacloudapi.cn</a>                                                                                                                    | To manage resources in Azure China regions.                                                                                                                                                                               |
| <a href="https://support.netapp.com">https://support.netapp.com</a>                                                                                                                                                                                                                                                                                                                                                                                         | To obtain licensing information and to send AutoSupport messages to NetApp support.                                                                                                                                       |
| <a href="https://*.api.blueexp.netapp.com">https://*.api.blueexp.netapp.com</a><br><a href="https://api.blueexp.netapp.com">https://api.blueexp.netapp.com</a><br><a href="https://*.cloudmanager.cloud.netapp.com">https://*.cloudmanager.cloud.netapp.com</a><br><a href="https://cloudmanager.cloud.netapp.com">https://cloudmanager.cloud.netapp.com</a><br><a href="https://netapp-cloud-account.auth0.com">https://netapp-cloud-account.auth0.com</a> | To provide SaaS features and services within BlueXP.<br><br>Note that the Connector is currently contacting "cloudmanager.cloud.netapp.com" but it will start contacting "api.blueexp.netapp.com" in an upcoming release. |
| <a href="https://*.blob.core.windows.net">https://*.blob.core.windows.net</a><br><a href="https://cloudmanagerinfraprod.azurecr.io">https://cloudmanagerinfraprod.azurecr.io</a>                                                                                                                                                                                                                                                                            | To upgrade the Connector and its Docker components.                                                                                                                                                                       |

## Proxy server

If your organization requires deployment of a proxy server for all outgoing internet traffic, obtain the following information about your HTTP or HTTPS proxy. You'll need to provide this information during installation.

- IP address
- Credentials
- HTTPS certificate

## Ports

There's no incoming traffic to the Connector, unless you initiate it or if the Connector is used as a proxy to send AutoSupport messages from Cloud Volumes ONTAP to NetApp Support.

- HTTP (80) and HTTPS (443) provide access to the local UI, which you'll use in rare circumstances.
- SSH (22) is only needed if you need to connect to the host for troubleshooting.
- Inbound connections over port 3128 are required if you deploy Cloud Volumes ONTAP systems in a subnet where an outbound internet connection isn't available.

If Cloud Volumes ONTAP systems don't have an outbound internet connection to send AutoSupport messages, BlueXP automatically configures those systems to use a proxy server that's included with the Connector. The only requirement is to ensure that the Connector's security group allows inbound connections over port 3128. You'll need to open this port after you deploy the Connector.

### **Step 3: Set up permissions**

You need to provide Azure permissions to BlueXP by using one of the following options:

- Option 1: Assign a custom role to the Azure VM using a system-assigned managed identity.
- Option 2: Provide BlueXP with the credentials for an Azure service principal that has the required permissions.

Follow the steps to prepare permissions for BlueXP.

## Custom role

Note that you can create an Azure custom role using the Azure portal, Azure PowerShell, Azure CLI, or REST API. The following steps show how to create the role using the Azure CLI. If you would prefer to use a different method, refer to [Azure documentation](#)

## Steps

1. If you're planning to manually install the software on your own host, enable a system-assigned managed identity on the VM so that you can provide the required Azure permissions through a custom role.

[Microsoft Azure documentation: Configure managed identities for Azure resources on a VM using the Azure portal](#)

2. Copy the contents of the [custom role permissions for the Connector](#) and save them in a JSON file.
3. Modify the JSON file by adding Azure subscription IDs to the assignable scope.

You should add the ID for each Azure subscription that you want to use with BlueXP.

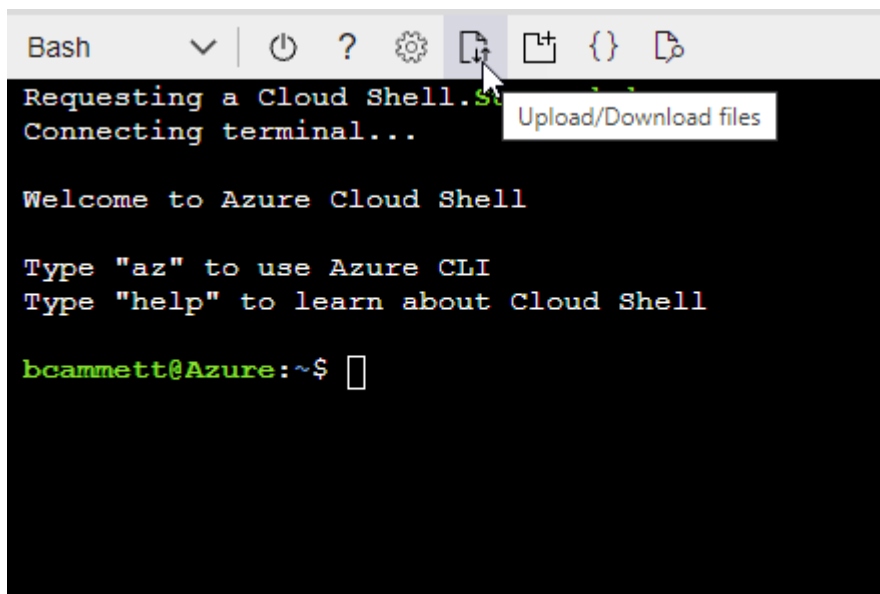
## Example

```
"AssignableScopes": [  
  "/subscriptions/d333af45-0d07-4154-943d-c25fbzzzzzzz",  
  "/subscriptions/54b91999-b3e6-4599-908e-416e0zzzzzzz",  
  "/subscriptions/398e471c-3b42-4ae7-9b59-ce5bbzzzzzzz"
```

4. Use the JSON file to create a custom role in Azure.

The following steps describe how to create the role by using Bash in Azure Cloud Shell.

- a. Start [Azure Cloud Shell](#) and choose the Bash environment.
- b. Upload the JSON file.





c. Use the Azure CLI to create the custom role:

```
az role definition create --role-definition Connector_Policy.json
```

## Result

You should now have a custom role called BlueXP Operator that you can assign to the Connector virtual machine.

## Service principal

Create and set up a service principal in Azure Active Directory and obtain the Azure credentials that BlueXP needs.

### Create an Azure Active Directory application for role-based access control

1. Ensure that you have permissions in Azure to create an Active Directory application and to assign the application to a role.

For details, refer to [Microsoft Azure Documentation: Required permissions](#)

2. From the Azure portal, open the **Azure Active Directory** service.



3. In the menu, select **App registrations**.
4. Select **New registration**.
5. Specify details about the application:
  - **Name:** Enter a name for the application.
  - **Account type:** Select an account type (any will work with BlueXP).
  - **Redirect URI:** You can leave this field blank.
6. Select **Register**.

You've created the AD application and service principal.

### Assign the application to a role

1. Create a custom role:

Note that you can create an Azure custom role using the Azure portal, Azure PowerShell, Azure CLI, or REST API. The following steps show how to create the role using the Azure CLI. If you would prefer to use a different method, refer to [Azure documentation](#)

- a. Copy the contents of the [custom role permissions for the Connector](#) and save them in a JSON file.
- b. Modify the JSON file by adding Azure subscription IDs to the assignable scope.

You should add the ID for each Azure subscription from which users will create Cloud Volumes ONTAP systems.

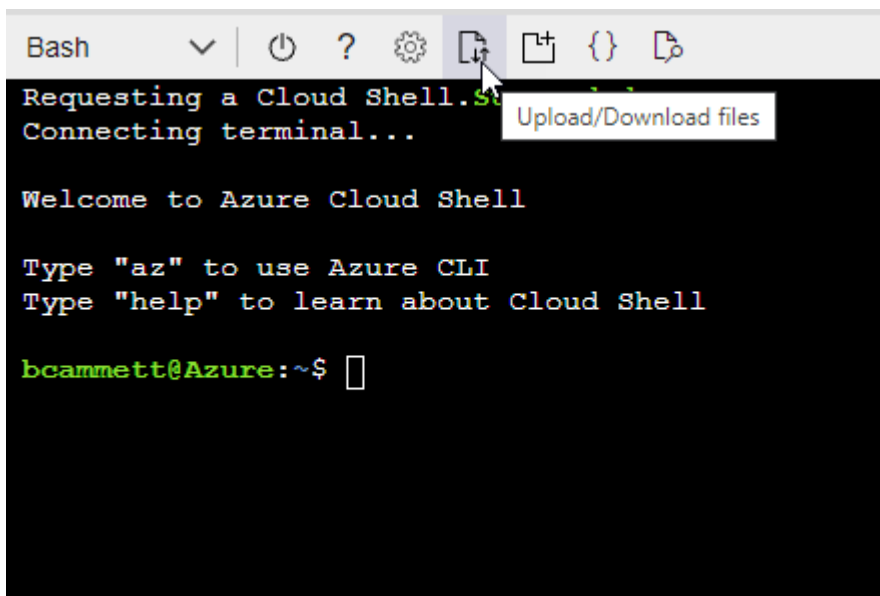
### Example

```
"AssignableScopes": [  
  "/subscriptions/d333af45-0d07-4154-943d-c25fbzzzzzzz",  
  "/subscriptions/54b91999-b3e6-4599-908e-416e0zzzzzzz",  
  "/subscriptions/398e471c-3b42-4ae7-9b59-ce5bbzzzzzzz"
```

- c. Use the JSON file to create a custom role in Azure.

The following steps describe how to create the role by using Bash in Azure Cloud Shell.

- Start [Azure Cloud Shell](#) and choose the Bash environment.
- Upload the JSON file.



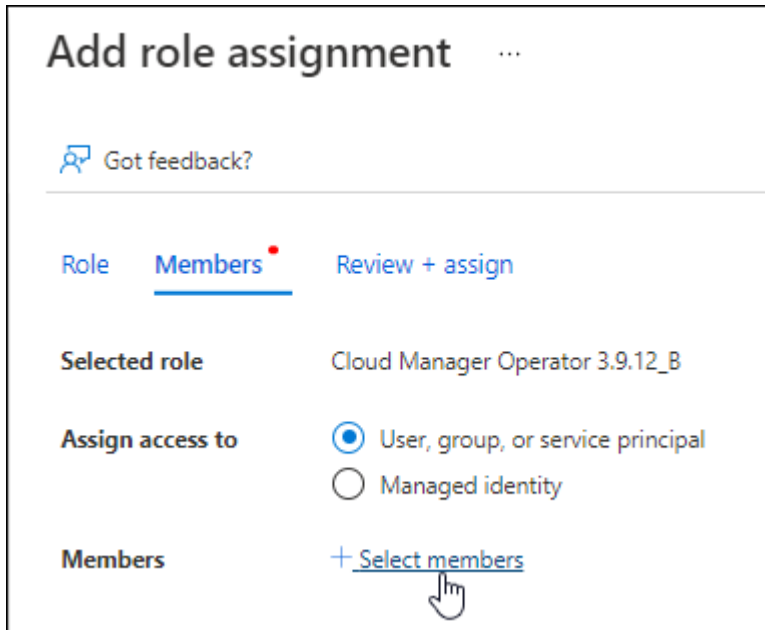
- Use the Azure CLI to create the custom role:

```
az role definition create --role-definition  
Connector_Policy.json
```

You should now have a custom role called BlueXP Operator that you can assign to the Connector virtual machine.

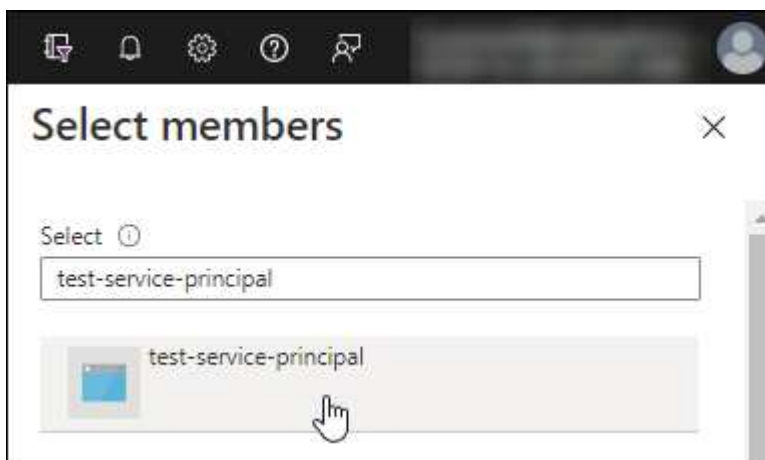
2. Assign the application to the role:
  - a. From the Azure portal, open the **Subscriptions** service.

- b. Select the subscription.
- c. Select **Access control (IAM) > Add > Add role assignment**.
- d. In the **Role** tab, select the **BlueXP Operator** role and select **Next**.
- e. In the **Members** tab, complete the following steps:
  - Keep **User, group, or service principal** selected.
  - Select **Select members**.



- Search for the name of the application.

Here's an example:



- Select the application and select **Select**.
  - Select **Next**.
- f. Select **Review + assign**.

The service principal now has the required Azure permissions to deploy the Connector.

If you want to deploy Cloud Volumes ONTAP from multiple Azure subscriptions, then you must

bind the service principal to each of those subscriptions. BlueXP enables you to select the subscription that you want to use when deploying Cloud Volumes ONTAP.

### Add Windows Azure Service Management API permissions

1. In the **Azure Active Directory** service, select **App registrations** and select the application.
2. Select **API permissions > Add a permission**.
3. Under **Microsoft APIs**, select **Azure Service Management**.


#### Request API permissions


Select an API


Microsoft APIs [APIs my organization uses](#) [My APIs](#)


Commonly used Microsoft APIs


**Microsoft Graph**  
Take advantage of the tremendous amount of data in Office 365, Enterprise Mobility + Security, and Windows 10. Access Azure AD, Excel, Intune, Outlook/Exchange, OneDrive, OneNote, SharePoint, Planner, and more through a single endpoint.





**Azure Batch**  
Schedule large-scale parallel and HPC applications in the cloud


**Azure Data Catalog**  
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Manage your key vaults as well as the keys, secrets, and certificates within your Key Vaults

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**Customer Insights**  
Create profile and interaction models for your products

**Data Export Service for Microsoft Dynamics 365**  
Export data from Microsoft Dynamics CRM organization to an external destination

4. Select **Access Azure Service Management as organization users** and then select **Add permissions**.

## Request API permissions

[← All APIs](#)



Azure Service Management

<https://management.azure.com/> [Docs](#) [↗](#)

What type of permissions does your application require?

### Delegated permissions

Your application needs to access the API as the signed-in user.

### Application permissions

Your application runs as a background service or daemon without a signed-in user.

Select permissions

[expand all](#)

Type to search

PERMISSION

ADMIN CONSENT REQUIRED



user\_impersonation

Access Azure Service Management as organization users (preview) ⓘ

## Get the application ID and directory ID for the application

1. In the **Azure Active Directory** service, select **App registrations** and select the application.
2. Copy the **Application (client) ID** and the **Directory (tenant) ID**.



When you add the Azure account to BlueXP, you need to provide the application (client) ID and the directory (tenant) ID for the application. BlueXP uses the IDs to programmatically sign in.

## Create a client secret

1. Open the **Azure Active Directory** service.
2. Select **App registrations** and select your application.
3. Select **Certificates & secrets > New client secret**.
4. Provide a description of the secret and a duration.
5. Select **Add**.
6. Copy the value of the client secret.

## Client secrets

A secret string that the application uses to prove its identity when requesting a token. Also can be referred to as application password.

[+ New client secret](#)

| DESCRIPTION | EXPIRES   | VALUE                            | Copy to clipboard |
|-------------|-----------|----------------------------------|-------------------|
| test secret | 8/16/2020 | *sZ1jSe2By:D*-ZRoV4NLfdAcY7:+0vA |                   |

You now have a client secret that BlueXP can use it to authenticate with Azure AD.

### Result

Your service principal is now setup and you should have copied the application (client) ID, the directory (tenant) ID, and the value of the client secret. You need to enter this information in BlueXP when you add an Azure account.

## Step 4: Install the Connector

After the pre-requisites are complete, you can manually install the software on your own Linux host.

### Before you begin

You should have the following:

- Root privileges to install the Connector.
- Details about a proxy server, if a proxy is required for internet access from the Connector.

You have the option to configure a proxy server after installation but doing so requires restarting the Connector.

- A CA-signed certificate, if the proxy server uses HTTPS or if the proxy is an intercepting proxy.
- A managed identity enabled on the VM in Azure so that you can provide the required Azure permissions through a custom role.

[Microsoft Azure documentation: Configure managed identities for Azure resources on a VM using the Azure portal](#)

### About this task

The installer that is available on the NetApp Support Site might be an earlier version. After installation, the Connector automatically updates itself if a new version is available.

### Steps

1. Verify that docker is enabled and running.

```
sudo systemctl enable docker && sudo systemctl start docker
```

2. If the `http_proxy` or `https_proxy` system variables are set on the host, remove them:

```
unset http_proxy
unset https_proxy
```

If you don't remove these system variables, the installation will fail.

3. Download the Connector software from the [NetApp Support Site](#), and then copy it to the Linux host.

You should download the "online" Connector installer that's meant for use in your network or in the cloud. A separate "offline" installer is available for the Connector, but it's only supported with private mode deployments.

4. Assign permissions to run the script.

```
chmod +x OnCommandCloudManager-<version>
```

Where <version> is the version of the Connector that you downloaded.

5. Run the installation script.

```
./OnCommandCloudManager-<version> --proxy <HTTP or HTTPS proxy server>
--cacert <path and file name of a CA-signed certificate>
```

The --proxy and --cacert parameters are optional. If you have a proxy server, you will need to enter the parameter(s) as shown. The installer doesn't prompt you to provide information about a proxy.

Here's an example of the command using both optional parameters:

```
./OnCommandCloudManager-V3.9.26 --proxy
https://user:password@10.0.0.30:8080/ --cacert
/tmp/cacert/certificate.cer
```

--proxy configures the Connector to use an HTTP or HTTPS proxy server using one of the following formats:

- http://address:port
- http://username:password@address:port
- https://address:port
- https://username:password@address:port

The user must be a local user. Domain users are not supported.

--cacert specifies a CA-signed certificate to use for HTTPS access between the Connector and the proxy server. This parameter is required only if you specify an HTTPS proxy server or if the proxy is an intercepting proxy.

6. Wait for the installation to complete.

At the end of the installation, the Connector service (occm) restarts twice if you specified a proxy server.

7. Open a web browser from a host that has a connection to the Connector virtual machine and enter the following URL:

`https://ipaddress`

8. After you log in, set up the Connector:
  - a. Specify the BlueXP account to associate with the Connector.
  - b. Enter a name for the system.
  - c. Under **Are you running in a secured environment?** keep restricted mode disabled.

You should keep restricted mode disabled because these steps describe how to use BlueXP in standard mode. You should enable restricted mode only if you have a secure environment and want to disconnect this account from BlueXP backend services. If that's the case, [follow steps to get started with BlueXP in restricted mode](#).

- d. Select **Let's start**.

## Result

The Connector is now installed and is set up with your BlueXP account.

## Step 5: Provide permissions to BlueXP

Now that you've installed the Connector, you need to provide BlueXP with the Azure permissions that you previously set up. Providing the permissions enables BlueXP to manage your data and storage infrastructure in Azure.



## Custom role

Go to the Azure portal and assign the Azure custom role to the Connector virtual machine for one or more subscriptions.

### Steps

1. From the Azure Portal, open the **Subscriptions** service and select your subscription.
2. Select **Access control (IAM) > Add > Add role assignment**.
3. In the **Role** tab, select the **BlueXP Operator** role and select **Next**.



BlueXP Operator is the default name provided in the BlueXP policy. If you chose a different name for the role, then select that name instead.

4. In the **Members** tab, complete the following steps:
  - a. Assign access to a **Managed identity**.
  - b. Select **Select members**, select the subscription in which the Connector virtual machine was created, choose **Virtual machine**, and then select the Connector virtual machine.
  - c. Select **Select**.
  - d. Select **Next**.
  - e. Select **Review + assign**.
  - f. If you want to manage resources in additional Azure subscriptions, switch to that subscription and then repeat these steps.

## Result

BlueXP now has the permissions that it needs to perform actions in Azure on your behalf.

## What's next?

Go to the [BlueXP console](#) to start using the Connector with BlueXP.

## Service principal

### Steps

1. In the upper right of the BlueXP console, select the Settings icon, and select **Credentials**.



2. Select **Add Credentials** and follow the steps in the wizard.
  - a. **Credentials Location:** Select **Microsoft Azure > Connector**.
  - b. **Define Credentials:** Enter information about the Azure Active Directory service principal that grants the required permissions:
    - Application (client) ID
    - Directory (tenant) ID
    - Client Secret
  - c. **Marketplace Subscription:** Associate a Marketplace subscription with these credentials by

subscribing now or by selecting an existing subscription.

d. **Review**: Confirm the details about the new credentials and select **Add**.

### **Result**

BlueXP now has the permissions that it needs to perform actions in Azure on your behalf.

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