



## **Get started**

### **Set up and administration**

NetApp  
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# Get started

## Learn the basics

### Learn about BlueXP

NetApp BlueXP provides your organization with a single control plane that helps you build, protect, and govern data across your on-premises and cloud environments. The BlueXP SaaS platform includes storage and data services that provide storage management, data mobility, data protection, and data analysis and control. Management capabilities are provided through a web-based console and APIs.

### Features

The BlueXP platform provides four main pillars of data management: storage, mobility, protection, and analysis and control.

#### Storage

Discover, deploy, and manage storage, whether it's in AWS, Azure, Google Cloud, or on premises.

- Set up and use [Cloud Volumes ONTAP](#) for efficient, multi-protocol data management across clouds.
- Set up and use cloud file-storage services:
  - [Azure NetApp Files](#)
  - [Amazon FSx for ONTAP](#)
  - [Cloud Volumes Service for Google Cloud](#)
- Discover and manage [on-premises storage](#):
  - E-Series systems
  - ONTAP clusters
  - StorageGRID systems

#### Mobility

Move data where it's needed by syncing, copying, tiering, and caching data.

- [Cloud Sync](#)
- [Cloud Tiering](#)
- [Global File Cache](#)

#### Protection

Use automated protection mechanisms to protect data against data loss, unplanned outages, ransomware, and other cyber threats.

- [Cloud Backup](#)
- [Replication](#)
- [Ransomware Protection](#)
- [Kubernetes](#)

## Analysis and control

Use tools to monitor, map, and optimize your data storage and infrastructure.

- [Cloud Data Sense](#)
- [Digital Advisor](#)

[Learn more about how you can use BlueXP to help your organization](#)

## Supported cloud providers

BlueXP enables you to manage cloud storage and use cloud services in Amazon Web Services, Microsoft Azure, and Google Cloud.

## Cost

Pricing for BlueXP depends on the services that you plan to use. [Learn about BlueXP pricing](#)

## How BlueXP works

BlueXP includes a web-based console that's provided through the SaaS layer, accounts that provide multi-tenancy, and Connectors that manage Cloud Volumes ONTAP and other cloud services.

## Software-as-a-service

BlueXP is accessible through a [web-based console](#) and APIs. This SaaS experience enables you to automatically access the latest features as they're released and to easily switch between your BlueXP accounts and Connectors.

## BlueXP account

When you log in to BlueXP for the first time, you're prompted to create a *BlueXP account*. This account provides multi-tenancy and enables you to organize users and resources in isolated *workspaces*.

[Learn more about accounts.](#)

## Connectors

You don't need a Connector to get started with BlueXP, but you'll need to create a Connector to unlock all BlueXP features and services. A Connector enables the management of resources and processes across your on-premises and cloud environments. It's required to use Cloud Volumes ONTAP and other data services.

[Learn more about Connectors.](#)

## Restricted mode and private mode

BlueXP is also supported in environments that have security and connectivity restrictions. You can use *restricted mode* or *private mode* to limit outbound connectivity to the BlueXP SaaS layer.

[Learn more about BlueXP deployment modes.](#)

## SOC 2 Type 2 certification

An independent certified public accountant firm and services auditor examined BlueXP, Cloud Sync, Cloud Tiering, Cloud Data Sense, and Cloud Backup (BlueXP platform), and affirmed that they have achieved SOC 2

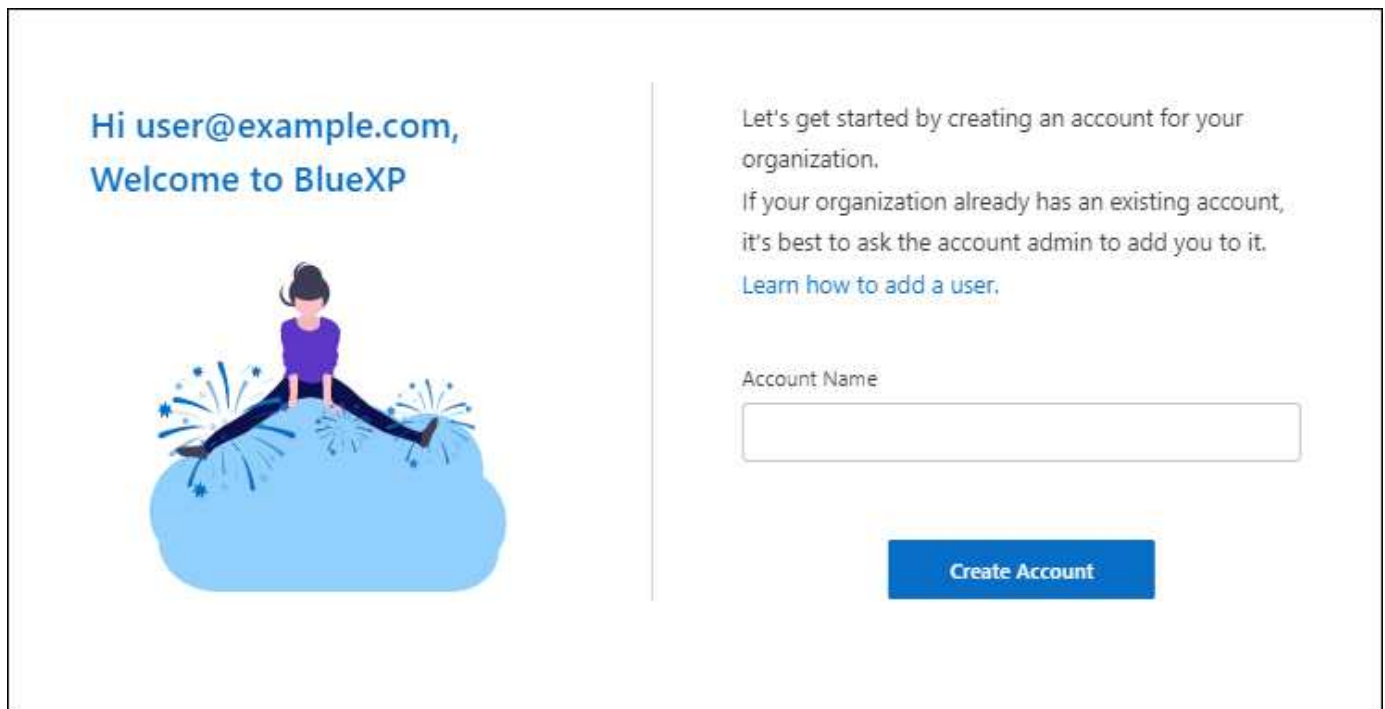
Type 2 reports based on the applicable Trust Services criteria.

[View NetApp's SOC 2 reports](#)

## Learn about BlueXP accounts

A *BlueXP account* provides multi-tenancy and enables you to organize users and resources in isolated workspaces from within BlueXP. For example, multiple users can deploy and manage Cloud Volumes ONTAP systems in isolated environments called *workspaces*. These workspaces are invisible to other users, unless they are shared.

When you first access BlueXP, you're prompted to select or create an account. For example, you'll see the following screen if you don't have an account yet:

The image shows a user interface for creating a BlueXP account. On the left, there is a greeting: "Hi user@example.com, Welcome to BlueXP" in blue text. Below the text is an illustration of a person in a purple shirt and black pants sitting on a large blue cloud, with small blue starburst effects around them. On the right side, there is instructional text: "Let's get started by creating an account for your organization." followed by "If your organization already has an existing account, it's best to ask the account admin to add you to it." and a link "Learn how to add a user." in blue. Below this text is a text input field labeled "Account Name". At the bottom right, there is a blue button with the text "Create Account" in white.

BlueXP Account Admins can then modify the settings for this account by managing users (members), workspaces, and Connectors:



[Learn how to manage your BlueXP account.](#)

## Deployment modes

BlueXP offers the following deployment modes for your account: standard mode, restricted mode, and private mode. These modes support environments that have varying levels of security and connectivity restrictions.

[Learn more about BlueXP deployment modes.](#)

## Members

Members are BlueXP users that you associate with your BlueXP account. Associating a user with an account and one or more workspaces in that account enables those users to create and manage working environments in BlueXP.

When you associate a user, you assign them a role:

- *Account Admin*: Can perform any action in BlueXP.
- *Workspace Admin*: Can create and manage resources in the assigned workspace.
- *Compliance Viewer*: Can only view Cloud Data Sense compliance information and generate reports for systems that they have permission to access.

[Learn more about these roles.](#)

## Workspaces

In BlueXP, a workspace isolates any number of *working environments* from other users in the account. Workspace Admins can't access the working environments in a workspace unless the Account Admin associates the admin with that workspace.

A working environment represents a storage system. For example:

- A Cloud Volumes ONTAP system

- An on-premises ONTAP cluster
- A Kubernetes cluster

[Learn how to add a workspace.](#)

## Connectors

A Connector executes the actions that BlueXP needs to perform in order to manage your data infrastructure. The Connector runs on a virtual machine instance that you deploy in your cloud provider or on an on-premises host that you configured.

You can use a Connector with more than one BlueXP service. For example, if you're using a Connector to manage Cloud Volumes ONTAP, you can use that same Connector with another service like Cloud Tiering.

[Learn more about Connectors.](#)

## Examples

The following examples depict how you might set up your accounts.

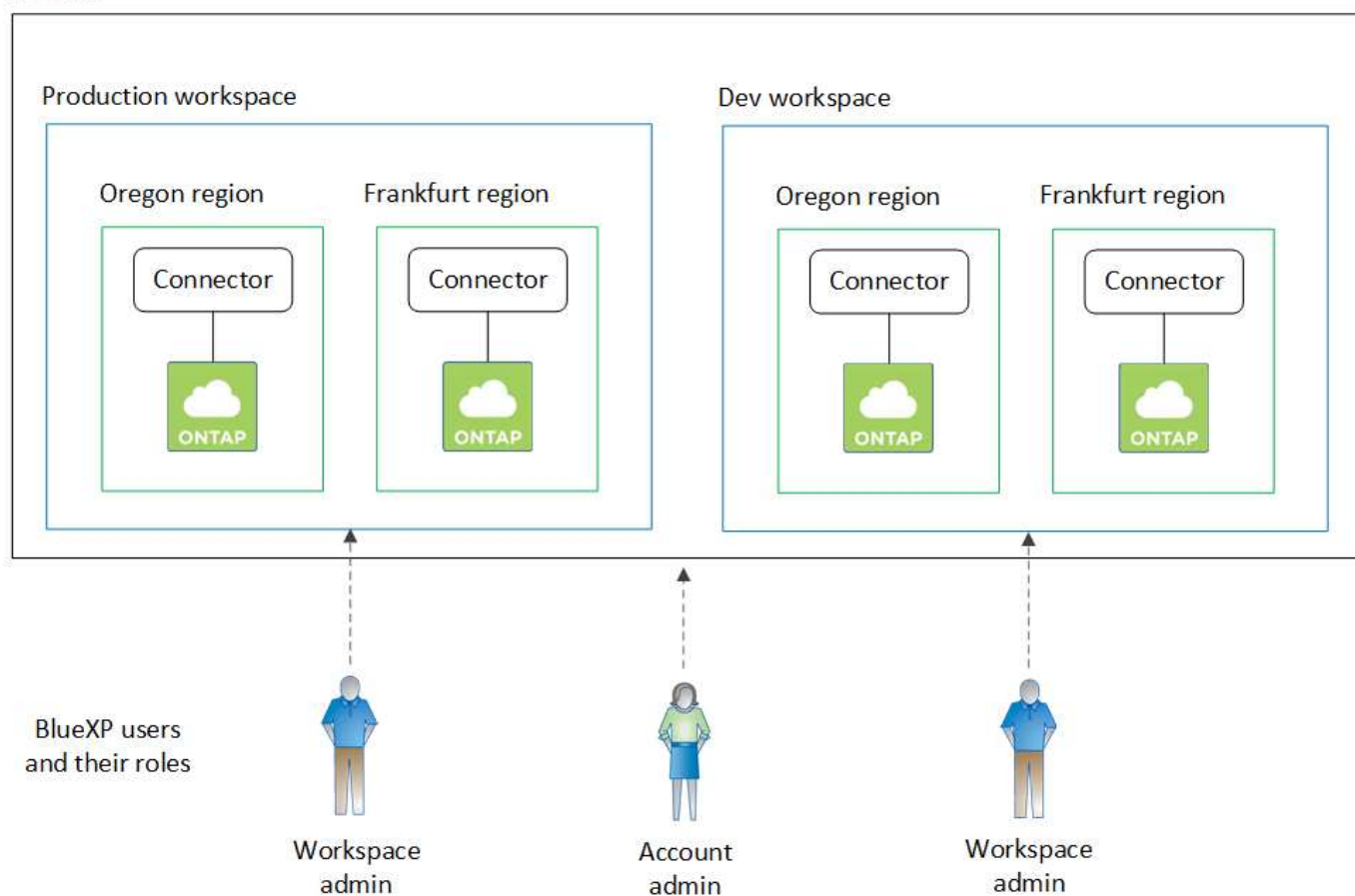


In both example images that follow, the Connector and the Cloud Volumes ONTAP systems don't actually reside *in* the BlueXP account—they're running in a cloud provider. This is a conceptual representation of the relationship between each component.

### Multiple workspaces

The following example shows an account that uses two workspaces to create isolated environments. The first workspace is for a production environment and the second is for a dev environment.

## Account



## Multiple accounts

Here's another example that shows the highest level of multi-tenancy by using two separate BlueXP accounts. For example, a service provider might use BlueXP in one account to provide services for their customers, while using another account to provide disaster recovery for one of their business units.

Note that account 2 includes two separate Connectors. This might happen if you have systems in separate regions or in separate cloud providers.





## Learn about Connectors

A *Connector* is NetApp software running in your cloud network or on-premises network. It executes the actions that BlueXP needs to perform in order to manage your data infrastructure. The Connector constantly polls the BlueXP SaaS layer for any actions that it needs to take. You don't need a Connector to get started with BlueXP, but you'll need to create a Connector to unlock all BlueXP features and services.

### What you can do without a Connector

A Connector isn't required to get started with BlueXP. You can use several features and services within BlueXP without ever creating a Connector.

You can use the following BlueXP features and services without a Connector:

- Amazon FSx for NetApp ONTAP working environment creation

While a Connector isn't required to create a working environment, it is required to create and manage volumes, replicate data, and integrate FSx for ONTAP with BlueXP services, such as Data Sense and Cloud Sync.

- Azure NetApp Files

While a Connector isn't required to set up and manage Azure NetApp Files, a Connector is required if you want to use Cloud Data Sense to scan Azure NetApp Files data.

- Cloud Sync
- Cloud Volumes Service for Google Cloud

- Digital Advisor
- Digital Wallet

In almost all cases, you can add a license to the Digital Wallet without a Connector.

The only time that a Connector is required to add a license to the Digital Wallet is for Cloud Volumes ONTAP *node-based* licenses. A Connector is required in this case because the data is taken from the licenses installed on Cloud Volumes ONTAP systems.

- Direct discovery of on-premises ONTAP clusters

While a Connector isn't required for direct discovery of an on-premises ONTAP cluster, a Connector is required if you want to take advantage of additional BlueXP features.

[Learn more about discovery and management options for on-prem ONTAP clusters](#)

## When a Connector is required

When you use BlueXP in standard mode, a Connector is required for the following features and services in BlueXP:

- Amazon FSx for ONTAP management features
- Amazon S3 discovery
- Azure Blob discovery
- Cloud Backup
- Cloud Data Sense
- Cloud Tiering
- Cloud Volumes ONTAP
- E-Series systems
- Global File Cache
- Google Cloud Storage discovery
- Kubernetes clusters
- On-premises ONTAP cluster integration with BlueXP data services
- StorageGRID

## Connectors must be operational at all times

Connectors are a fundamental part of the BlueXP service architecture. It's your responsibility to ensure that relevant Connectors are up, operational, and accessible at all times. While the service is designed to overcome short outages of Connector availability, you must take immediate action when required to remedy infrastructure failures.

This documentation is governed by the EULA. If the product is not operated in accordance with the documentation, the functionality and operation of the product, as well as your rights under the EULA, may be adversely impacted.

## Impact on Cloud Volumes ONTAP

A Connector is a key component in the health and operation of Cloud Volumes ONTAP. If a Connector is powered down, Cloud Volumes ONTAP PAYGO systems and capacity-based BYOL systems shut down after losing communication with a Connector for longer than 14 days. This happens because the Connector refreshes licensing on the system each day.

If your Cloud Volumes ONTAP system has a node-based BYOL license, the system remains running after 14 days because the license is installed on the Cloud Volumes ONTAP system.

## Supported locations

A Connector is supported in the following locations:

- Amazon Web Services
- Microsoft Azure

A Connector in Azure 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](#)

- Google Cloud

If you want to use BlueXP services with Google Cloud, then you must use a Connector that's running in Google Cloud.

- On your premises

## Restricted mode and private mode

To use BlueXP in restricted mode or private mode, you get started with BlueXP by installing the Connector and then accessing the user interface that's running locally on the Connector.

[Learn about BlueXP deployment modes.](#)

## How to create a Connector

A BlueXP Account Admin can create a Connector directly from BlueXP, from your cloud provider's marketplace, or by manually installing the software on your own Linux host. How you get started depends on whether you're using BlueXP in standard mode, restricted mode, or private mode.

- [Learn about BlueXP deployment modes](#)
- [Quick start for BlueXP in standard mode](#)
- [Quick start for BlueXP in restricted mode](#)
- [Quick start for BlueXP in private mode](#)

## Permissions

Specific permissions are needed to create the Connector directly from BlueXP and another set of permissions are needed for the Connector instance itself. If you create the Connector in AWS or Azure directly from BlueXP, then BlueXP creates the Connector with the permissions that it needs. There's nothing else that you need to do.

To learn how to set up permissions, refer to the following pages:

- Standard mode
  - [Set up AWS permissions](#)
  - [Set up Azure permissions](#)
  - [Set up Google Cloud permissions](#)
  - [Set up cloud permissions for on-prem deployments](#)
- [Set up cloud permissions for restricted mode](#)
- [Set up cloud permissions for private mode](#)

To view the exact permissions that the Connector needs, refer to the following pages:

- [Learn how the Connector uses AWS permissions](#)
- [Learn how the Connector uses Azure permissions](#)
- [Learn how the Connector uses Google Cloud permissions](#)

## Connector upgrades

We typically update the Connector software each month to introduce new features and to provide stability improvements. While most of the services and features in the BlueXP platform are offered through SaaS-based software, a few features and functionalities are dependent on the version of the Connector. That includes Cloud Volumes ONTAP management, on-prem ONTAP cluster management, settings, and help.

The Connector automatically updates its software to the latest version, as long as it has outbound internet access to obtain the software update. If you're using BlueXP in private mode, then you'll need to manually upgrade the Connector.

[Learn how to manually upgrade the Connector software](#)

## Operating system and VM maintenance

Maintaining the operating system on the Connector host is your responsibility. For example, you should apply security updates to the operating system on the Connector host by following your company's standard procedures for operating system distribution.

Note that you don't need to stop any services on the Connector host when running an OS update.

If you need to stop and then start the Connector VM, you should do so from your cloud provider's console or by using the standard procedures for on-premises management.

[Be aware that the Connector must be operational at all times.](#)

## Multiple working environments

A Connector can manage multiple working environments in BlueXP. The maximum number of working environments that a single Connector should manage varies. It depends on the type of working environments, the number of volumes, the amount of capacity being managed, and the number of users.

If you have a large-scale deployment, work with your NetApp representative to size your environment. If you experience any issues along the way, reach out to us by using the in-product chat.

## Multiple Connectors

In some cases, you might only need one Connector, but you might find yourself needing two or more Connectors.

Here are a few examples:

- You have a multi-cloud environment (AWS and Azure) and you prefer to have one Connector in AWS and another in Azure. Each manages the Cloud Volumes ONTAP systems running in those environments.
- A service provider might use one BlueXP account to provide services for their customers, while using another account to provide disaster recovery for one of their business units. Each account would have separate Connectors.

### When to switch

When you create your first Connector, BlueXP automatically uses that Connector for each additional working environment that you create. Once you create an additional Connector, you'll need to switch between them to see the working environments that are specific to each Connector.

[Learn how to switch between Connectors.](#)

### Disaster recovery

You can manage a working environment with multiple Connectors at the same time for disaster recovery purposes. If one Connector goes down, you can switch to the other Connector to immediately manage the working environment.

To set up this configuration:

1. [Switch to another Connector.](#)
2. Discover the existing working environment.
  - [Add existing Cloud Volumes ONTAP systems to BlueXP](#)
  - [Discover ONTAP clusters](#)
3. Set the [Capacity Management Mode](#)

Only the main Connector should be set to **Automatic Mode**. If you switch to another Connector for DR purposes, then you can change the Capacity Management Mode as needed.

## BlueXP deployment modes

BlueXP offers multiple *deployment modes* that enable you to use BlueXP in a way that meets your business and security requirements. *Standard mode* leverages the BlueXP SaaS layer to provide full functionality, while *restricted mode* and *private mode* are available for organizations that have connectivity restrictions.

While BlueXP inhibits the flow of traffic, communication, and data when using restricted mode or private mode, it's your responsibility to ensure that your environment (on premises and in the cloud) is in compliance with the required regulations.

## Overview

BlueXP offers the following deployment modes for your account. Each mode differs in terms of outbound connectivity requirements, deployment location, installation process, authentication method, available data and storage services, and charging methods.

### Standard mode

BlueXP is accessible to users as a cloud service from the web-based console. Depending on the BlueXP services that you're planning to use, a BlueXP admin creates one or more Connectors to manage data within your hybrid cloud environment.

This mode uses encrypted data transmission over the public internet.

### Restricted mode

A BlueXP Connector is installed in the cloud (in a government region, sovereign cloud region, or commercial region) and has limited outbound connectivity to the BlueXP SaaS layer. Users access BlueXP locally from the web-based console that's available from the Connector, not from the SaaS layer.

This mode is typically used by state and local governments and regulated companies.

[Learn more about outbound connectivity to the SaaS layer.](#)

### Private mode

A BlueXP Connector is installed on premises or in the cloud (in a secure region, sovereign cloud region, or commercial region) and has *no* connectivity to the BlueXP SaaS layer. Users access BlueXP locally from the web-based console that's available from the Connector, not from the SaaS layer.

A secure region includes [AWS C2S and SC2S](#) and [Azure IL6](#)

The following table provides a comparison of these modes.

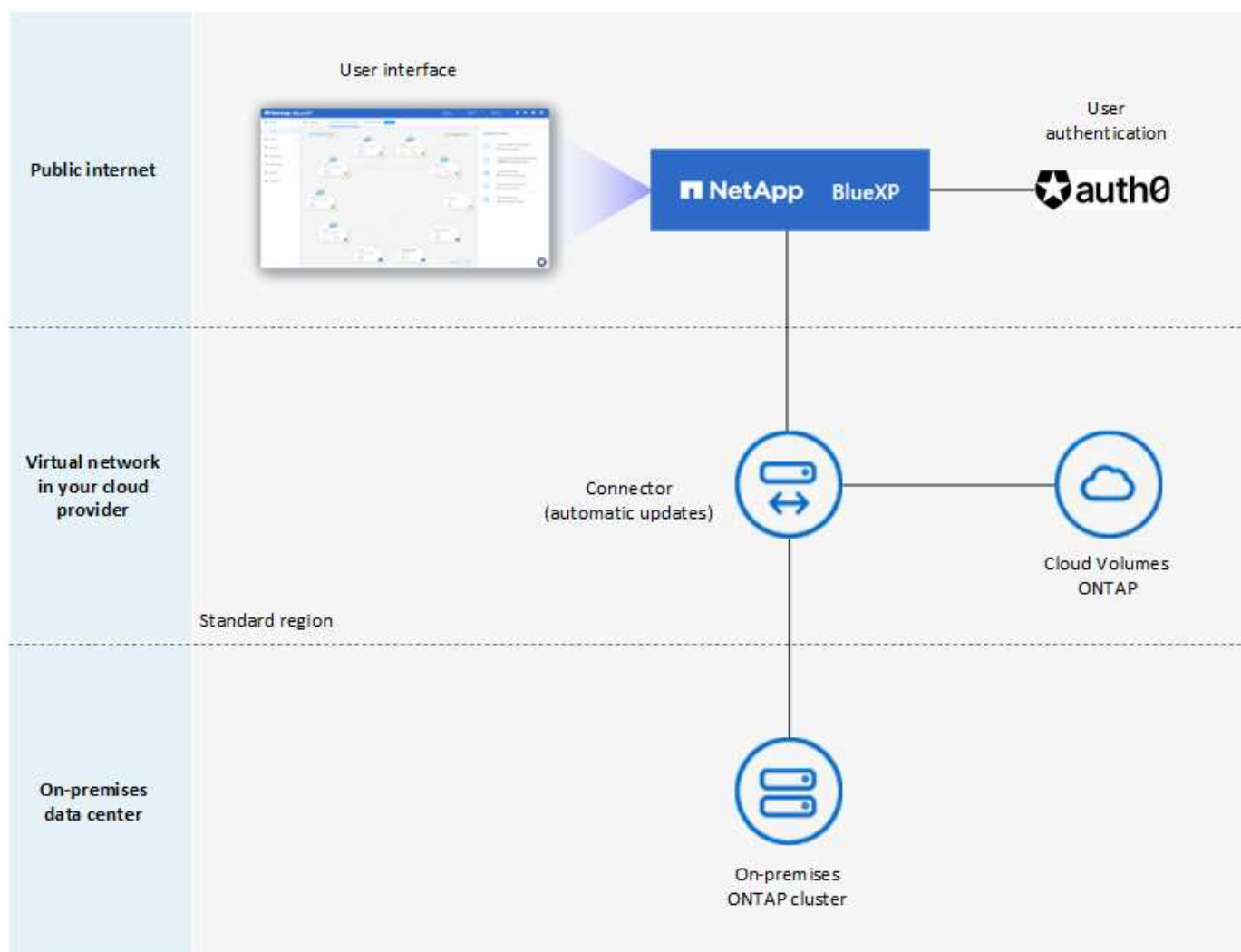
	Standard mode	Restricted mode	Private mode
<b>Connection required to BlueXP SaaS layer?</b>	Yes	Outbound only	No
<b>Connection required to your cloud provider?</b>	Yes	Yes, within the region	Yes, within the region (if using Cloud Volumes ONTAP)
<b>Connector installation</b>	From BlueXP, cloud marketplace, or manual install	Cloud marketplace or manual install	Manual install
<b>Connector upgrades</b>	Automatic upgrades of NetApp Connector software	Automatic upgrades of NetApp Connector software	Manual upgrade required
<b>UI access</b>	From the BlueXP SaaS layer	Locally from the Connector VM	Locally from the Connector VM
<b>API endpoint</b>	The BlueXP SaaS layer	The BlueXP SaaS layer	The Connector

	Standard mode	Restricted mode	Private mode
<b>Authentication</b>	Through SaaS using auth0, NSS login, or identity federation	Through SaaS using auth0 or identity federation	Local user authentication
<b>Storage and data services</b>	All are supported	Many are supported	Several are supported
<b>Licensing options</b>	Marketplace subscriptions and BYOL	Marketplace subscriptions and BYOL	BYOL

Read through the following sections to learn more about these modes, including which BlueXP features and services are supported.

## Standard mode

The following image is an example of a standard mode deployment.



BlueXP works as follows in standard mode:

## Outbound communication

Connectivity is required from the Connector to the BlueXP SaaS layer, to your cloud provider's publicly

available resources, and to other essential components for day-to-day operations.

- [Endpoints that the Connector contacts in AWS](#)
- [Endpoints that the Connector contacts in Azure](#)
- [Endpoints that the Connector contacts in Google Cloud](#)

### **Supported location for the Connector**

In standard mode, the Connector is supported in the cloud or on your premises.

### **Connector installation**

Connector installation is possible from a setup wizard in BlueXP, from the AWS or Azure Marketplace, or using an installer to manually install the Connector on your own Linux host in your data center or in the cloud.

### **Connector upgrades**

Automated upgrades of the Connector software are available from BlueXP with monthly updates.

### **User interface access**

The user interface is accessible from the web-based console that's provided through the SaaS layer.

### **API endpoint**

API calls are made to the following endpoint:  
<https://cloudmanager.cloud.netapp.com>

### **Authentication**

Authentication is provided through BlueXP's cloud service using auth0 or through NetApp Support Site (NSS) logins. Identity federation is available.

### **Supported BlueXP services**

All BlueXP services are available to users.

### **Supported licensing options**

Marketplace subscriptions and BYOL are supported with standard mode; however, the supported licensing options depends on which BlueXP service you are using. Review the documentation for each service to learn more about the available licensing options.

### **How to get started with standard mode**

Go to the [BlueXP web-based console](#) and sign up.

[Learn how to get started with standard mode.](#)

### **Restricted mode**

The following image is an example of a restricted mode deployment.





BlueXP works as follows in restricted mode:

### Outbound communication

Outbound connectivity is required from the Connector to the BlueXP SaaS layer to use BlueXP data services, to enable automatic software upgrades of the Connector, to use auth0-based authentication, and to send metadata for charging purposes (storage VM name, allocated capacity, and volume UUID, type, and IOPS).

The BlueXP SaaS layer does not initiate communication to the Connector. All communication is initiated by the Connector, which can pull or push data from or to the SaaS layer as required.

A connection is also required to cloud provider resources from within the region.

### Supported location for the Connector

In restricted mode, the Connector is supported in the cloud: in a government region, sovereign region, or commercial region.

### Connector installation

Connector installation is possible from the AWS or Azure Marketplace or a manual installation on your own Linux host.

## Connector upgrades

Automated upgrades of the Connector software are available from BlueXP with monthly updates.

## User interface access

The user interface is accessible from the Connector that's deployed in your cloud region.

## API endpoint

API calls are made to the following endpoint:

<https://cloudmanager.cloud.netapp.com>

## Authentication

Authentication is provided through BlueXP's cloud service using auth0. Identity federation is also available.

## Supported BlueXP services

BlueXP supports the following storage and data services with restricted mode:

Supported services	Notes
Amazon FSx for ONTAP	Full support
Azure NetApp Files	Full support
Cloud Backup	Supported in Government regions and commercial regions with restricted mode. Not supported in sovereign regions with restricted mode.  The following features are not supported: Applications, Virtual Machines, and Kubernetes.
Cloud Data Sense	Supported in Government regions with restricted mode. Not supported in commercial regions or in sovereign regions with restricted mode.  The following limitations apply: <ul style="list-style-type: none"><li>• OneDrive accounts, SharePoint accounts, and Google Drive accounts can't be scanned.</li><li>• Microsoft Azure Information Protection (AIP) label functionality can't be integrated.</li></ul>
Cloud Volumes ONTAP	Full support
Digital Wallet	You can use the Digital Wallet with the supported licensing options listed below for restricted mode.
On-premises ONTAP clusters	Discovery with a Connector and discovery without a Connector (direct discovery) are both supported.  When you discover an on-prem cluster with a Connector, the Advanced view (System Manager) is not supported.
Replication	Supported in Government regions with restricted mode. Not supported in commercial regions or in sovereign regions with restricted mode.

## Supported licensing options

The following licensing options are supported with restricted mode:

- Marketplace subscriptions (hourly and annual contracts)

Note the following:

- For Cloud Volumes ONTAP, only capacity-based licensing is supported.
- In Azure, annual contracts are not supported with government regions.
- BYOL

For Cloud Volumes ONTAP, both capacity-based licensing and node-based licensing are supported with BYOL.

## How to get started with restricted mode

You need to enable restricted mode when you create your BlueXP account.

If you don't have an account yet, you'll be prompted to create your account and enable restricted mode when you log in to BlueXP for the first time from a Connector that you manually installed or that you created from your cloud provider's marketplace.

If you already have an account and you want to create another one, then you need to use the Tenancy API.

Note that you can't change the restricted mode setting after BlueXP creates the account. You can't enable restricted mode later and you can't disable it later. It must be set at time of account creation.

- [Learn how to get started with restricted mode.](#)
- [Learn how to create an additional BlueXP account.](#)

## Private mode

In private mode, you can install a Connector either on premises or in the cloud and then use BlueXP to manage data across your hybrid cloud. There is no connectivity to the BlueXP SaaS layer.

The following image shows an example of a private mode deployment where the Connector is installed in the cloud and manages both Cloud Volumes ONTAP and an on-premises ONTAP cluster.



Meanwhile, the second image shows an example of a private mode deployment where the Connector is installed on premises, manages an on-premises ONTAP cluster, and provides access to supported BlueXP data services.



BlueXP works as follows in private mode:

## Outbound communication

No outbound connectivity is required. All packages, dependencies, and essential components are packaged with the Connector and served from the local machine. Connectivity to your cloud provider's publicly available resources is required only if you are deploying Cloud Volumes ONTAP.

## Supported location for the Connector

In private mode, the Connector is supported in the cloud or on premises.

## Connector installation

Manual installations of the Connector are supported on your own Linux host in the cloud or on premises.

## Connector upgrades

You need to upgrade the Connector software manually. The Connector software is published to the NetApp Support Site at undefined intervals.

## User interface access

The user interface is accessible from the Connector that's deployed in your cloud region or on premises.

## API endpoint

API calls are made to the Connector virtual machine.

## Authentication

Authentication is provided through local user management and access. Authentication is not provided through BlueXP's cloud service.

## Supported BlueXP services in cloud deployments

BlueXP supports the following storage and data services with private mode when the Connector is installed in the cloud:

Supported services	Notes
Cloud Backup	Supported in AWS and Azure commercial regions.  Not supported in Google Cloud or in <a href="#">AWS C2S/SC2S</a> or <a href="#">Azure IL6</a>
Cloud Volumes ONTAP	Because there's no internet access, the following features aren't available: automated software upgrades, AutoSupport, and AWS cost information.
Digital Wallet	You can use the Digital Wallet with the supported licensing options listed below for private mode.
On-premises ONTAP clusters	Requires connectivity from the cloud (where the Connector is installed) to the on-premises environment.  Discovery without a Connector (direct discovery) is not supported.

## Supported BlueXP services in on-prem deployments

BlueXP supports the following storage and data services with private mode when the Connector is installed on your premises:

Supported services	Notes
Cloud Backup	Only back up and restore of on-prem ONTAP volumes to StorageGRID systems is supported.  <a href="#">Learn how to back up on-prem ONTAP data to StorageGRID</a>
Cloud Data Sense	<ul style="list-style-type: none"> <li>The only supported data sources are the ones that you can discover locally.  <a href="#">View the sources that you can discover locally</a></li> <li>Features that require outbound internet access are not supported.  <a href="#">View the feature limitations</a></li> </ul>
Digital Wallet	You can use the Digital Wallet with the supported licensing options listed below for private mode.
On-premises ONTAP clusters	Discovery without a Connector (direct discovery) is not supported.
Replication	Full support

### Supported licensing options

Only BYOL is supported with private mode.

For Cloud Volumes ONTAP BYOL, only node-based licensing is supported. Capacity-based licensing is not supported. Because an outbound internet connection isn't available, you will need to manually upload your Cloud Volumes ONTAP licensing file in the Digital Wallet.

[Learn how to add licenses to the Digital Wallet](#)

### How to get started with private mode

Private mode is available by downloading the "offline" installer from the NetApp Support Site.

[Learn how to get started with private mode.](#)

### Service and feature comparison

The following table can help you quickly identify which BlueXP services and features are supported with restricted mode and private mode.

Note that some services might be supported with limitations. For more details about how these services are supported with restricted mode and private mode, refer to the sections above.

BlueXP service or feature	Restricted mode	Private mode
Amazon FSx for ONTAP	Yes	No
Amazon S3	No	No
AppTemplate	No	No
Azure Blob	No	No
Azure NetApp Files	Yes	No

BlueXP service or feature	Restricted mode	Private mode
Cloud Backup	Yes	Yes
Cloud Data Sense	Yes	Yes
Cloud Sync	No	No
Cloud Tiering	No	No
Cloud Volumes ONTAP	Yes	Yes
Cloud Volumes Service for Google Cloud	No	No
Compute	No	No
Digital Advisor	No	No
Digital Wallet	Yes	Yes
E-Series	No	No
Economic efficiency	No	No
Global File Cache	No	No
Google Cloud Storage	No	No
Kubernetes clusters	No	No
On-prem ONTAP clusters	Yes	Yes
Operational resiliency	No	No
Ransomware Protection	No	No
Replication	Yes	Yes
StorageGRID	No	No
Credentials	Yes	Yes
NSS accounts	Yes	No
Notifications	Yes	No
Timeline	Yes	Yes

## Get started with standard mode

### Quick start for BlueXP in standard mode

Get started with BlueXP in standard mode in a few steps.

**1**

#### Sign up and create an account

Go to the [BlueXP console](#) and sign up. You'll be given the option to create an account, but you can skip that step if you're being invited to an existing account.

At this point, you're logged in and can start using several BlueXP services like Digital Advisor, Amazon FSx for

ONTAP, Azure NetApp Files, and more. [Learn what you can do without a Connector.](#)

[Learn how to sign up and create an account.](#)

## 2

### Create a Connector

You don't need a Connector to get started with BlueXP, but you can create a Connector to unlock all BlueXP features and services. The Connector is NetApp software that enables BlueXP to manage resources and processes within your hybrid cloud environment.

A BlueXP Account Admin can create a Connector in your cloud or on-premises network.

- [Learn more about when Connectors are required and how they work](#)
- [Learn how to create a Connector in AWS](#)
- [Learn how to create a Connector in Azure](#)
- [Learn how to create a Connector in Google Cloud](#)
- [Learn how to create a Connector on premises](#)

Note that if you want to use BlueXP services to manage storage and data in Google Cloud, then the Connector must be running in Google Cloud.

## 3

### Subscribe to BlueXP

Subscribe to BlueXP from your cloud provider's marketplace to pay for BlueXP services at an hourly rate (PAYGO) or through an annual contract.

[Learn how to subscribe to BlueXP.](#)

## Prepare networking for user access to 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. The machine running the web browser must have connections to these endpoints.

Endpoints	Purpose
<a href="https://console.bluexp.netapp.com">https://console.bluexp.netapp.com</a>	Your web browser contacts this URL when using the web-based console.
AWS services (amazonaws.com): <ul style="list-style-type: none"><li>• CloudFormation</li><li>• Elastic Compute Cloud (EC2)</li><li>• Key Management Service (KMS)</li><li>• Security Token Service (STS)</li><li>• Simple Storage Service (S3)</li></ul>	Required to deploy a Connector from BlueXP in AWS. The exact endpoint depends on the region in which you deploy the Connector. <a href="#">Refer to AWS documentation for details.</a>



Endpoints	Purpose
https://management.azure.com https://login.microsoftonline.com	Required to deploy a Connector from BlueXP in most Azure regions.
https://management.microsoftazure.de https://login.microsoftonline.de	Required to deploy a Connector from BlueXP in Azure Germany regions.
https://management.usgovcloudapi.net https://login.microsoftonline.com	Required to deploy a Connector from BlueXP in Azure US Gov regions.
https://www.googleapis.com	Required to deploy a Connector from BlueXP in Google Cloud.
https://signin.b2c.netapp.com	Required to update NetApp Support Site (NSS) credentials or to add new NSS credentials to BlueXP.
https://netapp-cloud-account.auth0.com https://cdn.auth0.com https://services.cloud.netapp.com	Your web browser connects to these endpoints for centralized user authentication through BlueXP.
https://widget.intercom.io	For in-product chat that enables you to talk to NetApp cloud experts.

### Related links

- [Endpoints that the Connector contacts in AWS](#)
- [Endpoints that the Connector contacts in Azure](#)
- [Endpoints that the Connector contacts in Google Cloud](#)
- [Endpoints contacted during manual installation of the Connector](#)

## Sign up to BlueXP

BlueXP is accessible from a web-based console. When you get started with BlueXP, your first step is to sign up using your existing NetApp Support Site credentials or by creating a NetApp cloud login.

### Sign up options

You can sign up to BlueXP using one of the following options:

- Your existing NetApp Support Site (NSS) credentials
- A NetApp cloud login by specifying your email address and a password

Both options support a federated connection, which enables single sign-on using credentials from your corporate directory (federated identity). You can set up a federation connection after you sign up. [Learn how to use identity federation with BlueXP.](#)

### Steps

1. Open a web browser and go to the [BlueXP console](#)

2. On the **Log in** page, select **Sign up**.



If you're planning to use your existing NSS credentials, then you can skip the sign up page and enter your email address directly in the log in page. BlueXP will sign you up as part of this initial login.

3. On the **Sign up** page, choose one of the login options:

- If you have an existing NetApp Support Site (NSS) account, select **Sign up with your NetApp Support Site credentials**.

When you use this option, your NetApp Support Site (NSS) credentials are not added to BlueXP in the Support Dashboard. [Learn how to add your NSS credentials to the Support Dashboard to enable key workflows](#).

- If you don't have an NSS account and you haven't created NetApp cloud credentials, enter the required information to create a NetApp cloud login.

Note that only English characters are allowed in the sign up form.

4. When prompted, review the End User License Agreement and accept the terms.

5. On the **Welcome** page, enter a name for your account.

If your business already has an account and you want to join it, then you should close out of BlueXP and ask the owner to associate you with the account. After the owner adds you, you can log in and you'll have access to the account. [Learn how to add members to an existing account](#).

An account is the top-level element in NetApp's identity platform. It enables you to add and manage users, roles, permissions, and working environments.

Hi user@example.com,  
Welcome to BlueXP

Let's get started by creating an account for your organization.  
If your organization already has an existing account, it's best to ask the account admin to add you to it.  
[Learn how to add a user.](#)

Account Name

Create Account

6. Select **Create Account**.

## Result

You now have a BlueXP login and an account. In most cases, the next step is to create a Connector, which connects BlueXP's services to your hybrid cloud environment.

## Log in to BlueXP (standard mode)

After you sign up to BlueXP, you can log in from the web-based console.

### Log in options

You can log in to the BlueXP web-based console using one of the following options:

- Your existing NetApp Support Site (NSS) credentials
- A NetApp cloud login using your email address and a password
- A federated connection

You can use single sign-on to log in using credentials from your corporate directory (federated identity). [Learn how to use identity federation with BlueXP.](#)

### Steps

1. Open a web browser and go to the [BlueXP console](#)
2. On the **Log in** page, enter the email address that's associated with your login.
3. Depending on the authentication method associated with your login, you'll be prompted to enter your credentials:
  - NetApp cloud credentials: Enter your password
  - Federated user: Enter your federated identity credentials
  - NetApp Support Site account: Enter your NetApp Support Site credentials

### Result

You're now logged in and can start using BlueXP to manage your hybrid multi-cloud infrastructure.

## Create a Connector

### AWS

#### Quick start to create a Connector in AWS

Create a Connector in AWS by choosing an installation option, setting up networking, preparing permissions, and more.

1

#### Understand your installation options

The standard way to create a Connector in AWS is directly from BlueXP, but you can also create it from the AWS Marketplace, or you can manually install the software on a pre-existing Linux host.

[Learn more about your installation options.](#)

2

#### Set up networking

Prepare the following for the Connector:

- A VPC and subnet
- A network connection to the networks where you're planning to create and manage working environments
- Outbound internet access to specific endpoints for day-to-day operations
- The IP address, credentials, and HTTPS certificate of a proxy server, if a proxy server is required for outbound internet

[Learn more about networking requirements.](#)

### 3

#### Review host requirements

The Connector software must run on a host that meets specific requirements. If you plan to manually install the Connector software on your own Linux host, then you should ensure that your host meets these requirements. If you're creating the Connector from BlueXP or from the AWS Marketplace, then these requirements are taken care of for you because the software is deployed from an image.

The key requirements are as follows:

- A dedicated host running CentOS or Red Hat Enterprise Linux
- 4 CPUs
- 14 GB of RAM
- Docker Engine

[Learn more about these host requirements.](#)

### 4

#### Set up AWS permissions

Set up AWS permissions based on the installation option that you're planning to use:

- **Install from BlueXP:** Create an IAM policy and attach it to an IAM role that BlueXP can assume or to an IAM user that you can provide access keys for. BlueXP authenticates with AWS and uses these permissions to create the Connector instance on your behalf.
- **Install from the AWS Marketplace:** Create an IAM policy and attach it to an IAM role. You'll associate this role with the Connector instance during installation.
- **Manual install:** Create an IAM policy and attach it to an IAM role or to an IAM user. You'll either associate the role with the Connector instance or provide BlueXP with an access key for the IAM user.

[Follow step-by-step instructions.](#)

### 5

#### Create the Connector

Create the Connector using one of the available installation options:

- **From BlueXP:** Click the Connector drop-down, select **Add Connector** and follow the prompts.
- **From the AWS Marketplace:** Go to the [BlueXP page on the AWS Marketplace](#) and follow the prompts to launch through EC2 so that you can attach an IAM role.

- **Manual install:** Download the Connector software from the [NetApp Support Site](#) and run the installation script.

[Follow step-by-step instructions.](#)



## **Provide BlueXP with permissions**

If you manually installed the Connector software on your own Linux host, you need to provide BlueXP with the permissions that you previously set up.

[Follow step-by-step instructions.](#)

### **Connector installation options in AWS**

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

The following installation options are available:

- Create the Connector directly from BlueXP (this is the standard option)

This action launches an EC2 instance running Linux and the Connector software in a VPC of your choice.

- Create a Connector from the AWS Marketplace

This action also launches an EC2 instance running Linux and the Connector software.

- 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 AWS.

[Learn how to install the Connector in AWS.](#)

### **Set up AWS networking**

Set up your networking so the Connector can manage resources and processes within your hybrid cloud environment.

#### **VPC and subnet**

When you create the Connector, you need to specify the VPC 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.

#### **Outbound internet access**

The network location where you deploy the Connector must have an outbound internet connection.

## Endpoints contacted during manual installation


If you plan to 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://cloudmanagerinfraprod.azurecr.io>
- <https://production-artifacts.cloudmanager.cloud.netapp.com>
- [https://\\*.blob.core.windows.net](https://*.blob.core.windows.net)

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

## Endpoints contacted for day-to-day operations

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

Endpoints	Purpose
AWS services (amazonaws.com): <ul style="list-style-type: none"><li>• CloudFormation</li><li>• Elastic Compute Cloud (EC2)</li><li>• Identity and Access Management (IAM)</li><li>• Key Management Service (KMS)</li><li>• Security Token Service (STS)</li><li>• Simple Storage Service (S3)</li></ul>	To manage resources in AWS. The exact endpoint depends on the region in which you deploy the Connector. <a href="#">Refer to AWS documentation for details</a>
<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.bluexp.netapp.com">https://*.api.bluexp.netapp.com</a> <a href="https://api.bluexp.netapp.com">https://api.bluexp.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>	To provide SaaS features and services within BlueXP. <div><p>The Connector is currently contacting "cloudmanager.cloud.netapp.com" but it will start contacting "api.bluexp.netapp.com" in an upcoming release.</p></div>
<a href="https://cloudmanagerinfraprod.azurecr.io">https://cloudmanagerinfraprod.azurecr.io</a> <a href="https://*.blob.core.windows.net">https://*.blob.core.windows.net</a>	To upgrade the Connector and its Docker components.

## Related link

### 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:

- 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 for AutoSupport messages.

- 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.

### IP address limitation

There's a possible conflict with IP addresses in the 172 range. [Learn more about this limitation.](#)

### Review Connector host requirements for AWS installs

The Connector software must run on a host that meets specific operating system requirements, RAM requirements, port requirements, and so on. If you plan to manually install the Connector, you should ensure that your host meets these requirements.

When you deploy the Connector from BlueXP or from the AWS Marketplace, the image includes the required OS and software components.

### 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

- CentOS 7.6, 7.7, 7.8, and 7.9
- Red Hat Enterprise Linux 7.6, 7.7, 7.8, 7.9, 8.6, and 8.7

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 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

## AWS EC2 instance type

An instance type that meets the CPU and RAM requirements above. We recommend t3.xlarge.

## Key pair

When you create the Connector from BlueXP or from the AWS Marketplace, you'll need to select an EC2 key pair to use with the instance.

## 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](#)

## Set up AWS permissions

Set up AWS permissions so that you can use BlueXP to manage your data and storage infrastructure in AWS. How you set up permissions depends on the installation option that you're planning to use.

You can choose from the following installation options:

- **Install from BlueXP:** Set up permissions that enable BlueXP to authenticate with AWS and deploy the instance. BlueXP automatically sets up permissions for the Connector instance during deployment.

[View step-by-step instructions.](#)

- **Install from the AWS Marketplace:** Set up an IAM role that you can associate with the Connector instance.

[View step-by-step instructions.](#)

- **Manual install:** Create IAM policies and attach them to an IAM role or to an IAM user.

[View step-by-step instructions.](#)

## Set up permissions to create the Connector from BlueXP

BlueXP needs to authenticate with AWS before it can deploy the Connector instance in your VPC. You can choose one of these authentication methods:

- Let BlueXP assume an IAM role that has the required permissions
- Provide an AWS access key and secret key for an IAM user who has the required permissions



With either option, the first step is to create an IAM policy. This policy contains only the permissions needed to launch the Connector instance in AWS from BlueXP.

If needed, you can restrict the IAM policy by using the IAM `Condition` element. [AWS documentation: Condition element](#)



When BlueXP creates the Connector, it applies a new set of permissions to the Connector instance that enables the Connector to AWS resources.

### Steps

1. Go to the AWS IAM console.
2. Click **Policies > Create policy**.
3. Click **JSON**.
4. Copy and paste the following policy:

```
{
  "Version": "2012-10-17",
  "Statement": [{
    "Effect": "Allow",
    "Action": [
      "iam:CreateRole",
      "iam>DeleteRole",
      "iam:PutRolePolicy",
      "iam:CreateInstanceProfile",
      "iam>DeleteRolePolicy",
      "iam:AddRoleToInstanceProfile",
      "iam:RemoveRoleFromInstanceProfile",
      "iam>DeleteInstanceProfile",
      "iam:PassRole",
      "ec2:DescribeInstanceStatus",
      "ec2:RunInstances",
      "ec2:ModifyInstanceAttribute",
      "ec2:CreateSecurityGroup",
      "ec2>DeleteSecurityGroup",
      "ec2:DescribeSecurityGroups",
      "ec2:RevokeSecurityGroupEgress",
      "ec2:AuthorizeSecurityGroupEgress",
      "ec2:AuthorizeSecurityGroupIngress",
      "ec2:RevokeSecurityGroupIngress",
      "ec2:CreateNetworkInterface",
      "ec2:DescribeNetworkInterfaces",
      "ec2>DeleteNetworkInterface",
      "ec2:ModifyNetworkInterfaceAttribute",
      "ec2:DescribeSubnets",
      "ec2:DescribeVpcs",
      "ec2:DescribeDhcpOptions",
```

```

        "ec2:DescribeKeyPairs",
        "ec2:DescribeRegions",
        "ec2:DescribeInstances",
        "ec2:CreateTags",
        "ec2:DescribeImages",
        "cloudformation:CreateStack",
        "cloudformation>DeleteStack",
        "cloudformation:DescribeStacks",
        "cloudformation:DescribeStackEvents",
        "cloudformation:ValidateTemplate",
        "ec2:AssociateIamInstanceProfile",
        "ec2:DescribeIamInstanceProfileAssociations",
        "ec2:DisassociateIamInstanceProfile",
        "iam:GetRole",
        "iam:TagRole",
        "iam:ListRoles",
        "kms:ListAliases"
    ],
    "Resource": "*"
},
{
    "Effect": "Allow",
    "Action": [
        "ec2:TerminateInstances"
    ],
    "Condition": {
        "StringLike": {
            "ec2:ResourceTag/OCCMInstance": "*"
        }
    },
    "Resource": [
        "arn:aws:ec2:*:*:instance/*"
    ]
}
]
}

```

5. Click **Next** and add tags, if needed.
6. Click **Next** and enter a name and description.
7. Click **Create policy**.
8. Either attach the policy to an IAM role that BlueXP can assume or to an IAM user so that you can provide BlueXP with access keys:
  - (Option 1) Set up an IAM role that BlueXP can assume:
    - a. Go to the AWS IAM console in the target account.

- b. Under Access Management, click **Roles > Create Role** and follow the steps to create the role.
- c. Under **Trusted entity type**, select **AWS account**.
- d. Select **Another AWS account** and enter the ID of the BlueXP SaaS account: 952013314444
- e. Select the policy that you created in the previous section.
- f. After you create the role, copy the Role ARN so that you can paste it in BlueXP when you create the Connector.
- (Option 2) Set up permissions for an IAM user so that you can provide BlueXP with access keys:
  - a. From the AWS IAM console, click **Users** and then select the user name.
  - b. Click **Add permissions > Attach existing policies directly**.
  - c. Select the policy that you created.
  - d. Click **Next** and then click **Add permissions**.
  - e. Ensure that you have the access key and secret key for the IAM user.

## Result

You should now have an IAM role that has the required permissions or an IAM user that has the required permissions. When you create the Connector from BlueXP, you can provide information about the role or access keys.

## Set up permissions for the Connector when deploying from the AWS Marketplace

Create IAM policies in AWS and attach them to an IAM role. When you create the Connector from the AWS Marketplace, you'll be prompted to select that IAM role.

## Steps

1. From the IAM console, create a policy:
  - a. Click **Policies > Create policy**.
  - b. Select **JSON** and copy and paste the contents of the [IAM policies for the Connector](#).
  - c. Finish the remaining steps to create the policy.

Depending on the BlueXP services that you're planning to use, you might need to create a second policy.

For standard regions, the permissions are spread across two policies. Two policies are required due to a maximum character size limit for managed policies in AWS.

2. Back in the IAM console, create an IAM role:
  - a. Click **Roles > Create role**.
  - b. Select **AWS service > EC2**.
  - c. Add permissions by attaching the policies that you created in the previous step.
  - d. Finish the remaining steps to create the role.

## Result

You now have an IAM role that you can associate with the EC2 instance during deployment from the AWS Marketplace.

## Set up permissions to assign after manual installation

If you manually install the Connector software on your own Linux host in AWS, you can provide permissions in the following ways:

- Option 1: Create IAM policies and attach the policies to an IAM role that you can associate with the EC2 instance.
- Option 2: Provide BlueXP with AWS access keys for an IAM user who has the required permissions.

## IAM role

### Steps

1. From the IAM console, create a policy:
  - a. Click **Policies > Create policy**.
  - b. Select **JSON** and copy and paste the contents of the [IAM policy for the Connector](#).
  - c. Finish the remaining steps to create the policy.

Depending on the BlueXP services that you're planning to use, you might need to create a second policy.

For standard regions, the permissions are spread across two policies. Two policies are required due to a maximum character size limit for managed policies in AWS. [Learn more about IAM policies for the Connector](#).

2. Back in the IAM console, create an IAM role:
  - a. Click **Roles > Create role**.
  - b. Select **AWS service > EC2**.
  - c. Add permissions by attaching the policies that you created in the previous step.
  - d. Finish the remaining steps to create the role.

### Result

You now have an IAM role that you can associate with the EC2 instance after you install the Connector. [Learn how to provide these permissions to BlueXP](#).

## AWS access key

### Steps

1. From the IAM console, create a policy:
  - a. Click **Policies > Create policy**.
  - b. Select **JSON** and copy and paste the contents of the [IAM policy for the Connector](#).
  - c. Finish the remaining steps to create the policy.

Depending on the BlueXP services that you're planning to use, you might need to create a second policy.

For standard regions, the permissions are spread across two policies. Two policies are required due to a maximum character size limit for managed policies in AWS. [Learn more about IAM policies for the Connector](#).

2. Attach the policies to an IAM user.
  - [AWS Documentation: Creating IAM Roles](#)
  - [AWS Documentation: Adding and Removing IAM Policies](#)
3. Ensure that the user has an access key that you can add to BlueXP after you install the Connector.

### Result

You now have an IAM user that has the required permissions and an access key that you can provide to BlueXP. [Learn how to provide these permissions to BlueXP](#).

## Create the Connector in AWS

Create the Connector directly from the BlueXP web-based console, from the AWS Marketplace, or by installing the software on your own Linux host.

## BlueXP

### What you'll need

- An AWS authentication method: either an IAM role or access keys for an IAM user with the required permissions.

[Learn how to set up AWS permissions](#)

- A VPC and subnet that meets networking requirements.

[Learn about networking requirements](#)

- A key pair for the EC2 instance.
- Details about a proxy server, if a proxy is required for internet access from the Connector.

### Steps

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



2. Choose **Amazon Web Services** as your cloud provider and click **Continue**.
3. On the **Deploying a Connector** page, review the details about what you'll need. You have two options:
  - a. Click **Continue** to prepare for deployment by using the in-product guide. Each step in the in-product guide includes the information that's contained on this page of the documentation.
  - b. Click **Skip to Deployment** if you already prepared by following the steps on this page.
4. Follow the steps in the wizard to create the Connector:
  - **Get Ready**: Review what you'll need.
  - **AWS Credentials**: Specify your AWS region and then choose an authentication method, which is either an IAM role that BlueXP can assume or an AWS access key and secret key.



If you choose **Assume Role**, you can create the first set of credentials from the Connector deployment wizard. Any additional set of credentials must be created from the Credentials page. They will then be available from the wizard in a drop-down list. [Learn how to add additional credentials](#).

- **Details**: Provide details about the Connector.

- Enter a name for the instance.
- Add custom tags (metadata) to the instance.
- 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](#).
- Choose whether you want to encrypt the Connector's EBS disks. You have the option to use the default encryption key or to use a custom key.
- **Network:** Specify a VPC, subnet, and key pair for the instance, choose whether to enable a public IP address, and optionally specify a proxy configuration.

Make sure that you have the correct key pair to use with the Connector. Without a key pair, you will not be able to access the Connector virtual machine.

- **Security Group:** Choose whether to create a new security group or whether to select an existing security group that allows inbound HTTP, HTTPS, and SSH access.
- **Review:** Review your selections to verify that your set up is correct.

5. Click **Add**.

The instance 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.

## AWS Marketplace

### What you'll need

- A VPC and subnet that meets networking requirements.

[Learn about networking requirements](#)

- An IAM role with an attached policy that includes the required permissions for the Connector.

[Learn how to set up AWS permissions](#)

- Permissions to subscribe and unsubscribe from the AWS Marketplace for your IAM user.
- A key pair for the EC2 instance.

## Steps

1. Go to the [BlueXP page on the AWS Marketplace](#)
2. On the Marketplace page, click **Continue to Subscribe** and then click **Continue to Configuration**.





3. Change any of the default options and click **Continue to Launch**.

4. Under **Choose Action**, select **Launch through EC2** and then click **Launch**.

These steps describe how to launch the instance from the EC2 Console because the console enables you to attach an IAM role to the Connector instance. This isn't possible using the **Launch from Website** action.

5. Follow the prompts to configure and deploy the instance:

- **Name and tags:** Enter a name and tags for the instance.
- **Application and OS Image:** Skip this section. The Connector AMI is already selected.
- **Instance type:** Depending on region availability, choose one of the supported instance types (t3.xlarge is recommended).

[Review the instance requirements.](#)

- **Key pair (login):** Select the key pair that you want to use to securely connect to the instance.
- **Network settings:** Edit the network settings as needed:
  - Choose the desired VPC and subnet.
  - Specify whether the instance should have a public IP address.
  - Specify firewall settings that enable the required connection methods for the Connector instance: SSH, HTTP, and HTTPS.

- **Configure storage:** Keep the default storage options.
- **Advanced details:** Under **IAM instance profile**, choose the IAM role that includes the required permissions for the Connector.

[Learn how to set up AWS permissions.](#)

- **Summary:** Review the summary and click **Launch instance**.

AWS launches the software with the specified settings. The Connector instance and software should be running in approximately five minutes.

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

`https://ipaddress`

7. 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. Click **Let's start**.

## Result

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

Open a web browser and go to the [BlueXP console](#) to start using the Connector with BlueXP.

## Manual install

### What you'll need

- 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.

### About this task

- The installation installs the AWS command line tools (awscli) to enable recovery procedures from NetApp support.

If you receive a message that installing the awscli failed, you can safely ignore the message. The Connector can operate successfully without the tools.

- 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`

`--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:

- Specify the BlueXP account to associate with the Connector.
- Enter a name for the system.
- 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](#).

- Click **Let's start**.

### Result

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

### What's next?

[Provide BlueXP with the permissions that you previously setup.](#)

## Provide AWS permissions to BlueXP

If you manually installed the Connector software on your own Linux host, you need to provide BlueXP with the permissions that you previously set up.

[Learn how to set up these permissions.](#)

These steps don't apply if you deployed the Connector directly from BlueXP or from the AWS Marketplace because the required permissions were provided during deployment.

## IAM role

Attach the IAM role that you previously created to the Connector EC2 instance.

### Steps

1. Go to the Amazon EC2 console.
2. Select **Instances**.
3. Select the Connector instance.
4. Select **Actions > Security > Modify IAM role**.
5. Select the IAM role and click **Update IAM role**.

### Result

BlueXP now has the permissions that it needs to perform actions in AWS on your behalf. Go to the [BlueXP console](#) to start using the Connector with BlueXP.

## AWS access key

Provide BlueXP with the AWS access key for an IAM user that has the required permissions.

### Steps

1. Ensure that the correct Connector is currently selected in BlueXP.
2. In the upper right of the BlueXP console, click the Settings icon, and select **Credentials**.



3. Click **Add Credentials** and follow the steps in the wizard.
  - a. **Credentials Location:** Select **Amazon Web Services > Connector**.
  - b. **Define Credentials:** Enter an AWS access key and secret key.
  - 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 click **Add**.

### Result

BlueXP now has the permissions that it needs to perform actions in AWS on your behalf. Go to the [BlueXP console](#) to start using the Connector with BlueXP.

## Azure

### Quick start to create a Connector in Azure

Create a Connector in Azure by choosing an installation option, setting up networking, preparing permissions, and more.

1

Understand your installation options

The standard way to create a Connector in Azure is directly from BlueXP, but you can also create it from the Azure Marketplace, or you can manually install the software on a pre-existing Linux host.

[Learn more about your installation options.](#)

2

## Set up networking

Prepare the following for the Connector:

- A VNet and subnet
- A network connection to the networks where you're planning to create and manage working environments
- Outbound internet access to specific endpoints for day-to-day operations
- The IP address, credentials, and HTTPS certificate of a proxy server, if a proxy server is required for outbound internet

[Learn more about networking requirements.](#)

3

## Review host requirements

The Connector software must run on a host that meets specific requirements. If you plan to manually install the Connector software on your own Linux host, then you should ensure that your host meets these requirements. If you're creating the Connector from BlueXP or from the Azure Marketplace, then these requirements are taken care of for you because the software is deployed from an image.

The key requirements are as follows:

- A dedicated host running CentOS or Red Hat Enterprise Linux
- 4 CPUs
- 14 GB of RAM
- Docker Engine

[Learn more about these host requirements.](#)

4

## Set up Azure permissions

Set up Azure permissions for the installation option that you're planning to use:

- **Install from BlueXP:** Create a custom role and then apply it to your Azure account or an Azure AD service principal. BlueXP authenticates with Azure and uses these permissions to create the Connector instance on your behalf.
- **Install from the Azure Marketplace:** Create a custom role that you can associate with the Connector VM instance or with an Azure AD service principal.
- **Manual install:** Create a custom role that you can associate with the Connector VM instance or with an Azure AD service principal.

[Follow step-by-step instructions for each of these options.](#)

## 5

### Create the Connector

Create the Connector using one of the available installation options:

- **From BlueXP:** Click the Connector drop-down, select **Add Connector** and follow the prompts.
- **From the Azure Marketplace:** Go to the [NetApp Connector VM page in the Azure Marketplace](#) and follow the prompts to create the Connector VM.
- **Manual install:** Download the Connector software from the [NetApp Support Site](#) and run the installation script.

[Follow step-by-step instructions for each of these options.](#)

## 6

### Provide BlueXP with permissions

If you created the Connector from the Azure Marketplace or manually installed the software, you need to provide BlueXP with the permissions that you previously set up.

[Follow step-by-step instructions.](#)

#### 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 the 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.

- 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.

[Learn how to install the Connector in Azure.](#)

#### Set up Azure networking

Set up your networking so the Connector can manage resources and processes within your hybrid cloud environment.

#### VNet and subnet

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

## Azure region

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.

## Outbound internet access

The network location where you deploy the Connector must have an outbound internet connection.

## Endpoints contacted during manual installation

If you plan to 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://cloudmanagerinfraprod.azurecr.io>
- <https://production-artifacts.cloudmanager.cloud.netapp.com>
- [https://\\*.blob.core.windows.net](https://*.blob.core.windows.net)


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

## Endpoints contacted for day-to-day operations

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

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.



Endpoints	Purpose
<a href="https://*.api.bluexp.netapp.com">https://*.api.bluexp.netapp.com</a> <a href="https://api.bluexp.netapp.com">https://api.bluexp.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>	To provide SaaS features and services within BlueXP.  <div>  <p>The Connector is currently contacting "cloudmanager.cloud.netapp.com" but it will start contacting "api.bluexp.netapp.com" in an upcoming release.</p> </div>
<a href="https://cloudmanagerinfraprod.azurecr.io">https://cloudmanagerinfraprod.azurecr.io</a> <a href="https://*.blob.core.windows.net">https://*.blob.core.windows.net</a>	To upgrade the Connector and its Docker components.

### Related link

[Prepare networking for user access to 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:

- 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 for AutoSupport messages.

- 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.

### IP address limitation

There's a possible conflict with IP addresses in the 172 range. [Learn more about this limitation.](#)

### Review Connector host requirements for Azure installs

The Connector software must run on a host that meets specific operating system requirements, RAM requirements, port requirements, and so on. If you plan to manually install the Connector, you should ensure that your host meets these requirements.

When you deploy the Connector from BlueXP or from the Azure Marketplace, the image includes the required OS and software components.

## 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

- CentOS 7.6, 7.7, 7.8, and 7.9
- Red Hat Enterprise Linux 7.6, 7.7, 7.8, 7.9, 8.6, and 8.7

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 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](#)

## Set up Azure permissions

Set up Azure permissions so that you can use BlueXP to manage your data and storage infrastructure in Azure. How you set up permissions depends on the installation option that you're planning to use.

You can choose from the following installation options:

- **Install from BlueXP:** Set up permissions that enable BlueXP to authenticate with Azure and deploy the VM. BlueXP automatically sets up permissions for the Connector VM during deployment.

[View step-by-step instructions.](#)

- **Install from the Azure Marketplace:** Set up an Azure custom role to associate with the Connector VM or with an Azure AD service principal.

[View step-by-step instructions.](#)

- **Manual install:** Set up an Azure custom role to associate with the Connector VM or with an Azure AD service principal.

[View step-by-step instructions.](#)

## Set up permissions to create the Connector from BlueXP

To create a Connector from BlueXP, you need to provide BlueXP with a login that has the required permissions to create the Connector VM in Azure. You have two options:

1. Sign in with your Microsoft 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.

With both options, the first step is create a custom role.

### Create a custom role

Create a custom role that you can assign to your Azure account or to a service principal.

#### Steps

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



This policy 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

```

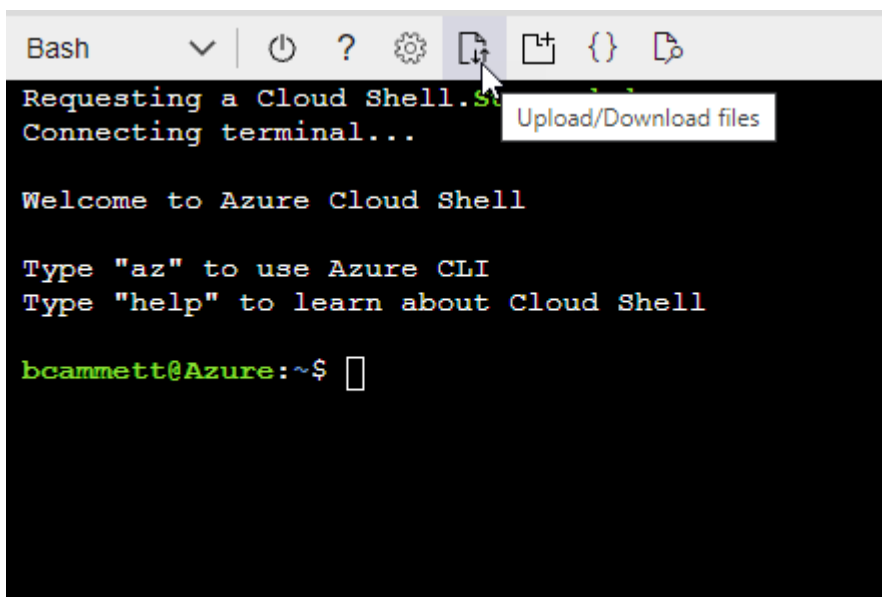
"AssignableScopes": [
  "/subscriptions/d333af45-0d07-4154-943d-c25fbzzzzzzz"
],

```

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.

### **Set up an authentication method**

To deploy the BlueXP Connector, BlueXP needs to authenticate with Azure. You can choose between two Azure authentication methods.

## Azure user 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.

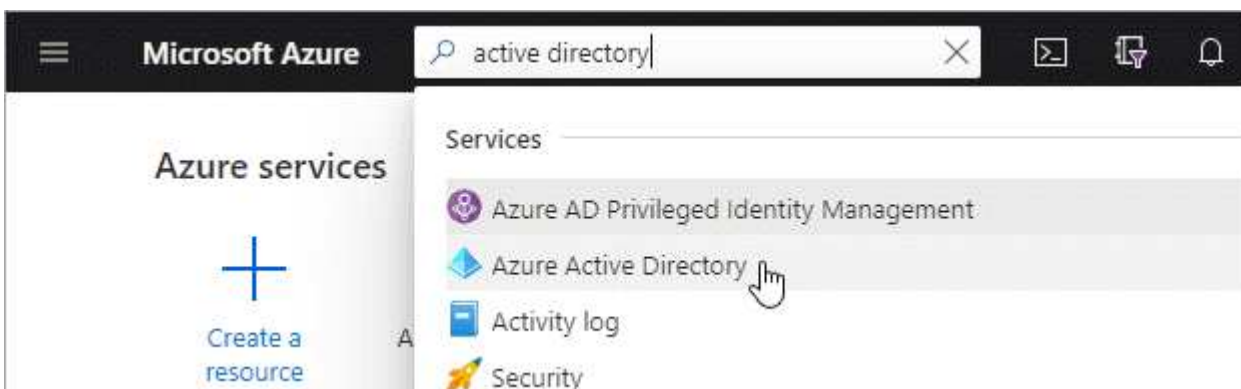
Create and set up a service principal in Azure Active Directory and obtain the Azure credentials that BlueXP needs.

### 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, click **App registrations**.

4. Click **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. Click **Register**.

You've created the AD application and service principal.

#### Assign the custom role to the application

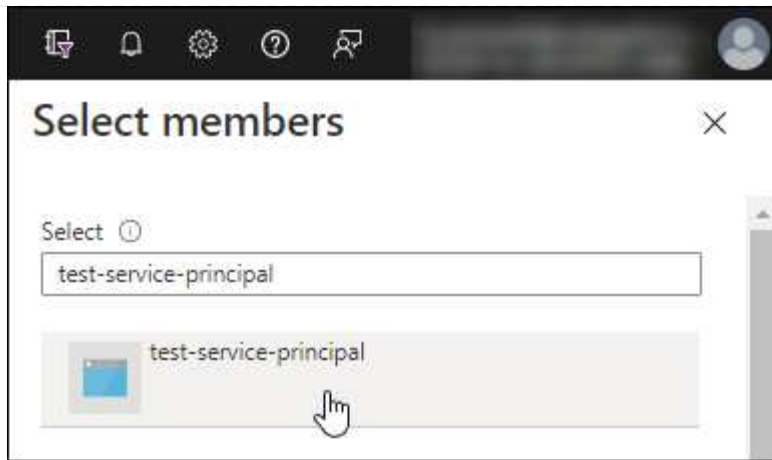
1. From the Azure portal, open the **Subscriptions** service.
2. Select the subscription.
3. Click **Access control (IAM) > Add > Add role assignment**.
4. In the **Role** tab, select the **BlueXP Operator** role and click **Next**.
5. In the **Members** tab, complete the following steps:
  - a. Keep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

- Click **Access Azure Service Management as organization users** and then click **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, click **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. Click **App registrations** and select your application.
3. Click **Certificates & secrets > New client secret**.
4. Provide a description of the secret and a duration.
5. Click **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.

## Set up permissions to assign after Azure Marketplace deployment or manual installation

If you deploy the Connector from the Azure Marketplace or if you manually install the Connector software on your own Linux host, 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.

## Custom role

### 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 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"
```

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.

[Learn how to provide these permissions to BlueXP.](#)

## 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, click **App registrations**.
4. Click **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. Click **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 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, click **App registrations** and select the application.
2. Click **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. Click **Access Azure Service Management as organization users** and then click **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, click **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. Click **App registrations** and select your application.
3. Click **Certificates & secrets > New client secret**.
4. Provide a description of the secret and a duration.
5. Click **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	
test secret	8/16/2020	*sZ1jSe2By:D*-ZRoV4NLfdAcY7:+0vA	 <a href="#">Copy to clipboard</a>

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.

[Learn how to provide these permissions to BlueXP.](#)

### Create the Connector in Azure

Create the Connector directly from the BlueXP web-based console, from the Azure Marketplace, or by installing the software on your own Linux host.

## BlueXP

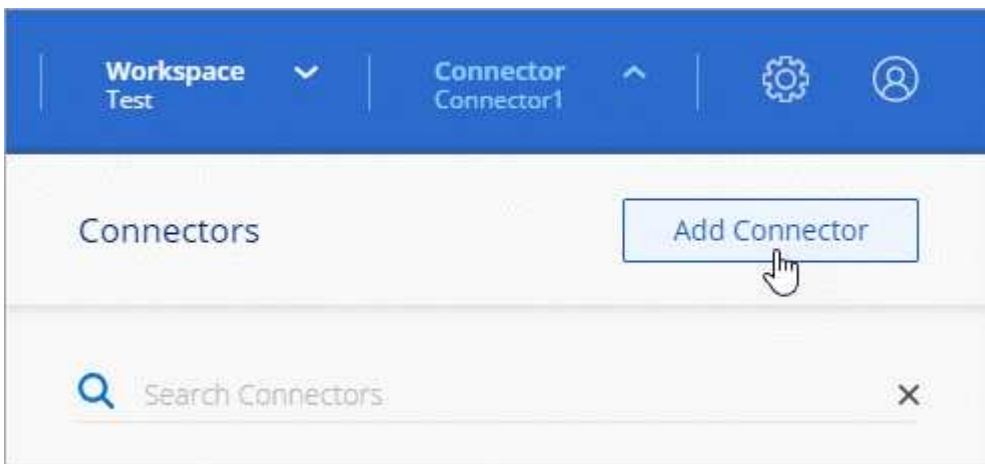
### What you'll need

- 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
- 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 simply deploy the Connector.

### Steps

1. If you're creating your first Working Environment, click **Add Working Environment** and follow the prompts. Otherwise, click 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.
- **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 subscriptions associated with this role. Each subscription that you choose provides the Connector with permissions to deploy Cloud Volumes ONTAP in those subscriptions.

- **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 inbound HTTP, HTTPS, and SSH access.
- **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.

## Azure Marketplace

### Steps

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

[Azure Marketplace page for commercial regions](#)

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

Note the following as you configure the VM:

- The Connector can perform optimally with either HDD or SSD disks.
- Choose a VM size that meets CPU and RAM requirements. We recommend DS3 v2.

[Review the VM requirements.](#)

- For the network security group, the Connector requires inbound connections using SSH, HTTP, and HTTPS.

[Learn more about security group rules for the Connector.](#)

- Under **Management**, enable **System assigned managed identity** for the Connector VM by selecting **On**.

This setting is important because a managed identity allows the Connector virtual machine to identify itself to Azure Active Directory without providing any credentials. After you're done, you'll need to assign the custom role that you created to [Learn more about managed identities for Azure resources](#).

4. On the **Review + create** page, review your selections and click **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. Click **Let's start**.

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

### What's next?

[Provide BlueXP with the permissions that you previously setup.](#)

### Manual install

#### What you'll need

- 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 installation installs the AWS command line tools (awscli) to enable recovery procedures from NetApp support.

If you receive a message that installing the awscli failed, you can safely ignore the message. The Connector can operate successfully without the tools.

- 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

--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. Click **Let's start**.

## Result

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

## What's next?

[Provide BlueXP with the permissions that you previously setup.](#)

## Provide Azure permissions to BlueXP

If you created the Connector from the Azure Marketplace or manually installed the software, you need to provide BlueXP with the permissions that you previously set up.

[Learn how to set up these permissions.](#)

These steps don't apply if you deployed the Connector directly from BlueXP because BlueXP assigns the required permissions during deployment.



## 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. Click **Access control (IAM) > Add > Add role assignment**.
3. In the **Role** tab, select the **BlueXP Operator** role and click **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. Click **Select members**, select the subscription in which the Connector virtual machine was created, choose **Virtual machine**, and then select the Connector virtual machine.
  - c. Click **Select**.
  - d. Click **Next**.
  - e. Click **Review + assign**.
  - f. If you want to deploy Cloud Volumes ONTAP from additional 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. Go to the [BlueXP console](#) and log in.
2. In the upper right of the BlueXP console, click the Settings icon, and select **Credentials**.



3. Click **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 click **Add**.

#### Result

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

## Google Cloud

### Quick start to create a Connector in Google Cloud

Create a Connector in Google Cloud by choosing an installation option, setting up networking, preparing permissions, and more.

1

#### Understand your installation options

The standard way to create a Connector in Google Cloud is directly from BlueXP, but you can also create it using gcloud, or by manually installing the software on a pre-existing Linux host.

[Learn more about your installation options.](#)

2

#### Set up networking

Prepare the following for the Connector:

- A VPC and subnet
- A network connection to the networks where you're planning to create and manage working environments
- Outbound internet access to specific endpoints for day-to-day operations
- The IP address, credentials, and HTTPS certificate of a proxy server, if a proxy server is required for outbound internet

[Learn more about networking requirements.](#)

3

#### Review host requirements

The Connector software must run on a host that meets specific requirements. If you plan to manually install the Connector software on your own Linux host, then you should ensure that your host meets these requirements. If you're creating the Connector from BlueXP or by using gcloud, then these requirements are taken care of for you because the software is deployed from an image.

The key requirements are as follows:

- A dedicated host running CentOS or Red Hat Enterprise Linux
- 4 CPUs
- 14 GB of RAM
- Docker Engine

[Learn more about these host requirements.](#)

4

#### Set up Google Cloud permissions

Set up Google Cloud permissions for the installation option that you're planning to use:

- **Installation from BlueXP or gcloud:** Create a custom role and attach it to the user who will deploy the Connector. Create another custom role and assign it to a service account for the Connector VM instance.
- **Manual install:** Create a custom role and assign it to a service account for the Connector VM instance.

[Follow step-by-step instructions for each of these options.](#)

5

#### Enable Google Cloud APIs

Several APIs are required to deploy the Connector and Cloud Volumes ONTAP in Google Cloud.

- Cloud Deployment Manager V2 API
- Cloud Logging API
- Cloud Resource Manager API
- Compute Engine API
- Identity and Access Management (IAM) API

6

#### Create the Connector

Create the Connector using one of the available installation options:

- **From BlueXP:** Click the Connector drop-down, select **Add Connector** and follow the prompts.
- **Using gcloud:** Use the `gcloud compute instances create` command.
- **Manual install:** Download the Connector software from the [NetApp Support Site](#) and run the installation script.

[Follow step-by-step instructions for each of these options.](#)

7

#### Provide BlueXP with permissions

If you manually installed the Connector software on your own Linux host, you need to provide BlueXP with the permissions that you previously set up.

[Follow step-by-step instructions.](#)

#### Connector installation options in Google Cloud

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

The following installation options are available:

- Create the Connector directly from BlueXP (this is the standard option)

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

- Create the Connector using gcloud

This action also launches a VM instance running Linux and the Connector software.

- 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 Google Cloud.

[Learn how to install the Connector in Google Cloud.](#)

### **Set up Google Cloud networking**

Set up your networking so the Connector can manage resources and processes within your hybrid cloud environment.

#### **VPC and subnet**

When you create the Connector, you need to specify the VPC 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.

#### **Outbound internet access**

The network location where you deploy the Connector must have an outbound internet connection.

#### **Endpoints contacted during manual installation**


If you plan to 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://cloudmanagerinfraproduct.azurecr.io>
- <https://production-artifacts.cloudmanager.cloud.netapp.com>
- [https://\\*.blob.core.windows.net](https://*.blob.core.windows.net)

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

## Endpoints contacted for day-to-day operations

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

Endpoints	Purpose
<a href="https://www.googleapis.com/compute/v1/">https://www.googleapis.com/compute/v1/</a> <a href="https://cloudresourcemanager.googleapis.com/v1/projects">https://cloudresourcemanager.googleapis.com/v1/projects</a> <a href="https://www.googleapis.com/compute/beta">https://www.googleapis.com/compute/beta</a> <a href="https://storage.googleapis.com/storage/v1">https://storage.googleapis.com/storage/v1</a> <a href="https://www.googleapis.com/storage/v1">https://www.googleapis.com/storage/v1</a> <a href="https://iam.googleapis.com/v1">https://iam.googleapis.com/v1</a> <a href="https://cloudkms.googleapis.com/v1">https://cloudkms.googleapis.com/v1</a> <a href="https://www.googleapis.com/deploymentmanager/v2/projects">https://www.googleapis.com/deploymentmanager/v2/projects</a>	To manage resources in Google Cloud.
<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.bluexp.netapp.com">https://*.api.bluexp.netapp.com</a> <a href="https://api.bluexp.netapp.com">https://api.bluexp.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>	To provide SaaS features and services within BlueXP.   The Connector is currently contacting "cloudmanager.cloud.netapp.com" but it will start contacting "api.bluexp.netapp.com" in an upcoming release.
<a href="https://cloudmanagerinfraprod.azurecr.io">https://cloudmanagerinfraprod.azurecr.io</a> <a href="https://*.blob.core.windows.net">https://*.blob.core.windows.net</a>	To upgrade the Connector and its Docker components.

### Related link

[Prepare networking for user access to 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:

- 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 for AutoSupport messages.

- 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.

## IP address limitation

There's a possible conflict with IP addresses in the 172 range. [Learn more about this limitation.](#)

## Review Connector host requirements for Google Cloud installs

The Connector software must run on a host that meets specific operating system requirements, RAM requirements, port requirements, and so on. If you plan to manually install the Connector, you should ensure that your host meets these requirements.

When you deploy the Connector from BlueXP or by using glcloud, the image includes the required OS and software components.

## 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

- CentOS 7.6, 7.7, 7.8, and 7.9
- Red Hat Enterprise Linux 7.6, 7.7, 7.8, 7.9, 8.6, and 8.7

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 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

## Google Cloud machine type

An instance type that meets the CPU and RAM requirements above. We recommend n2-standard-4.

The Connector is supported in Google Cloud on a VM instance with an OS that supports [Shielded VM features](#)

## 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](#)

### Set up Google Cloud permissions

Set up Google Cloud permissions so that you can use BlueXP to manage your data and storage infrastructure in Google Cloud.

You need to set up Google Cloud permissions as follows:

- If you are planning to create the Connector from BlueXP or by using gcloud, then you need to set up permissions for the Google Cloud user who will deploy the Connector VM.
- Set up permissions for the Connector by creating a role and granting the role to a service account.

You'll associate this service account with the Connector VM so that BlueXP has the required permissions.

Depending on your configuration, you might need to complete the following steps as well:

- Set up permissions across projects
- Set up permissions for a shared VPC

### Set up permissions to create the Connector from BlueXP or gcloud

Before you can deploy a Connector from BlueXP or by using gcloud, you need to ensure that your Google Cloud account has the correct permissions.

#### Steps

1. Create a custom role in Google Cloud:
  - a. Create a YAML file that includes the following permissions:

```
title: Connector deployment policy
description: Permissions for the user who deploys the Connector from
BlueXP
stage: GA
includedPermissions:
- compute.disks.create
- compute.disks.get
- compute.disks.list
- compute.disks.setLabels
- compute.disks.use
- compute.firewalls.create
- compute.firewalls.delete
- compute.firewalls.get
- compute.firewalls.list
- compute.globalOperations.get
- compute.images.get
- compute.images.getFromFamily
```

```
- compute.images.list
- compute.images.useReadOnly
- compute.instances.attachDisk
- compute.instances.create
- compute.instances.get
- compute.instances.list
- compute.instances.setDeletionProtection
- compute.instances.setLabels
- compute.instances.setMachineType
- compute.instances.setMetadata
- compute.instances.setTags
- compute.instances.start
- compute.instances.updateDisplayDevice
- compute.machineTypes.get
- compute.networks.get
- compute.networks.list
- compute.networks.updatePolicy
- compute.projects.get
- compute.regions.get
- compute.regions.list
- compute.subnetworks.get
- compute.subnetworks.list
- compute.zoneOperations.get
- compute.zones.get
- compute.zones.list
- deploymentmanager.compositeTypes.get
- deploymentmanager.compositeTypes.list
- deploymentmanager.deployments.create
- deploymentmanager.deployments.delete
- deploymentmanager.deployments.get
- deploymentmanager.deployments.list
- deploymentmanager.manifests.get
- deploymentmanager.manifests.list
- deploymentmanager.operations.get
- deploymentmanager.operations.list
- deploymentmanager.resources.get
- deploymentmanager.resources.list
- deploymentmanager.typeProviders.get
- deploymentmanager.typeProviders.list
- deploymentmanager.types.get
- deploymentmanager.types.list
- resourcemanager.projects.get
- compute.instances.setServiceAccount
- iam.serviceAccounts.list
```

b. From Google Cloud, activate cloud shell.



- c. Upload the YAML file that includes the required permissions.
- d. Create a custom role by using the `gcloud iam roles create` command.

The following example creates a role named "connectorDeployment" at the project level:

```
gcloud iam roles create connectorDeployment --project=myproject --file=connector-deployment.yaml
```

[Google Cloud docs: Creating and managing custom roles](#)

2. Assign this custom role to the user who will deploy the Connector from BlueXP or by using `gcloud`.

[Google Cloud docs: Grant a single role](#)

## Result

The Google Cloud user now has the permissions required to create the Connector.

## Set up permissions for the Connector

A service account is required to provide the Connector with the permissions that BlueXP needs to manage resources in Google Cloud. You need to associate this service account with the Connector VM.

## Steps

1. Create a custom role in Google Cloud:
  - a. Create a YAML file that includes the contents of the [service account permissions for the Connector](#).
  - b. From Google Cloud, activate cloud shell.
  - c. Upload the YAML file that includes the required permissions.
  - d. Create a custom role by using the `gcloud iam roles create` command.

The following example creates a role named "connector" at the project level:

```
gcloud iam roles create connector --project=myproject --file=connector.yaml
```

[Google Cloud docs: Creating and managing custom roles](#)

2. Create a service account in Google Cloud:
  - a. From the IAM & Admin service, click **Service Accounts > Create Service Account**.
  - b. Enter service account details and click **Create and Continue**.
  - c. Select the role that you just created.
  - d. Finish the remaining steps to create the role.

[Google Cloud docs: Creating a service account](#)

## Result

The service account for the Connector VM is set up.

## Set up permissions across projects

If you plan to deploy Cloud Volumes ONTAP systems in different projects than the project where the Connector resides, then you'll need to provide the Connector's service account with access to those projects.

For example, let's say the Connector is in project 1 and you want to create Cloud Volumes ONTAP systems in project 2. You'll need to grant access to the service account in project 2.

### Steps

1. In the Google Cloud console, go to the IAM service and select the project where you want to create Cloud Volumes ONTAP systems.
2. On the **IAM** page, select **Grant Access** and provide the required details.
  - Enter the email of the Connector's service account.
  - Select the Connector's custom role.
  - Click **Save**.

For more details, refer to [Google Cloud documentation](#)

### Set up shared VPC permissions

If you are using a shared VPC to deploy resources into a service project, then you'll need to prepare your permissions.

This table is for reference and your environment should reflect the permissions table when IAM configuration is complete.

Identity	Creator	Hosted in	Service project permissions	Host project permissions	Purpose
Google account to deploy the Connector	Custom	Service Project	<a href="#">Connector deployment policy</a>	compute.networkUser	Deploying the Connector in the service project
Connector service account	Custom	Service project	<a href="#">Connector service account policy</a>	<ul style="list-style-type: none"> <li>• compute.networkUser</li> <li>• deploymentmanager.editor</li> </ul>	Deploying and maintaining Cloud Volumes ONTAP and services in the service project
Cloud Volumes ONTAP service account	Custom	Service project	<ul style="list-style-type: none"> <li>• storage.admin</li> <li>• member: BlueXP service account as serviceAccount.user</li> </ul>	N/A	(Optional) For data tiering and Cloud Backup
Google APIs service agent	Google Cloud	Service project	(Default) Editor	compute.networkUser	Interacts with Google Cloud APIs on behalf of deployment. Allows BlueXP to use the shared network.

Identity	Creator	Hosted in	Service project permissions	Host project permissions	Purpose
Google Compute Engine default service account	Google Cloud	Service project	(Default) Editor	compute.networkUser	Deploys Google Cloud instances and compute infrastructure on behalf of deployment. Allows BlueXP to use the shared network.

#### Notes:

1. deploymentmanager.editor is only required at the host project if you are not passing firewall rules to the deployment and are choosing to let BlueXP create them for you. BlueXP will create a deployment in the host project which contains the VPC0 firewall rule if no rule is specified.
2. firewall.create and firewall.delete are only required if you are not passing firewall rules to the deployment and are choosing to let BlueXP create them for you. These permissions reside in the BlueXP account .yaml file. If you are deploying an HA pair using a shared VPC, these permissions will be used to create the firewall rules for VPC1, 2 and 3. For all other deployments, these permissions will also be used to create rules for VPC0.
3. For data tiering, the tiering service account must have the serviceAccount.user role on the service account, not just at the project level. Currently if you assign serviceAccount.user at the project level, the permissions don't show when you query the service account with getIAMPolicy.

#### Enable Google Cloud APIs

Several APIs are required to deploy the Connector and Cloud Volumes ONTAP in Google Cloud.

#### Step

1. Enable the following Google Cloud APIs in your project:
  - Cloud Deployment Manager V2 API
  - Cloud Logging API
  - Cloud Resource Manager API
  - Compute Engine API
  - Identity and Access Management (IAM) API

[Google Cloud documentation: Enabling APIs](#)

#### Create the Connector in Google Cloud

Create the Connector directly from the BlueXP web-based console, by using gcloud, or by installing the software on your own Linux host.

## BlueXP

### What you'll need

- The required Google Cloud permissions to create the Connector and a service account for the Connector VM.

[Learn how to set up Google Cloud permissions](#)

- A VPC and subnet that meets networking requirements.

[Learn about networking requirements](#)

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

### Steps

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



2. Choose **Google Cloud Platform** as your cloud provider.
3. On the **Deploying a Connector** page, review the details about what you'll need. You have two options:
  - a. Click **Continue** to prepare for deployment by using the in-product guide. Each step in the in-product guide includes the information that's contained on this page of the documentation.
  - b. Click **Skip to Deployment** if you already prepared by following the steps on this page.
4. Follow the steps in the wizard to create the Connector:
  - If you're prompted, log in to your Google account, which should have the required permissions to create the virtual machine instance.

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

- **Details:** Enter a name for the virtual machine instance, specify tags, select a project, and then select the service account that has the required permissions (refer to the section above for details).
- **Location:** Specify a region, zone, VPC, and subnet for the instance.
- **Network:** Choose whether to enable a public IP address and optionally specify a proxy configuration.
- **Firewall Policy:** Choose whether to create a new firewall policy or whether to select an existing

firewall policy that allows inbound HTTP, HTTPS, and SSH access.

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

5. Click **Add**.

The instance 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.

## gcloud

### What you'll need

- The required Google Cloud permissions to create the Connector and a service account for the Connector VM.

[Learn how to set up Google Cloud permissions](#)

- A VPC and subnet that meets networking requirements.

[Learn about networking requirements](#)

## Steps

1. Log in to the gcloud SDK using your preferred methodology.

In our examples, we'll use a local shell with the gcloud SDK installed, but you could use the native Google Cloud Shell in the Google Cloud console.

For more information about the Google Cloud SDK, visit the [Google Cloud SDK documentation page](#).

2. Verify that you are logged in as a user who has the required permissions that are defined in the section above:

```
gcloud auth list
```

The output should show the following where the \* user account is the desired user account to be logged in as:

```
Credentialed Accounts
ACTIVE  ACCOUNT
      some_user_account@domain.com
*      desired_user_account@domain.com
To set the active account, run:
$ gcloud config set account `ACCOUNT`
Updates are available for some Cloud SDK components. To install
them,
please run:
$ gcloud components update
```

### 3. Run the `gcloud compute instances create` command:

```
gcloud compute instances create <instance-name>
  --machine-type=n2-standard-4
  --image-project=netapp-cloudmanager
  --image-family=cloudmanager
  --scopes=cloud-platform
  --project=<project>
  --service-account=<service-account>
  --zone=<zone>
  --no-address
  --tags <network-tag>
  --network <network-path>
  --subnet <subnet-path>
  --boot-disk-kms-key <kms-key-path>
```

#### **instance-name**

The desired instance name for the VM instance.

#### **project**

(Optional) The project where you want to deploy the VM.

#### **service-account**

The service account specified in the output from step 2.

#### **zone**

The zone where you want to deploy the VM

#### **no-address**

(Optional) No external IP address is used (you need a cloud NAT or proxy to route traffic to the public internet)

#### **network-tag**

(Optional) Add network tagging to link a firewall rule using tags to the Connector instance

#### **network-path**

(Optional) Add the name of the network to deploy the Connector into (for a Shared VPC, you need the full path)

#### **subnet-path**

(Optional) Add the name of the subnet to deploy the Connector into (for a Shared VPC, you need the full path)

#### **kms-key-path**

(Optional) Add a KMS key to encrypt the Connector's disks (IAM permissions also need to be applied)

For more information about these flags, visit the [Google Cloud compute SDK documentation](#).

Running the command deploys the Connector using the NetApp golden image. The Connector instance and software should be running in approximately five minutes.

4. Open a web browser from a host that has a connection to the Connector instance and enter the following URL:

`https://ipaddress`

5. After you log in, set up the Connector:
  - a. Specify the BlueXP account to associate with the Connector.

[Learn about BlueXP accounts.](#)

- b. Enter a name for the system.

## Result

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

Open a web browser and go to the [BlueXP console](#) to start using the Connector with BlueXP.

## Manual install

### What you'll need

- 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.

### About this task

- The installation installs the AWS command line tools (awscli) to enable recovery procedures from NetApp support.

If you receive a message that installing the awscli failed, you can safely ignore the message. The Connector can operate successfully without the tools.

- 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

--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. Click **Let's start**.

**Result**

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

**What's next?**

[Provide BlueXP with the permissions that you previously setup.](#)

**Provide Google Cloud permissions to BlueXP**

If you manually installed the Connector software on your own Linux host, you need to provide BlueXP with the permissions that you previously set up.

[Learn how to set up these permissions.](#)

These steps don't apply if you deployed the Connector directly from BlueXP or by using gcloud.

**Steps**

1. Go to the Google Cloud portal and assign the service account to the Connector VM instance.

[Google Cloud documentation: Changing the service account and access scopes for an instance](#)

2. If you want to deploy Cloud Volumes ONTAP in other projects, grant access by adding the service account with the BlueXP role to that project. You'll need to repeat this step for each project.

**Result**

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

**On premises**

**Quick start to create a Connector on premises**

Create a Connector on your premises by setting up networking, preparing a host, preparing cloud permissions, and more.



**Set up networking**

Prepare the following for the Connector:

- A network location where you plan to install the Connector

- A network connection to the networks where you're planning to create and manage working environments
- Outbound internet access to specific endpoints for day-to-day operations
- The IP address, credentials, and HTTPS certificate of a proxy server, if a proxy server is required for outbound internet

[Learn more about networking requirements.](#)

2

### Review host requirements

The Connector software must run on a host that meets specific requirements. The key requirements are as follows:

- A dedicated host running CentOS or Red Hat Enterprise Linux
- 4 CPUs
- 14 GB of RAM
- Docker Engine

[Learn more about these host requirements.](#)

3

### Set up cloud permissions

Set up permissions for your cloud provider so that you can use BlueXP to manage storage in the cloud:

- **AWS:** Create an IAM policy and attach the policy to an IAM user. After installation, you need to provide BlueXP with access keys for that IAM user.
- **Azure:** Set up a service principal in Azure Active Directory that includes the required permissions. After installation, you need to provide BlueXP with the credentials for the service principal.

When the Connector is installed on your premises, it can't manage storage or data in Google Cloud. The Connector must be installed in Google Cloud to manage any storage or data that resides there.

[Follow step-by-step instructions for each of these options.](#)

4

### Install the Connector software

Download the Connector software from the [NetApp Support Site](#) and run the installation script.

[Follow step-by-step instructions.](#)

5

### Provide BlueXP with permissions

After you install and set up the Connector, you need to add your cloud credentials so that BlueXP has the required permissions to perform actions in AWS or Azure.

[Follow step-by-step instructions.](#)

## Set up on-prem networking

Set up your networking so the Connector can manage resources and processes within your hybrid cloud environment.

### Connections to target networks

A Connector requires a network connection to the type of working environment that you're creating and the services that you're planning to enable.

For example, if you want to launch Cloud Volumes ONTAP in the cloud, then you must set up a VPN connection from your corporate network to the virtual network where you plan to launch Cloud Volumes ONTAP.

### Outbound internet access

The network location where you deploy the Connector must have an outbound internet connection.

### 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://cloudmanagerinfraproduct.azurecr.io>
- <https://production-artifacts.cloudmanager.cloud.netapp.com>
- [https://\\*.blob.core.windows.net](https://*.blob.core.windows.net)

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

### Endpoints contacted for day-to-day operations

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

Endpoints	Purpose
AWS services (amazonaws.com): <ul style="list-style-type: none"> <li>• CloudFormation</li> <li>• Elastic Compute Cloud (EC2)</li> <li>• Identity and Access Management (IAM)</li> <li>• Key Management Service (KMS)</li> <li>• Security Token Service (STS)</li> <li>• Simple Storage Service (S3)</li> </ul>	To manage resources in AWS. The exact endpoint depends on the region in which you deploy the Connector. <a href="#">Refer to AWS documentation for details</a>
<a href="https://management.azure.com">https://management.azure.com</a> <a href="https://login.microsoftonline.com">https://login.microsoftonline.com</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>	To manage resources in Azure China regions.
<a href="https://www.googleapis.com/compute/v1/">https://www.googleapis.com/compute/v1/</a> <a href="https://cloudresourcemanager.googleapis.com/v1/projects">https://cloudresourcemanager.googleapis.com/v1/projects</a> <a href="https://www.googleapis.com/compute/beta">https://www.googleapis.com/compute/beta</a> <a href="https://storage.googleapis.com/storage/v1">https://storage.googleapis.com/storage/v1</a> <a href="https://www.googleapis.com/storage/v1">https://www.googleapis.com/storage/v1</a> <a href="https://iam.googleapis.com/v1">https://iam.googleapis.com/v1</a> <a href="https://cloudkms.googleapis.com/v1">https://cloudkms.googleapis.com/v1</a> <a href="https://www.googleapis.com/deploymentmanager/v2/projects">https://www.googleapis.com/deploymentmanager/v2/projects</a>	To manage resources in Google Cloud.
<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>	<div>  <p>The Connector is currently contacting "cloudmanager.cloud.netapp.com" but it will start contacting "api.blueexp.netapp.com" in an upcoming release.</p> </div>
<a href="https://cloudmanagerinfraprod.azurecr.io">https://cloudmanagerinfraprod.azurecr.io</a> <a href="https://*.blob.core.windows.net">https://*.blob.core.windows.net</a>	To upgrade the Connector and its Docker components.

## Related link

[Prepare networking for user access to 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:

- 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 for AutoSupport messages.

- 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.

## IP address limitation

There's a possible conflict with IP addresses in the 172 range. [Learn more about this limitation.](#)

## Review Connector host requirements for on-prem installs

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

- CentOS 7.6, 7.7, 7.8, and 7.9
- Red Hat Enterprise Linux 7.6, 7.7, 7.8, 7.9, 8.6, and 8.7

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 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

### 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](#)

## Set up cloud permissions for on-prem deployments

If you want to use BlueXP services in AWS or Azure with an on-prem Connector, then you need to set up permissions in your cloud provider so that you can add the credentials to the Connector after you install it.



Why not Google Cloud? When the Connector is installed on your premises, it can't manage your resources in Google Cloud. The Connector must be installed in Google Cloud to manage any resources that resides there.

## AWS

When the Connector is installed on premises, you need to provide BlueXP with AWS permissions by adding access keys for an IAM user who has the required permissions.

You must use this authentication method if the Connector is installed on premises. You can't use an IAM role.

### Steps

1. From the IAM console, create a policy:
  - a. Click **Policies > Create policy**.
  - b. Select **JSON** and copy and paste the contents of the [IAM policy for the Connector](#).
  - c. Finish the remaining steps to create the policy.

Depending on the BlueXP services that you're planning to use, you might need to create a second policy.

For standard regions, the permissions are spread across two policies. Two policies are required due to a maximum character size limit for managed policies in AWS. [Learn more about IAM policies for the Connector](#).

2. Attach the policies to an IAM user.
  - [AWS Documentation: Creating IAM Roles](#)
  - [AWS Documentation: Adding and Removing IAM Policies](#)
3. Ensure that the user has access keys that you can add to BlueXP after you install the Connector.

### Result

You should now have access keys for an IAM user who has the required permissions. After you install the Connector, you'll need to associate these credentials with the Connector from BlueXP.

[Learn how to provide these permissions to BlueXP](#).

## Azure

When the Connector is installed on premises, you need to provide BlueXP with Azure permissions by setting up a service principal in Azure Active Directory and obtaining 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, click **App registrations**.
4. Click **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. Click **Register**.

You've created the AD application and service principal.

### Assign the application to a role

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

**Add role assignment** ...

Got feedback?

**Role**   **Members**   **Review + assign**

**Selected role**   Cloud Manager Operator 3.9.12\_B

**Assign access to**   ☒ User, group, or service principal  
☐ Managed identity

**Members**   [+ Select members](#)

- Search for the name of the application.

Here's an example:

**Select members** ✕

Select ⓘ

test-service-principal

test-service-principal

- Select the application and click **Select**.
  - Click **Next**.
- f. Click **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, click **App registrations** and select the application.
2. Click **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

- Click **Access Azure Service Management as organization users** and then click **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, click **App registrations** and select the application.
2. Copy the **Application (client) ID** and the **Directory (tenant) ID**.

Delete Endpoints

Welcome to the new and improved App registrations. Looking to learn

Display name : test-service-principal

Application (client) ID : 73de25f9-99be-4ae0-8b24-538ca787a6b3

Directory (tenant) ID : 4b0911a0-929b-4715-944b-c03745165b3a

Object ID : b37489a9-379f-49c2-b27c-e630514106a5

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. Click **App registrations** and select your application.
3. Click **Certificates & secrets > New client secret**.
4. Provide a description of the secret and a duration.
5. Click **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. After you install the Connector, you'll need to associate these credentials with the Connector from BlueXP.

[Learn how to provide these permissions to BlueXP.](#)

## Install and set up the Connector on premises

Install the Connector on premises and then log in and set it up to work with your BlueXP account.

### Install the Connector

Download and install the Connector software on an existing Linux host on premises.

#### What you'll need

- 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.

#### About this task

- The installation installs the AWS command line tools (awscli) to enable recovery procedures from NetApp support.

If you receive a message that installing the awscli failed, you can safely ignore the message. The Connector can operate successfully without the tools.

- 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`

`--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.

## Result

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

## Set up the Connector

Sign up or log in and then set up the Connector to work with your account.

### Steps

1. Open a web browser and enter the following URL:

`https://ipaddress`

*ipaddress* can be localhost, a private IP address, or a public IP address, depending on the configuration of the host. For example, if the Connector is in the public cloud without a public IP address, you must enter a private IP address from a host that has a connection to the Connector host.

2. Sign up or log in.
3. After you log in, set up BlueXP:
  - 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. (In addition, restricted mode isn't supported when the Connector is installed on premises.)

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

### Result

BlueXP is now set up with the Connector that you just installed.

### What's next?

[Provide BlueXP with the permissions that you previously setup.](#)

#### Provide permissions to BlueXP for on-prem installs

After you install and set up the Connector, you need to add your cloud credentials so that BlueXP has the required permissions to perform actions in AWS or Azure.



Why not Google Cloud? When the Connector is installed on your premises, it can't manage your resources in Google Cloud. The Connector must be installed in Google Cloud to manage any resources that resides there.

## AWS

### Before you get started

If you just created these credentials in AWS, it might take a few minutes until they are available for use. Wait a few minutes before you add the credentials to BlueXP.

### Steps

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



2. Click **Add Credentials** and follow the steps in the wizard.
  - a. **Credentials Location:** Select **Amazon Web Services > Connector**.
  - b. **Define Credentials:** Enter an AWS access key and secret key.
  - 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 click **Add**.

### Result

BlueXP now has the permissions that it needs to perform actions in AWS on your behalf. You can now go to the [BlueXP console](#) to start using the Connector with BlueXP.

## Azure

### Before you get started

If you just created these credentials in Azure, it might take a few minutes until they are available for use. Wait a few minutes before you add the credentials to BlueXP.

### Steps

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



2. Click **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 click **Add**.



**Result**

BlueXP now has the permissions that it needs to perform actions in Azure on your behalf. You can now go to the [BlueXP console](#) to start using the Connector with BlueXP.

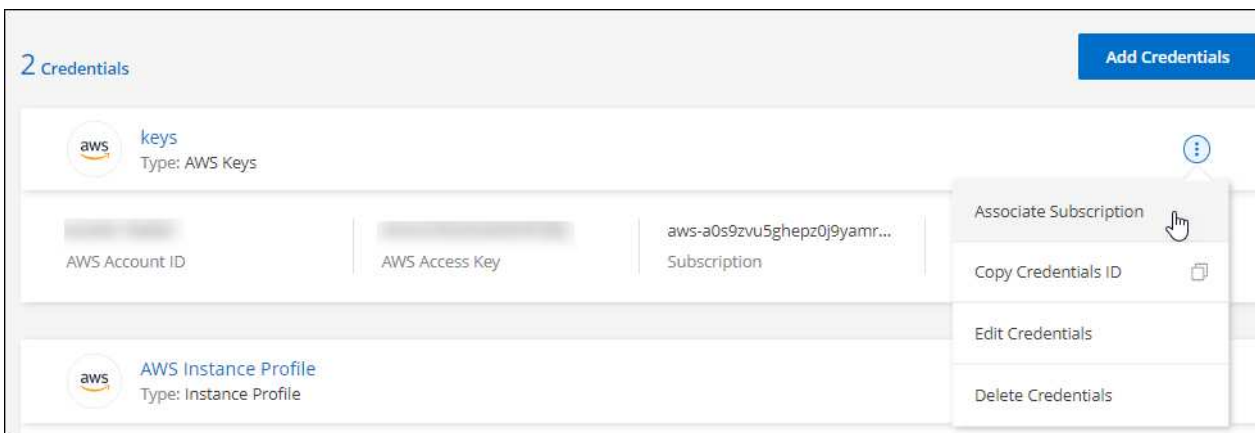
**Subscribe to BlueXP (standard mode)**

Subscribe to BlueXP from your cloud provider's marketplace to pay for BlueXP services at an hourly rate (PAYGO) or through an annual contract.

## AWS

### Steps

1. In the upper right of the BlueXP console, click the Settings icon, and select **Credentials**.
2. Click the action menu for a set of credentials and then select **Associate Subscription**.



3. To associate the credentials with an existing subscription, select the subscription from the down-down list and click **Associate**.
4. To associate the credentials with a new subscription, click **Add Subscription > Continue** and follow the steps in the AWS Marketplace:
  - a. Click **View purchase options**.
  - b. Click **Subscribe**.
  - c. Click **Set up your account**.

You'll be redirected to the BlueXP website.

- d. From the **Subscription Assignment** page:

- Select the BlueXP accounts that you'd like to associate this subscription with.
- In the **Replace existing subscription** field, choose whether you'd like to automatically replace the existing subscription for one account with this new subscription.

BlueXP replaces the existing subscription for all credentials in the account with this new subscription. If a set of credentials wasn't ever associated with a subscription, then this new subscription won't be associated with those credentials.

For all other accounts, you'll need to manually associate the subscription by repeating these steps.

- Click **Save**.

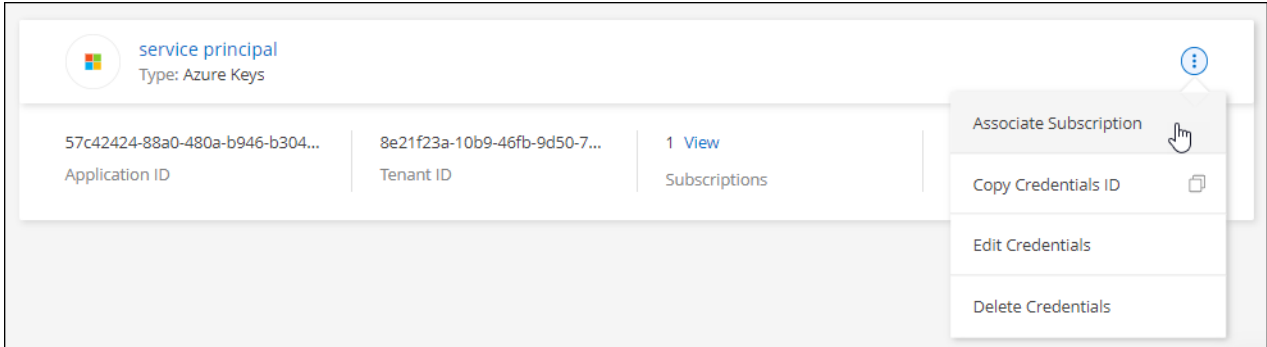
The following video shows the steps to subscribe from the AWS Marketplace:

► <https://docs.netapp.com/us-en/cloud-manager-setup->

## Azure

### Steps

1. In the upper right of the BlueXP console, click the Settings icon, and select **Credentials**.
2. Click the action menu for a set of credentials and then select **Associate Subscription**.



3. To associate the credentials with an existing subscription, select the subscription from the down-down list and click **Associate**.
4. To associate the credentials with a new subscription, click **Add Subscription > Continue** and follow the steps in the Azure Marketplace:
  - a. If prompted, log in to your Azure account.
  - b. Click **Subscribe**.
  - c. Fill out the form and click **Subscribe**.
  - d. After the subscription process is complete, click **Configure account now**.

You'll be redirected to the BlueXP website.

- e. From the **Subscription Assignment** page:

- Select the BlueXP accounts that you'd like to associate this subscription with.
- In the **Replace existing subscription** field, choose whether you'd like to automatically replace the existing subscription for one account with this new subscription.

BlueXP replaces the existing subscription for all credentials in the account with this new subscription. If a set of credentials wasn't ever associated with a subscription, then this new subscription won't be associated with those credentials.

For all other accounts, you'll need to manually associate the subscription by repeating these steps.

- Click **Save**.

The following video shows the steps to subscribe from the Azure Marketplace:

► <https://docs.netapp.com/us-en/cloud-manager-setup->

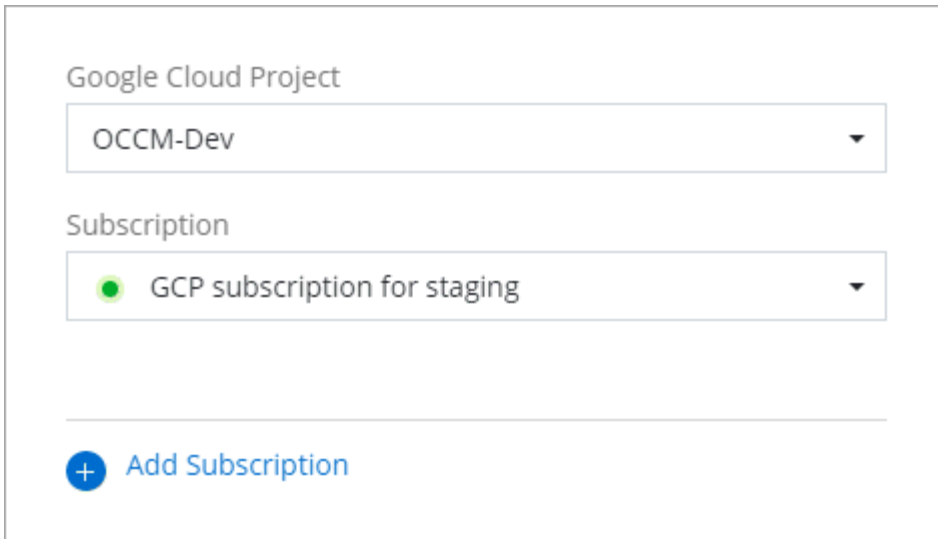
## Google Cloud

### Steps

1. In the upper right of the BlueXP console, click the Settings icon, and select **Credentials**.
2. Click the action menu for a set of credentials and then select **Associate Subscription**.



3. To associate the credentials with an existing subscription, select a Google Cloud project and subscription from the down-down list, and then click **Associate**.



4. If you don't already have a subscription, click **Add Subscription > Continue** and follow the steps in the Google Cloud Marketplace.



Before you complete the following steps, ensure that you have both Billing Admin privileges in your Google Cloud account as well as a BlueXP login.

- a. After you're redirected to the [NetApp BlueXP page on the Google Cloud Marketplace](#), ensure that the correct project is selected at the top navigation menu.

The screenshot shows the Google Cloud interface with the NetApp logo and 'Google Cloud' text in the top left. A search bar in the top right contains 'netapp.com'. Below the header, a back arrow and 'Product details' text are visible. The main content area features the 'NetApp BlueXP' title, the NetApp logo, and a link to 'NetApp, Inc.'. A description states: 'BlueXP lets you build, protect, and govern your hybrid multicloud data estate.' A prominent blue 'SUBSCRIBE' button is centered. Below this is a navigation bar with links for 'OVERVIEW', 'PRICING', 'DOCUMENTATION', and 'SUPPORT'. The 'OVERVIEW' section is active, showing a description of BlueXP as a hybrid multicloud storage and data services experience. To the right, an 'Additional details' section lists the product type as 'SaaS & APIs', the last updated date as '12/19/22', and the category as 'Analytics, Developer tools, Storage'.

Google Cloud netapp.com

Product details

## NetApp BlueXP

**NetApp** [NetApp, Inc.](#)

BlueXP lets you build, protect, and govern your hybrid multicloud data estate.

**SUBSCRIBE**

[OVERVIEW](#) [PRICING](#) [DOCUMENTATION](#) [SUPPORT](#)

### Overview

BlueXP is NetApp's hybrid multicloud storage and data services experience that helps organizations build and operate a centrally controlled data foundation across on-premises, edge, and cloud environments.

BlueXP abstracts the complexity of architecting the underlying Google Cloud infrastructure resources making it easier to deploy and operate NetApp's storage, mobility, protection, and analysis services within your Google Cloud environment.

### Additional details

Type: [SaaS & APIs](#)

Last updated: 12/19/22

Category: [Analytics](#), [Developer tools](#), [Storage](#)

- b. Click **Subscribe**.
- c. Select the appropriate billing account and agree to the terms and conditions.
- d. Click **Subscribe**.

This step sends your transfer request to NetApp.

- e. On the pop-up dialog box, click **Register with NetApp, Inc.**

This step must be completed to link the Google Cloud subscription to your BlueXP account. The process of linking a subscription isn't complete until you are redirected from this page and then sign in to BlueXP.

Your order request has been sent to NetApp, Inc.



Your new subscription to the Cloud Manager 1 month plan for Cloud Manager for Cloud Volumes ONTAP requires your registration with NetApp, Inc.. After NetApp, Inc. approves your request, your subscription will be active and you will begin getting charged. This processing time will depend on the vendor, and you should reach out to NetApp, Inc. directly with any questions related to signup.

[VIEW ORDERS](#)

[REGISTER WITH NETAPP, INC.](#)

f. Complete the steps on the **Subscription Assignment** page:



If someone from your organization has already subscribed to the NetApp BlueXP subscription from your billing account, then you will be redirected to [the Cloud Volumes ONTAP page on the BlueXP website](#) instead. If this is unexpected, contact your NetApp sales team. Google enables only one subscription per Google billing account.

- Select the BlueXP accounts that you'd like to associate this subscription with.
- In the **Replace existing subscription** field, choose whether you'd like to automatically replace the existing subscription for one account with this new subscription.

BlueXP replaces the existing subscription for all credentials in the account with this new subscription. If a set of credentials wasn't ever associated with a subscription, then this new subscription won't be associated with those credentials.

For all other accounts, you'll need to manually associate the subscription by repeating these steps.

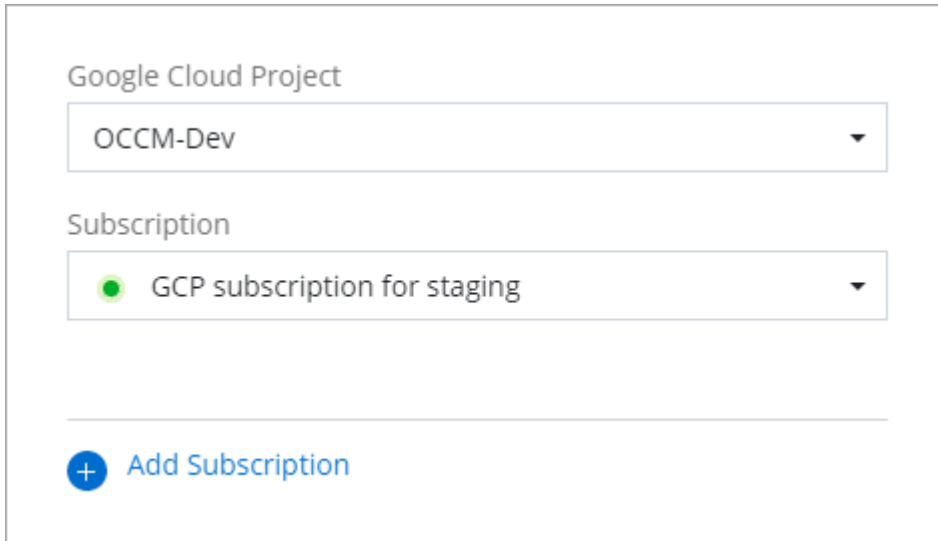
- Click **Save**.

The following video shows the steps to subscribe from the Google Cloud Marketplace:

► <https://docs.netapp.com/us-en/cloud-manager-setup-admin//media/video-subscribing->

[google-cloud.mp4](#) (video)

- g. Once this process is complete, navigate back to the Credentials page in BlueXP and select this new subscription.



The screenshot shows a form with two dropdown menus. The first dropdown is labeled 'Google Cloud Project' and has 'OCCM-Dev' selected. The second dropdown is labeled 'Subscription' and has 'GCP subscription for staging' selected, which is preceded by a green dot icon. Below these dropdowns is a horizontal line, and then a blue button with a plus sign and the text 'Add Subscription'.

## What you can do next (standard mode)

Now that you've logged in and set up BlueXP in standard mode, users can create and discover working environments and use BlueXP data services.

For help, go to the [home page for the BlueXP documentation](#) to view the docs for all BlueXP services.

## Get started with restricted mode

### Quick start for BlueXP in restricted mode

Get started with BlueXP in restricted mode in a few steps.

1

#### Prepare for deployment

- Prepare a dedicated Linux host that meets requirements for CPU, RAM, disk space, Docker Engine, and more.
- Set up networking that provides access to the target networks, outbound internet access for manual installations, and outbound internet for day-to-day access.
- Set up permissions in your cloud provider so that you can associate those permissions with the Connector instance after you deploy it.

[Learn how to prepare for deployment.](#)

2

#### Deploy the Connector

- Install the Connector from your cloud provider's marketplace or by manually installing the software on your

own Linux host.

- b. Set up BlueXP by opening a web browser and entering the Linux host's IP address.
- c. Provide BlueXP with the permissions that you previously set up.

[Learn how to deploy the Connector.](#)



### **Subscribe to BlueXP**

Subscribe to BlueXP from your cloud provider's marketplace to pay for BlueXP services at an hourly rate (PAYGO) or through an annual contract.

[Learn how to subscribe to BlueXP.](#)

## **Prepare for deployment in restricted mode**

You should understand what's needed to get started with BlueXP in restricted mode so that you can prepare your environment.

### **Understand how restricted mode works**

Before you get started, you should have an understanding of how BlueXP works in restricted mode.

For example, you should understand that you need to use the browser-based interface that is available locally from the BlueXP Connector that you need to install. You can't access BlueXP from the web-based console that's provided through the SaaS layer.

In addition, not all BlueXP services are available.

[Learn how restricted mode works.](#)

### **Review installation options**

In restricted mode, you can only install the Connector in the cloud. The following installation options are available:

- From the AWS Marketplace
- From the Azure Marketplace
- Manually installing the Connector on your own Linux host that's running in AWS, Azure, or Google Cloud

### **Review host requirements**

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

When you deploy the Connector from the AWS or Azure Marketplace, the image includes the required OS and software components. You simply need to choose an instance type that meets CPU and RAM requirements.

### **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

- CentOS 7.6, 7.7, 7.8, and 7.9
- Red Hat Enterprise Linux 7.6, 7.7, 7.8, 7.9, 8.6, and 8.7

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 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

## AWS EC2 instance type

An instance type that meets the CPU and RAM requirements above. We recommend t3.xlarge.

## Azure VM size

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

## Google Cloud machine type

An instance type that meets the CPU and RAM requirements above. We recommend n2-standard-4.

The Connector is supported in Google Cloud on a VM instance with an OS that supports [Shielded VM features](#)

## 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](#)

## Prepare networking for the Connector

Set up your networking so the Connector can manage resources and processes within your public cloud environment. Other than having a virtual network and subnet for the Connector, you'll need to ensure that the following requirements are met.

## Connections to target networks

The Connector must have a network connection to the location where you plan to manage storage. For example, the VPC or VNet where you plan to deploy Cloud Volumes ONTAP, or the data center where your on-premises ONTAP clusters reside.

### Outbound internet access for manual installs

If you plan to 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://cloudmanagerinfraproduct.azurecr.io>
- <https://production-artifacts.cloudmanager.cloud.netapp.com>
- [https://\\*.blob.core.windows.net](https://*.blob.core.windows.net)

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

### Outbound internet access for day-to-day operations

The network location where you deploy the Connector must have an outbound internet connection. The Connector requires outbound internet access to contact the following endpoints in order to manage resources and processes within your public cloud environment.

Endpoints	Purpose
AWS services (amazonaws.com): <ul style="list-style-type: none"><li>• CloudFormation</li><li>• Elastic Compute Cloud (EC2)</li><li>• Identity and Access Management (IAM)</li><li>• Key Management Service (KMS)</li><li>• Security Token Service (STS)</li><li>• Simple Storage Service (S3)</li></ul>	To manage resources in AWS. The exact endpoint depends on the region in which you deploy the Connector. <a href="#">Refer to AWS documentation for details</a>
<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.usgovcloudapi.net">https://management.usgovcloudapi.net</a> <a href="https://login.microsoftonline.us">https://login.microsoftonline.us</a> <a href="https://blob.core.usgovcloudapi.net">https://blob.core.usgovcloudapi.net</a> <a href="https://core.usgovcloudapi.net">https://core.usgovcloudapi.net</a>	To manage resources in Azure Government 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.

Endpoints	Purpose
<a href="https://www.googleapis.com/compute/v1/">https://www.googleapis.com/compute/v1/</a> <a href="https://cloudresourcemanager.googleapis.com/v1/projects">https://cloudresourcemanager.googleapis.com/v1/projects</a> <a href="https://www.googleapis.com/compute/beta">https://www.googleapis.com/compute/beta</a> <a href="https://storage.googleapis.com/storage/v1">https://storage.googleapis.com/storage/v1</a> <a href="https://www.googleapis.com/storage/v1">https://www.googleapis.com/storage/v1</a> <a href="https://iam.googleapis.com/v1">https://iam.googleapis.com/v1</a> <a href="https://cloudkms.googleapis.com/v1">https://cloudkms.googleapis.com/v1</a> <a href="https://www.googleapis.com/deploymentmanager/v2/projects">https://www.googleapis.com/deploymentmanager/v2/projects</a>	To manage resources in Google Cloud.
<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.bluexp.netapp.com">https://*.api.bluexp.netapp.com</a> <a href="https://api.bluexp.netapp.com">https://api.bluexp.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>	<div>  <p>The Connector is currently contacting "cloudmanager.cloud.netapp.com" but it will start contacting "api.bluexp.netapp.com" in an upcoming release.</p> </div>
<a href="https://cloudmanagerinfraprod.azurecr.io">https://cloudmanagerinfraprod.azurecr.io</a> <a href="https://*.blob.core.windows.net">https://*.blob.core.windows.net</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:

- IP address
- Credentials
- HTTPS certificate

### Public IP address in Azure

If you want to use a public IP address with the Connector VM in Azure, the IP address must use a Basic SKU to ensure that BlueXP uses this public IP address.

Create public IP address

Name \*

newIP

SKU \* ⓘ

☒ Basic
 ☐ Standard

Assignment

☐ Dynamic
 ☒ Static

If you use a Standard SKU IP address instead, then BlueXP uses the *private* IP address of the Connector, instead of the public IP. If the machine that you're using to access the BlueXP Console doesn't have access to that private IP address, then actions from the BlueXP Console will fail.

[Azure documentation: Public IP SKU](#)

## Ports

There's no incoming traffic to the Connector, unless you initiate it.

HTTP (80) and HTTPS (443) provide access to the BlueXP console. SSH (22) is only needed if you need to connect to the host for troubleshooting. Meanwhile, 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.

## Prepare networking for user access to BlueXP console

In restricted mode, the BlueXP user interface is accessible from the Connector. As you use the BlueXP user interface, it contacts a few endpoints to complete data management tasks. The machine running the web browser must have connections to the following endpoints.

Endpoints	Purpose
https://signin.b2c.netapp.com	Required to update NetApp Support Site (NSS) credentials or to add new NSS credentials to BlueXP.
https://netapp-cloud-account.auth0.com	Your web browser connects to these endpoints for centralized user authentication through BlueXP.
https://cdn.auth0.com	
https://services.cloud.netapp.com	
https://widget.intercom.io	For in-product chat that enables you to talk to NetApp cloud experts.

## Prepare cloud permissions

BlueXP requires permissions from your cloud provider to deploy Cloud Volumes ONTAP in a virtual network and to use BlueXP data services. You need to set up permissions in your cloud provider and then associate those permissions with the Connector.

To view the required steps, select the authentication option that you'd like to use for your cloud provider.

## AWS IAM role

Use an IAM role to provide the Connector with permissions.

If you're creating the Connector from the AWS Marketplace, you'll be prompted to select that IAM role when you launch the EC2 instance.

If you're manually installing the Connector on your own Linux host, you'll need to attach the role to the EC2 instance.

### Steps

1. Log in to the AWS console and navigate to the IAM service.
2. Create a policy:
  - a. Click **Policies > Create policy**.
  - b. Select **JSON** and copy and paste the contents of the [IAM policy for the Connector](#).
  - c. Finish the remaining steps to create the policy.
3. Create an IAM role:
  - a. Click **Roles > Create role**.
  - b. Select **AWS service > EC2**.
  - c. Add permissions by attaching the policy that you just created.
  - d. Finish the remaining steps to create the role.

### Result

You now have an IAM role for the Connector EC2 instance.

## AWS access key

Set up permissions and an access key for an IAM user. You'll need to provide BlueXP with the AWS access key after you install the Connector and set up BlueXP.

### Steps

1. From the IAM console, create a policy:
  - a. Click **Policies > Create policy**.
  - b. Select **JSON** and copy and paste the contents of the [IAM policy for the Connector](#).
  - c. Finish the remaining steps to create the policy.

Depending on the BlueXP services that you're planning to use, you might need to create a second policy.

For standard regions, the permissions are spread across two policies. Two policies are required due to a maximum character size limit for managed policies in AWS. [Learn more about IAM policies for the Connector](#).

2. Attach the policies to an IAM user.
  - [AWS Documentation: Creating IAM Roles](#)
  - [AWS Documentation: Adding and Removing IAM Policies](#)
3. Ensure that the user has access keys that you can add to BlueXP after you install the Connector.

## Result

The account now has the required permissions.

## Azure role

Create an Azure custom role with the required permissions. You'll assign this role to the Connector VM.

## Steps

1. If you're planning to manually install the software on your own host, enable a system-assigned managed identity on the 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 from which users will create Cloud Volumes ONTAP systems.

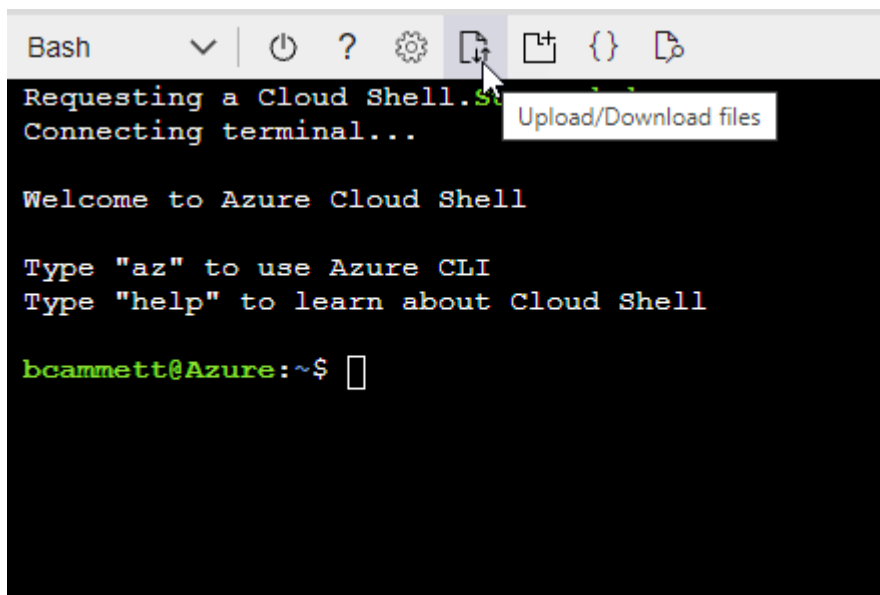
## Example

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

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.

## Azure service principal

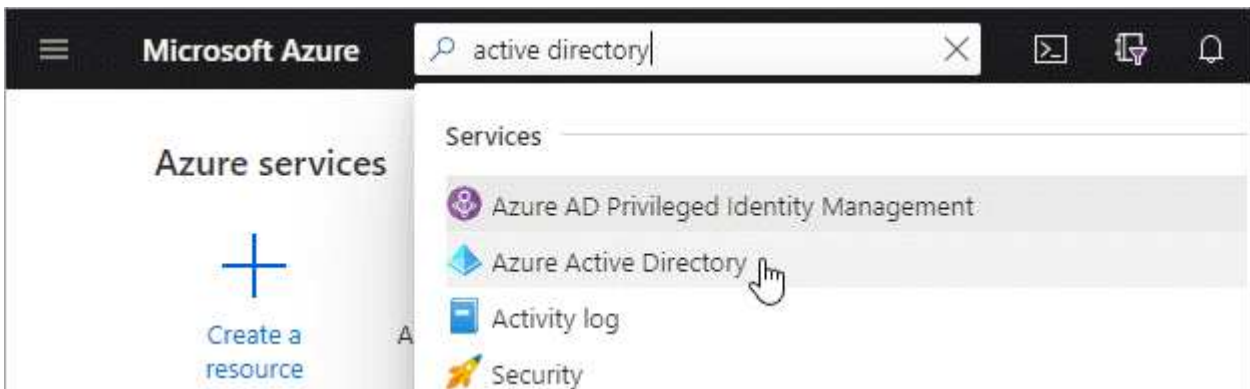
Create and set up a service principal in Azure Active Directory and obtain the Azure credentials that BlueXP needs. You'll need to provide BlueXP with these credentials after you install the Connector and set up BlueXP.

## 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.



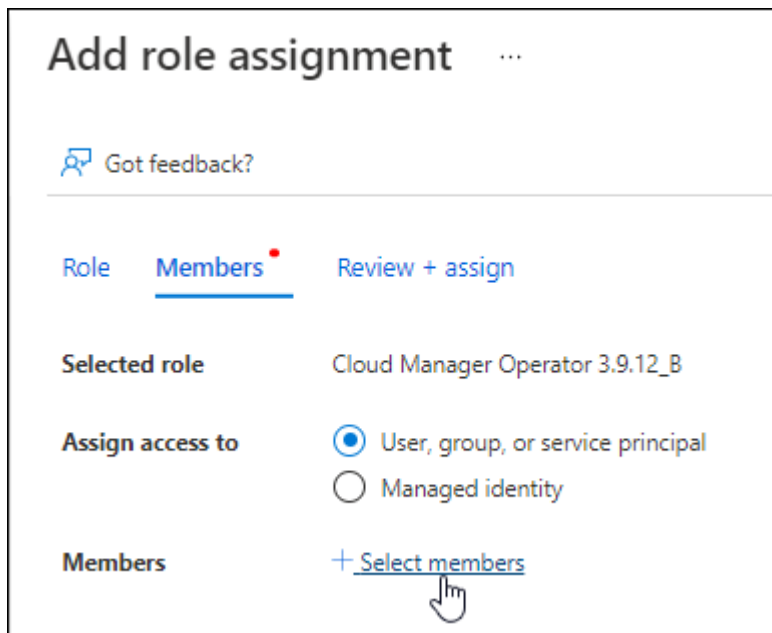
3. In the menu, click **App registrations**.
4. Click **New registration**.
5. Specify details about the application:
  - **Name**: Enter a name for the application.
  - **Account type**: Select an account type (any will work with BlueXP).
  - **Redirect URI**: You can leave this field blank.
6. Click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

You've created the AD application and service principal.

## Assign the custom role to the application

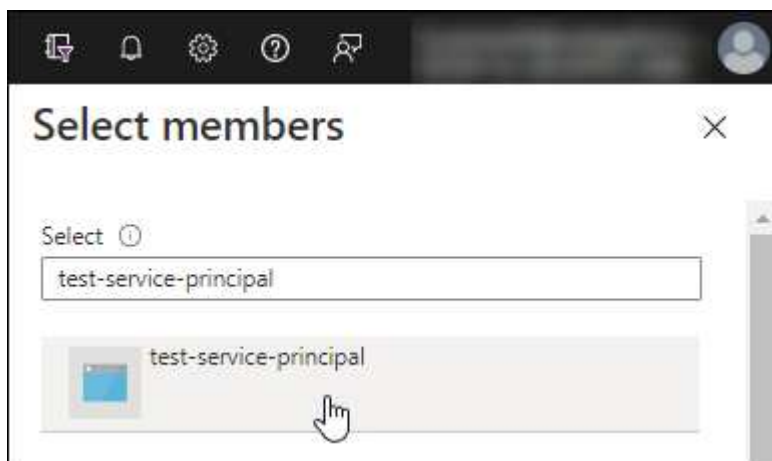
1. From the Azure portal, open the **Subscriptions** service.
2. Select the subscription.
3. Click **Access control (IAM) > Add > Add role assignment**.

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 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, click **App registrations** and select the application.
2. Click **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. Click **Access Azure Service Management as organization users** and then click **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, click **App registrations** and select the application.
2. Copy the **Application (client) ID** and the **Directory (tenant) ID**.

Delete Endpoints

Welcome to the new and improved App registrations. Looking to learn

Display name : test-service-principal

Application (client) ID : 73de25f9-99be-4ae0-8b24-538ca787a6b3

Directory (tenant) ID : 4b0911a0-929b-4715-944b-c03745165b3a

Object ID : b37489a9-379f-49c2-b27c-e630514106a5

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. Click **App registrations** and select your application.
3. Click **Certificates & secrets > New client secret**.
4. Provide a description of the secret and a duration.
5. Click **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.

<a href="#">+ New client secret</a>		
DESCRIPTION	EXPIRES	VALUE
test secret	8/16/2020	*sZ1jSe2By:D*-ZRoV4NLfdAcY7:+0vA

Copy to clipboard

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.

## Google Cloud service account

Create a role and apply it to a service account that you'll use for the Connector VM instance.

## Steps

1. Create a custom role in Google Cloud:
  - a. Create a YAML file that includes the permissions defined in the [Connector policy for Google Cloud](#).
  - b. From Google Cloud, activate cloud shell.
  - c. Upload the YAML file that includes the required permissions for the Connector.
  - d. Create a custom role by using the `gcloud iam roles create` command.

The following example creates a role named "connector" at the project level:

```
gcloud iam roles create connector --project=myproject
--file=connector.yaml
```

[Google Cloud docs: Creating and managing custom roles](#)

2. Create a service account in Google Cloud:
  - a. From the IAM & Admin service, click **Service Accounts > Create Service Account**.
  - b. Enter service account details and click **Create and Continue**.
  - c. Select the role that you just created.
  - d. Finish the remaining steps to create the role.

[Google Cloud docs: Creating a service account](#)

## Result

You now have a service account that you can assign to the Connector VM instance.

## Enable Google Cloud APIs

Several APIs are required to deploy Cloud Volumes ONTAP in Google Cloud.

### Step

1. [Enable the following Google Cloud APIs in your project](#)
  - Cloud Deployment Manager V2 API
  - Cloud Logging API
  - Cloud Resource Manager API
  - Compute Engine API
  - Identity and Access Management (IAM) API

## Deploy the Connector in restricted mode

To use BlueXP in restricted mode, you need to install the Connector, set up BlueXP by accessing the user interface that's running on the Connector, and then provide cloud permissions.

### Install the Connector

Install the Connector from your cloud provider's marketplace or by manually installing the software on your own Linux host.

## AWS Commercial Marketplace

### What you'll need

- A VPC and subnet that meets networking requirements.

[Learn about networking requirements](#)

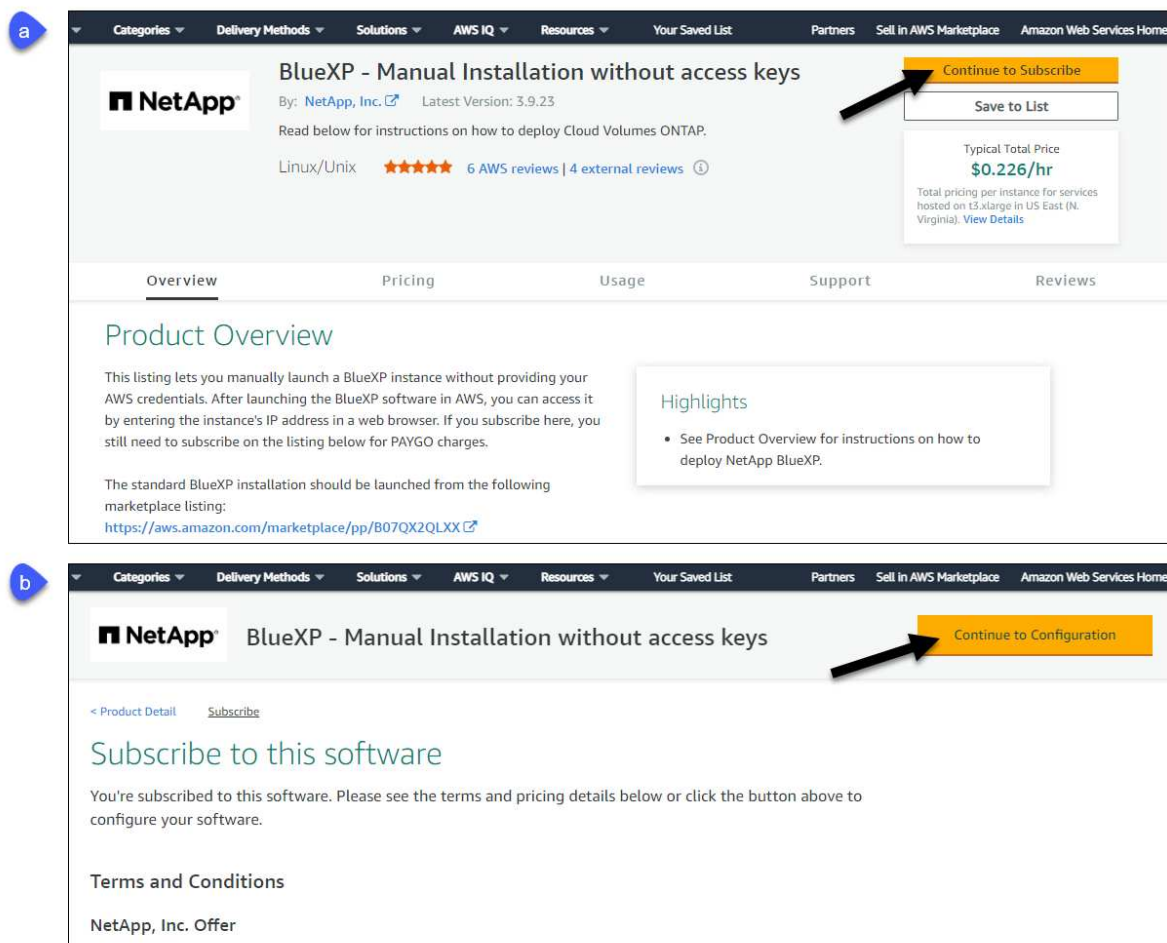
- An IAM role with an attached policy that includes the required permissions for the Connector.

[Learn how to set up AWS permissions](#)

- Permissions to subscribe and unsubscribe from the AWS Marketplace for your IAM user.
- A key pair for the EC2 instance.

### Steps

1. Go to the [BlueXP page on the AWS Marketplace](#)
2. On the Marketplace page, click **Continue to Subscribe** and then click **Continue to Configuration**.



3. Change any of the default options and click **Continue to Launch**.
4. Under **Choose Action**, select **Launch through EC2** and then click **Launch**.

These steps describe how to launch the instance from the EC2 Console because the console enables you to attach an IAM role to the Connector instance. This isn't possible using the **Launch from**

## Website action.

5. Follow the prompts to configure and deploy the instance:

- **Name and tags:** Enter a name and tags for the instance.
- **Application and OS Image:** Skip this section. The Connector AMI is already selected.
- **Instance type:** Depending on region availability, choose one of the supported instance types (t3.xlarge is recommended).

[Review the instance requirements.](#)

- **Key pair (login):** Select the key pair that you want to use to securely connect to the instance.
- **Network settings:** Edit the network settings as needed:
  - Choose the desired VPC and subnet.
  - Specify whether the instance should have a public IP address.
  - Specify firewall settings that enable the required connection methods for the Connector instance: SSH, HTTP, and HTTPS.
- **Configure storage:** Keep the default storage options.
- **Advanced details:** Under **IAM instance profile**, choose the IAM role that includes the required permissions for the Connector.

[Learn how to set up AWS permissions.](#)

- **Summary:** Review the summary and click **Launch instance**.

## Result

AWS launches the software with the specified settings. The Connector instance and software should be running in approximately five minutes.

## What's next?

Set up BlueXP.

## AWS Gov Marketplace

### What you'll need

- A VPC and subnet that meets networking requirements.

[Learn about networking requirements](#)

- An IAM role with an attached policy that includes the required permissions for the Connector.

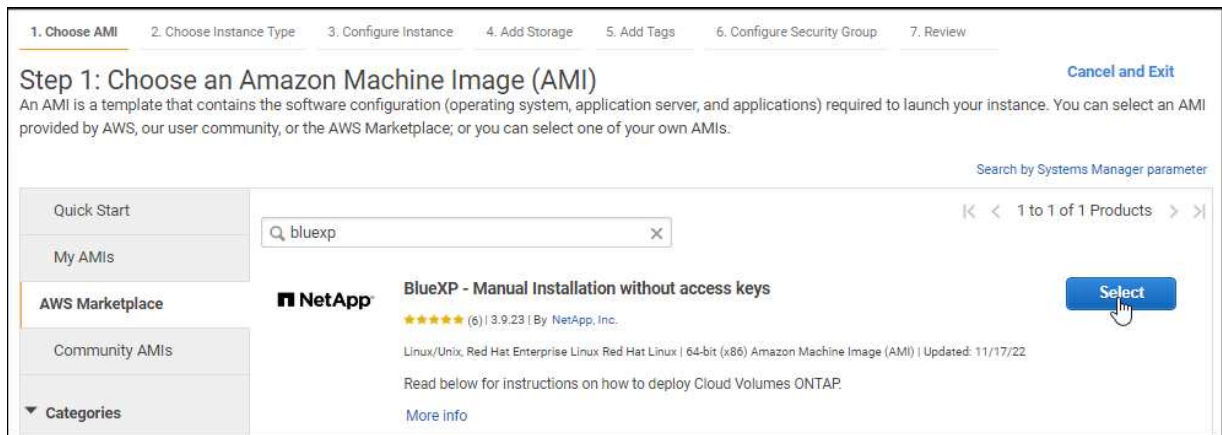
[Learn how to set up AWS permissions](#)

- Permissions to subscribe and unsubscribe from the AWS Marketplace for your IAM user.
- A key pair for the EC2 instance.

## Steps

1. Go to the BlueXP offering in the AWS Marketplace.
  - a. Open the EC2 service and select **Launch instance**.
  - b. Select **AWS Marketplace**.

c. Search for BlueXP and select the offering.



d. Click **Continue**.

2. Follow the prompts to configure and deploy the instance:

- **Choose an Instance Type:** Depending on region availability, choose one of the supported instance types (t3.xlarge is recommended).

[Review the instance requirements.](#)

- **Configure Instance Details:** Select a VPC and subnet, choose the IAM role that you created in step 1, enable termination protection (recommended), and choose any other configuration options that meet your requirements.

Number of instances	1	<a href="#">Launch into Auto Scaling Group</a>
Purchasing option	<input type="checkbox"/> Request Spot instances	
Network	vpc-a76d91c2   VPC4QA (default)	<a href="#">Create new VPC</a>
Subnet	subnet-39536c13   QASubnet1   us-east-1b 155 IP Addresses available	<a href="#">Create new subnet</a>
Auto-assign Public IP	Enable	
Placement group	<input type="checkbox"/> Add instance to placement group	
Capacity Reservation	Open	<a href="#">Create new Capacity Reservation</a>
IAM role	Cloud_Manager	<a href="#">Create new IAM role</a>
CPU options	<input type="checkbox"/> Specify CPU options	
Shutdown behavior	Stop	
Enable termination protection	<input checked="" type="checkbox"/> Protect against accidental termination	
Monitoring	<input type="checkbox"/> Enable CloudWatch detailed monitoring <a href="#">Additional charges apply.</a>	

- **Add Storage:** Keep the default storage options.
- **Add Tags:** Enter tags for the instance, if desired.
- **Configure Security Group:** Specify the required connection methods for the Connector instance:

SSH, HTTP, and HTTPS.

- **Review:** Review your selections and click **Launch**.

### Result

AWS launches the software with the specified settings. The Connector instance and software should be running in approximately five minutes.

### What's next?

Set up BlueXP.

### Azure Marketplace

#### What you'll need

- A VNet and subnet that meets networking requirements.

[Learn about networking requirements](#)

- An Azure custom role that includes the required permissions for the Connector.

[Learn how to set up Azure permissions](#)

### Steps

1. Go to the NetApp Connector VM page in the Azure Marketplace.
  - [Azure Marketplace page for commercial regions](#)
  - [Azure Marketplace page for Azure Government regions](#)
2. Click **Get it now** and then click **Continue**.
3. From the Azure portal, click **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.
- **Public IP:** If you want to use a public IP address with the Connector VM, the IP address must use a Basic SKU to ensure that BlueXP uses this public IP address.

If you use a Standard SKU IP address instead, then BlueXP uses the *private* IP address of the



Connector, instead of the public IP. If the machine that you're using to access the BlueXP Console doesn't have access to that private IP address, then actions from the BlueXP Console will fail.

[Azure documentation: Public IP SKU](#)

- **Network security group:** The Connector requires inbound connections using SSH, HTTP, and HTTPS.

[Learn about networking requirements.](#)

- **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 click **Create** to start the deployment.

## Result

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

## What's next?

Set up BlueXP.

## Manual install

### What you'll need

- 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.

### About this task

- The installation installs the AWS command line tools (awscli) to enable recovery procedures from NetApp support.

If you receive a message that installing the awscli failed, you can safely ignore the message. The Connector can operate successfully without the tools.

- 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

--cacert specifies a CA-signed certificate to use for HTTPS access between the Connector and the proxy server. h

## Result

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

### What's next?

Set up BlueXP.

## Set up BlueXP

When you access the BlueXP console for the first time, you'll be prompted to choose an account to associate the Connector with and you'll need to enable restricted mode.



If you already have an account and you want to create another one, then you need to use the Tenancy API. [Learn how to create an additional BlueXP account.](#)

### Steps

1. Open a web browser from a host that has a connection to the Connector instance and enter the following URL:

`https://ipaddress`

2. Sign up or log in to BlueXP.
3. After you're logged in, set up BlueXP:
  - a. Enter a name for the Connector.
  - b. Enter a name for a new BlueXP account or select an existing account.

You can select an existing account if your log in is already associated with a BlueXP account.


- c. Select **Are you running in a secured environment?**
- d. Select **Enable restricted mode on this account.**

Note that you can't change this setting after BlueXP creates the account. You can't enable restricted mode later and you can't disable it later.

If you deployed the Connector in a Government region, the checkbox is already enabled and can't be changed. This is because restricted mode is the only mode supported in Government regions.

Hi Tami,

Welcome to NetApp BlueXP



Let's get started by creating an account for your organization.

If your organization already has an existing account, it's best to ask the account admin to add you to it. [Learn how to add user](#)

Connector name

BlueXP1

Account name

MyCompany

Are you running in a secured environment?

Use restricted deployment mode to disconnect this account from the BlueXP backend services. Restricted deployments are often required in extremely secure or regulated environments. Note: Use this option only if you're sure you need it as some BlueXP functionality is not available in restricted deployments.

[Learn more about BlueXP deployment modes](#)

☒ Enable restricted mode on this account

Let's start

e. Click **Let's start**.

## Result

The Connector is now installed and set up with your BlueXP account. All users need to access BlueXP using the IP address of the Connector instance.

## What's next?

Provide BlueXP with the permissions that you previously set up.

## Provide permissions to BlueXP

If you deployed the Connector from the Azure Marketplace or if you manually installed the Connector software, you need to provide the permissions that you previously set up so that you can use BlueXP services.

These steps don't apply if you deployed the Connector from the AWS Marketplace because you chose the required IAM role during deployment.

[Learn how to prepare cloud permissions.](#)

### AWS IAM role

Attach the IAM role that you previously created to the EC2 instance where you installed the Connector.

These steps apply only if you manually installed the Connector in AWS. For AWS Marketplace deployments, you already associated the Connector instance with an IAM role that includes the required permissions.

#### Steps

1. Go to the Amazon EC2 console.
2. Select **Instances**.
3. Select the Connector instance.
4. Select **Actions > Security > Modify IAM role**.
5. Select the IAM role and click **Update IAM role**.

#### Result

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

### AWS access key

Provide BlueXP with the AWS access key for an IAM user that has the required permissions.

#### Steps

1. Ensure that the correct Connector is currently selected in BlueXP.
2. In the upper right of the BlueXP console, click the Settings icon, and select **Credentials**.



3. Click **Add Credentials** and follow the steps in the wizard.
  - a. **Credentials Location:** Select **Amazon Web Services > Connector**.
  - b. **Define Credentials:** Enter an AWS access key and secret key.
  - 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 click **Add**.

#### Result

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

### Azure 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. Click **Access control (IAM) > Add > Add role assignment**.
3. In the **Role** tab, select the **BlueXP Operator** role and click **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. Click **Select members**, select the subscription in which the Connector virtual machine was created, choose **Virtual machine**, and then select the Connector virtual machine.
  - c. Click **Select**.
  - d. Click **Next**.
  - e. Click **Review + assign**.
  - f. If you want to deploy Cloud Volumes ONTAP from additional 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.

### Azure service principal

Provide BlueXP with the credentials for the Azure service principal that you previously setup.

### Steps

1. Go to the [BlueXP console](#) and log in.
2. In the upper right of the BlueXP console, click the Settings icon, and select **Credentials**.



3. Click **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 click **Add**.

### Result

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

### Google Cloud service account

Associate the service account with the Connector VM.

### Steps

1. Go to the Google Cloud portal and assign the service account to the Connector VM instance.

[Google Cloud documentation: Changing the service account and access scopes for an instance](#)

2. If you want to deploy Cloud Volumes ONTAP in other projects, grant access by adding the service account with the BlueXP role to that project. You'll need to repeat this step for each project.

### Result

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

## Log in to BlueXP (restricted mode)

When you use BlueXP in restricted mode, you'll need to log in to the BlueXP console from the user interface that runs locally on the Connector.

### Log in options

BlueXP supports logging in with one of the following options when your account is set up in restricted mode:

- A NetApp cloud login using your email address and a password
- A federated connection

You can use single sign-on to log in using credentials from your corporate directory (federated identity).

[Learn how to use identity federation with BlueXP.](#)

### Steps

1. Open a web browser and enter the following URL:

`https://ipaddress`

*ipaddress* can be localhost, a private IP address, or a public IP address, depending on the configuration of the host where you installed the Connector. For example, you might need to enter a private IP address from a host that has a connection to the Connector host.

2. Enter your user name and password to log in.

### Result

You're now logged in and can start using BlueXP to manage your hybrid multi-cloud infrastructure.

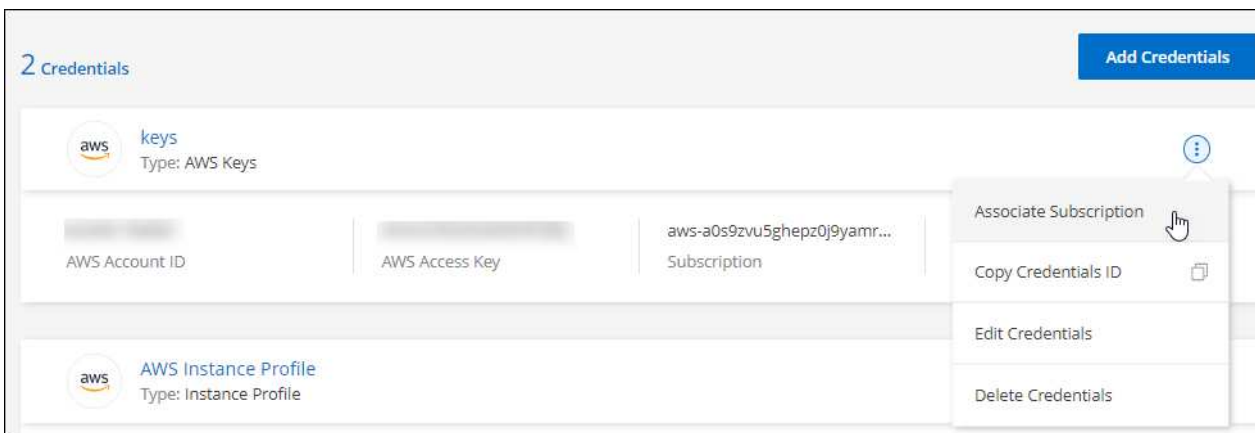
## Subscribe to BlueXP (restricted mode)

Subscribe to BlueXP from your cloud provider's marketplace to pay for BlueXP services at an hourly rate (PAYGO) or through an annual contract.

## AWS

### Steps

1. In the upper right of the BlueXP console, click the Settings icon, and select **Credentials**.
2. Click the action menu for a set of credentials and then select **Associate Subscription**.



3. To associate the credentials with an existing subscription, select the subscription from the down-down list and click **Associate**.
4. To associate the credentials with a new subscription, click **Add Subscription > Continue** and follow the steps in the AWS Marketplace:
  - a. Click **View purchase options**.
  - b. Click **Subscribe**.
  - c. Click **Set up your account**.

You'll be redirected to the BlueXP website.

- d. From the **Subscription Assignment** page:
  - Select the BlueXP accounts that you'd like to associate this subscription with.
  - In the **Replace existing subscription** field, choose whether you'd like to automatically replace the existing subscription for one account with this new subscription.

BlueXP replaces the existing subscription for all credentials in the account with this new subscription. If a set of credentials wasn't ever associated with a subscription, then this new subscription won't be associated with those credentials.

For all other accounts, you'll need to manually associate the subscription by repeating these steps.

- Click **Save**.

The following video shows the steps to subscribe from the AWS Marketplace:

► <https://docs.netapp.com/us-en/cloud-manager-setup->



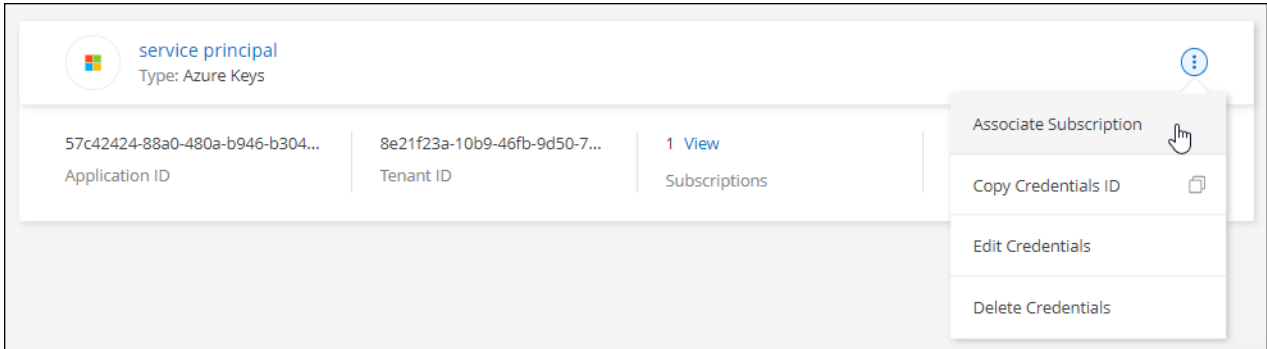
## Azure



In Azure, annual contracts are not supported with government regions.

## Steps

1. In the upper right of the BlueXP console, click the Settings icon, and select **Credentials**.
2. Click the action menu for a set of credentials and then select **Associate Subscription**.



3. To associate the credentials with an existing subscription, select the subscription from the down-down list and click **Associate**.
4. To associate the credentials with a new subscription, click **Add Subscription > Continue** and follow the steps in the Azure Marketplace:
  - a. If prompted, log in to your Azure account.
  - b. Click **Subscribe**.
  - c. Fill out the form and click **Subscribe**.
  - d. After the subscription process is complete, click **Configure account now**.

You'll be redirected to the BlueXP website.

- e. From the **Subscription Assignment** page:

- Select the BlueXP accounts that you'd like to associate this subscription with.
- In the **Replace existing subscription** field, choose whether you'd like to automatically replace the existing subscription for one account with this new subscription.

BlueXP replaces the existing subscription for all credentials in the account with this new subscription. If a set of credentials wasn't ever associated with a subscription, then this new subscription won't be associated with those credentials.

For all other accounts, you'll need to manually associate the subscription by repeating these steps.

- Click **Save**.

The following video shows the steps to subscribe from the Azure Marketplace:

► <https://docs.netapp.com/us-en/cloud-manager-setup->

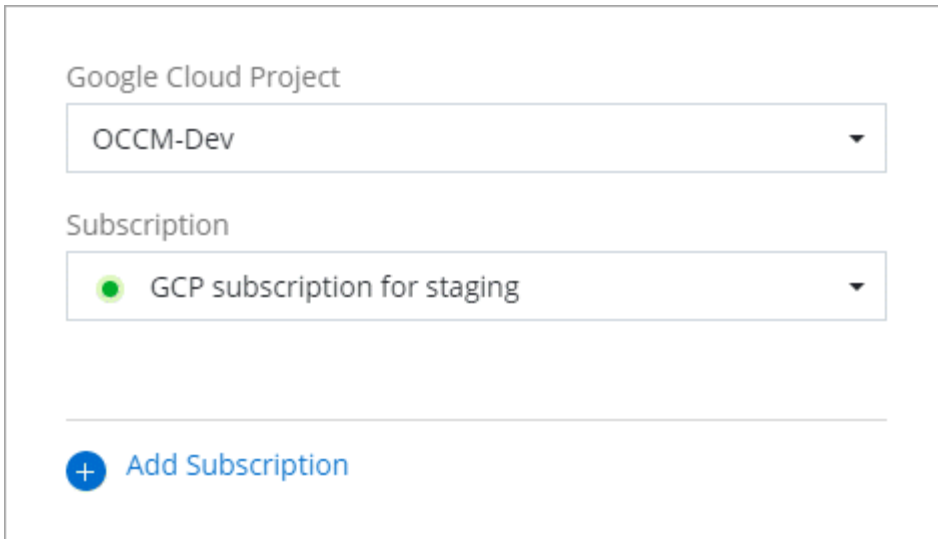
## Google Cloud

### Steps

1. In the upper right of the BlueXP console, click the Settings icon, and select **Credentials**.
2. Click the action menu for a set of credentials and then select **Associate Subscription**.



3. To associate the credentials with an existing subscription, select a Google Cloud project and subscription from the down-down list, and then click **Associate**.



4. If you don't already have a subscription, click **Add Subscription > Continue** and follow the steps in the Google Cloud Marketplace.



Before you complete the following steps, ensure that you have both Billing Admin privileges in your Google Cloud account as well as a BlueXP login.

- a. After you're redirected to the [NetApp BlueXP page on the Google Cloud Marketplace](#), ensure that the correct project is selected at the top navigation menu.

The screenshot shows the Google Cloud interface with the NetApp logo and 'Google Cloud' text in the top left. A search bar in the top right contains 'netapp.com'. Below the header, a back arrow and 'Product details' are visible. The main content area features the 'NetApp BlueXP' title, the NetApp logo, and a link to 'NetApp, Inc.'. A description states: 'BlueXP lets you build, protect, and govern your hybrid multicloud data estate.' A prominent blue 'SUBSCRIBE' button is centered. Below this is a navigation bar with links for 'OVERVIEW', 'PRICING', 'DOCUMENTATION', and 'SUPPORT'. The 'OVERVIEW' section is active, showing a description of BlueXP as a hybrid multicloud storage and data services experience. To the right, an 'Additional details' section lists the product type as 'SaaS & APIs', the last updated date as '12/19/22', and the category as 'Analytics, Developer tools, Storage'.

Google Cloud netapp.com

Product details

## NetApp BlueXP

**NetApp** [NetApp, Inc.](#)

BlueXP lets you build, protect, and govern your hybrid multicloud data estate.

**SUBSCRIBE**

[OVERVIEW](#) [PRICING](#) [DOCUMENTATION](#) [SUPPORT](#)

### Overview

BlueXP is NetApp's hybrid multicloud storage and data services experience that helps organizations build and operate a centrally controlled data foundation across on-premises, edge, and cloud environments.

BlueXP abstracts the complexity of architecting the underlying Google Cloud infrastructure resources making it easier to deploy and operate NetApp's storage, mobility, protection, and analysis services within your Google Cloud environment.

### Additional details

Type: [SaaS & APIs](#)

Last updated: 12/19/22

Category: [Analytics](#), [Developer tools](#), [Storage](#)

- b. Click **Subscribe**.
- c. Select the appropriate billing account and agree to the terms and conditions.
- d. Click **Subscribe**.

This step sends your transfer request to NetApp.

- e. On the pop-up dialog box, click **Register with NetApp, Inc.**

This step must be completed to link the Google Cloud subscription to your BlueXP account. The process of linking a subscription isn't complete until you are redirected from this page and then sign in to BlueXP.

Your order request has been sent to NetApp, Inc.



Your new subscription to the Cloud Manager 1 month plan for Cloud Manager for Cloud Volumes ONTAP requires your registration with NetApp, Inc.. After NetApp, Inc. approves your request, your subscription will be active and you will begin getting charged. This processing time will depend on the vendor, and you should reach out to NetApp, Inc. directly with any questions related to signup.

[VIEW ORDERS](#)

[REGISTER WITH NETAPP, INC.](#)

f. Complete the steps on the **Subscription Assignment** page:



If someone from your organization has already subscribed to the NetApp BlueXP subscription from your billing account, then you will be redirected to [the Cloud Volumes ONTAP page on the BlueXP website](#) instead. If this is unexpected, contact your NetApp sales team. Google enables only one subscription per Google billing account.

- Select the BlueXP accounts that you'd like to associate this subscription with.
- In the **Replace existing subscription** field, choose whether you'd like to automatically replace the existing subscription for one account with this new subscription.

BlueXP replaces the existing subscription for all credentials in the account with this new subscription. If a set of credentials wasn't ever associated with a subscription, then this new subscription won't be associated with those credentials.

For all other accounts, you'll need to manually associate the subscription by repeating these steps.

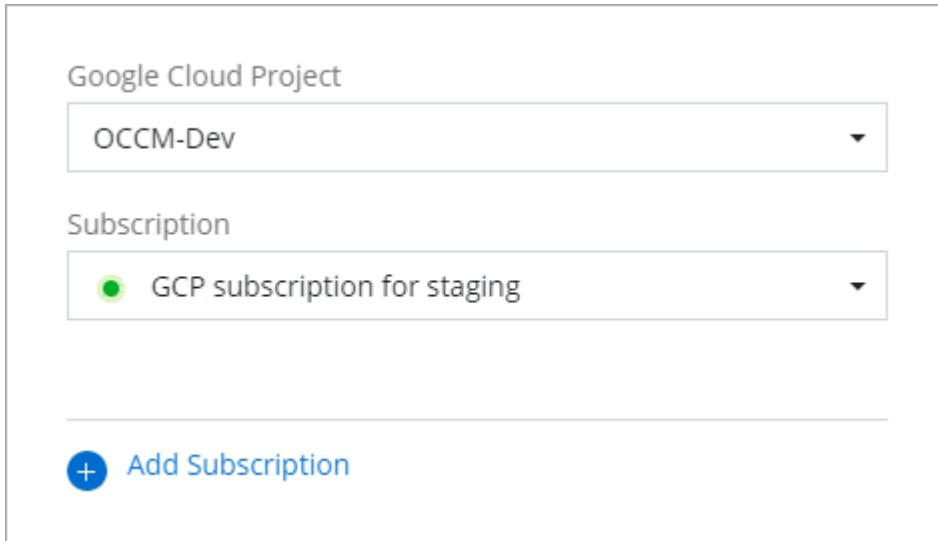
- Click **Save**.

The following video shows the steps to subscribe from the Google Cloud Marketplace:

► <https://docs.netapp.com/us-en/cloud-manager-setup-admin//media/video-subscribing->

[google-cloud.mp4](#) (video)

- g. Once this process is complete, navigate back to the Credentials page in BlueXP and select this new subscription.



The screenshot shows a form with two dropdown menus. The first dropdown is labeled 'Google Cloud Project' and has 'OCCM-Dev' selected. The second dropdown is labeled 'Subscription' and has 'GCP subscription for staging' selected, which is preceded by a green circular icon. Below these dropdowns is a horizontal line, and then a blue circular button with a white plus sign and the text 'Add Subscription'.

## What you can do next (restricted mode)

After you get up and running with BlueXP in restricted mode, you can start using the BlueXP services that are supported with restricted mode.

For help, refer to the documentation for these services:

- [Amazon FSx for ONTAP docs](#)
- [Azure NetApp Files docs](#)
- [Cloud Backup docs](#)
- [Cloud Data Sense docs](#)
- [Cloud Volumes ONTAP docs](#)
- [On-premises ONTAP cluster docs](#)
- [Replication docs](#)

## Get started with private mode

### Quick start for BlueXP in private mode

Get started with BlueXP in private mode in a few steps.

1

#### Prepare for deployment

- a. Prepare a dedicated Linux host that meets requirements for CPU, RAM, disk space, Docker Engine, and more.

- b. Set up networking that provides access to the target networks.
- c. For cloud deployments, set up permissions in your cloud provider so that you can associate those permissions with the Connector after you install the software.

[Learn how to prepare for deployment.](#)

## 2

### Deploy the Connector

- a. Install the Connector software on your own Linux host.
- b. Set up BlueXP by opening a web browser and entering the Linux host's IP address.
- c. For cloud deployments, provide BlueXP with the permissions that you previously set up.

[Learn how to deploy the Connector.](#)

## Prepare for deployment in private mode

You should understand what's needed to get started with BlueXP in private mode so that you can prepare your environment.



If you want to use BlueXP in the [AWS Commercial Cloud Services \(C2S\) environment](#) then you should follow separate instructions that describe how to prepare, install the Connector, and launch Cloud Volumes ONTAP. [Learn how to get started with Cloud Volumes ONTAP in the AWS C2S environment](#)

### Understand how private mode works

Before you get started, you should have an understanding of how BlueXP works in private mode.

For example, you should understand that you need to use the browser-based interface that is available locally from the BlueXP Connector that you need to install. You can't access BlueXP from the web-based console that's provided through the SaaS layer.

In addition, not all BlueXP services are available.

[Learn how private mode works.](#)

### Review installation options

In private mode, you can install the Connector on premises or in the cloud by manually installing the Connector on your own Linux host.

If you want to create a Cloud Volumes ONTAP system in Google Cloud, then the Connector must be running in Google Cloud—it can't be running on premises.

### 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

- CentOS 7.6, 7.7, 7.8, and 7.9
- Red Hat Enterprise Linux 7.6, 7.7, 7.8, 7.9, 8.6, and 8.7

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 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

## AWS EC2 instance type

An instance type that meets the CPU and RAM requirements above. We recommend t3.xlarge.

## Azure VM size

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

## Google Cloud machine type

An instance type that meets the CPU and RAM requirements above. We recommend n2-standard-4.

The Connector is supported in Google Cloud on a VM instance with an OS that supports [Shielded VM features](#)

## 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](#)

## Prepare networking for the Connector

Set up your networking so the Connector can manage resources and processes within your public cloud environment. Other than having a virtual network and subnet for the Connector, you'll need to ensure that the following requirements are met.

## Connections to target networks

The Connector must have a network connection to the location where you plan to manage storage. For example, the VPC or VNet where you plan to deploy Cloud Volumes ONTAP, or the data center where your on-premises ONTAP clusters reside.

## Endpoints for day-to-day operations

The Connector contacts the following endpoints to deploy and manage Cloud Volumes ONTAP in your public cloud environment.

Endpoints	Purpose
AWS services (amazonaws.com): <ul style="list-style-type: none"><li>• CloudFormation</li><li>• Elastic Compute Cloud (EC2)</li><li>• Identity and Access Management (IAM)</li><li>• Key Management Service (KMS)</li><li>• Security Token Service (STS)</li><li>• Simple Storage Service (S3)</li></ul>	To manage resources in AWS. The exact endpoint depends on the region in which you deploy the Connector. <a href="#">Refer to AWS documentation for details</a>
https://management.azure.com https://login.microsoftonline.com https://blob.core.windows.net https://core.windows.net	To manage resources in Azure public regions.
https://management.azure.microsoft.scloud https://login.microsoftonline.microsoft.scloud https://blob.core.microsoft.scloud https://core.microsoft.scloud	To manage resources in the Azure IL6 region.
https://management.chinacloudapi.cn https://login.chinacloudapi.cn https://blob.core.chinacloudapi.cn https://core.chinacloudapi.cn	To manage resources in Azure China regions.
https://www.googleapis.com/compute/v1/ https://cloudresourcemanager.googleapis.com/v1/projects https://www.googleapis.com/compute/beta https://storage.googleapis.com/storage/v1 https://www.googleapis.com/storage/v1 https://iam.googleapis.com/v1 https://cloudkms.googleapis.com/v1 https://www.googleapis.com/deploymentmanager/v2/projects	To manage resources in Google Cloud.

## Proxy server

If your organization requires deployment of a proxy server for outgoing internet traffic, obtain the following information about your HTTP or HTTPS proxy:

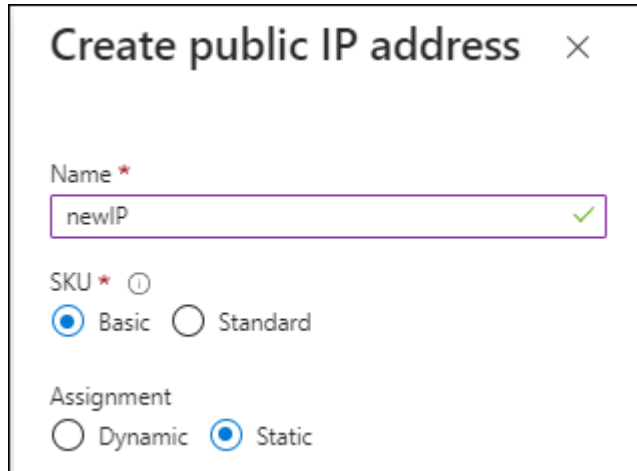


- IP address
- Credentials
- HTTPS certificate

With private mode, the only time that BlueXP sends outbound traffic is to your cloud provider in order to create a Cloud Volumes ONTAP system.

### Public IP address in Azure

If you want to use a public IP address with the Connector VM in Azure, the IP address must use a Basic SKU to ensure that BlueXP uses this public IP address.



**Create public IP address** ✕

Name \*  
newIP ✓

SKU \* ⓘ  
☒ Basic ☐ Standard

Assignment  
☐ Dynamic ☒ Static

If you use a Standard SKU IP address instead, then BlueXP uses the *private* IP address of the Connector, instead of the public IP. If the machine that you're using to access the BlueXP Console doesn't have access to that private IP address, then actions from the BlueXP Console will fail.

[Azure documentation: Public IP SKU](#)

### Ports

There's no incoming traffic to the Connector, unless you initiate it.

HTTP (80) and HTTPS (443) provide access to the BlueXP console. SSH (22) is only needed if you need to connect to the host for troubleshooting. Meanwhile, 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.

### Prepare cloud permissions

If you are planning to create Cloud Volumes ONTAP systems, then BlueXP requires permissions from your cloud provider. You need to set up permissions in your cloud provider and then associate those permission with the Connector instance after you install it.

To view the required steps, select the authentication option that you'd like to use for your cloud provider.

If you're going to install the Connector on premises, then you must provide permissions using AWS access keys or an Azure service principal. The other options are not supported.

## AWS IAM role

Use an IAM role to provide the Connector with permissions. You'll need to manually attach the role to the EC2 instance for the Connector.

### Steps

1. Log in to the AWS console and navigate to the IAM service.
2. Create a policy:
  - a. Click **Policies > Create policy**.
  - b. Select **JSON** and copy and paste the contents of the [IAM policy for the Connector](#).
  - c. Finish the remaining steps to create the policy.
3. Create an IAM role:
  - a. Click **Roles > Create role**.
  - b. Select **AWS service > EC2**.
  - c. Add permissions by attaching the policy that you just created.
  - d. Finish the remaining steps to create the role.

### Result

You now have an IAM role for the Connector EC2 instance.

## AWS access key

Set up permissions and an access key for an IAM user. You'll need to provide BlueXP with the AWS access key after you install the Connector and set up BlueXP.

### Steps

1. From the IAM console, create a policy:
  - a. Click **Policies > Create policy**.
  - b. Select **JSON** and copy and paste the contents of the [IAM policy for the Connector](#).
  - c. Finish the remaining steps to create the policy.

Depending on the BlueXP services that you're planning to use, you might need to create a second policy.

For standard regions, the permissions are spread across two policies. Two policies are required due to a maximum character size limit for managed policies in AWS. [Learn more about IAM policies for the Connector](#).

2. Attach the policies to an IAM user.
  - [AWS Documentation: Creating IAM Roles](#)
  - [AWS Documentation: Adding and Removing IAM Policies](#)
3. Ensure that the user has access keys that you can add to BlueXP after you install the Connector.

### Result

The account now has the required permissions.

## Azure role

Create an Azure custom role with the required permissions. You'll assign this role to the Connector VM.

### Steps

1. Enable a system-assigned managed identity on the VM where you plan to install the Connector 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 from which users will create Cloud Volumes ONTAP systems.

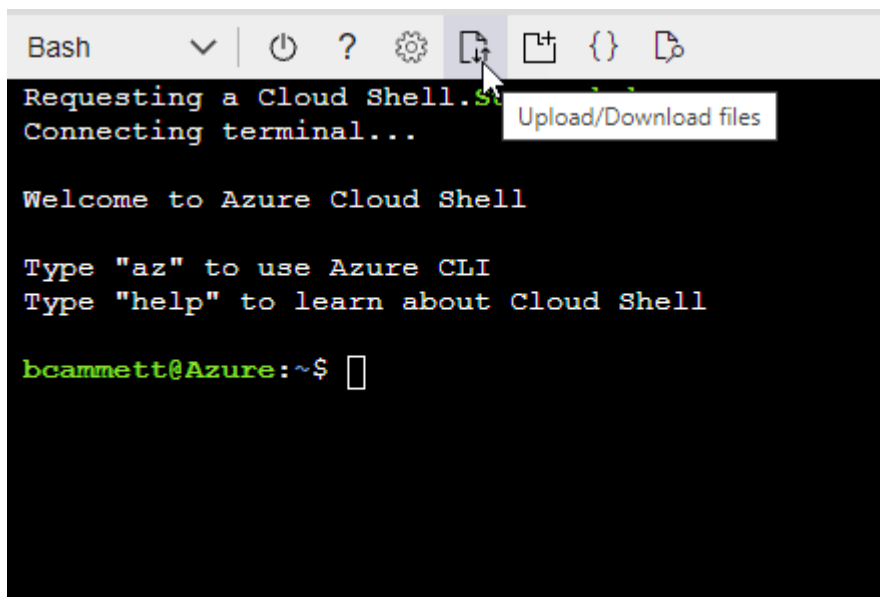
### Example

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

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.

## Azure service principal

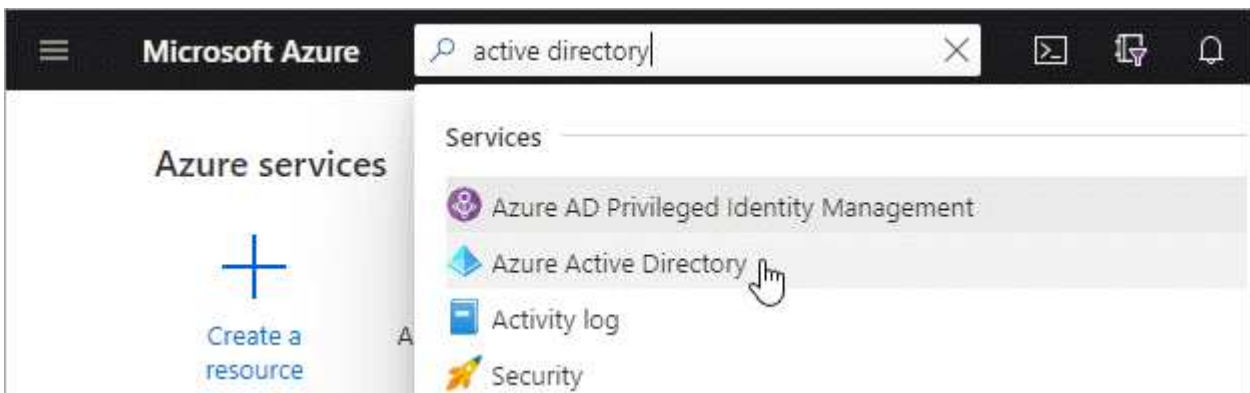
Create and set up a service principal in Azure Active Directory and obtain the Azure credentials that BlueXP needs. You'll need to provide BlueXP with these credentials after you install the Connector and set up BlueXP.

### 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.



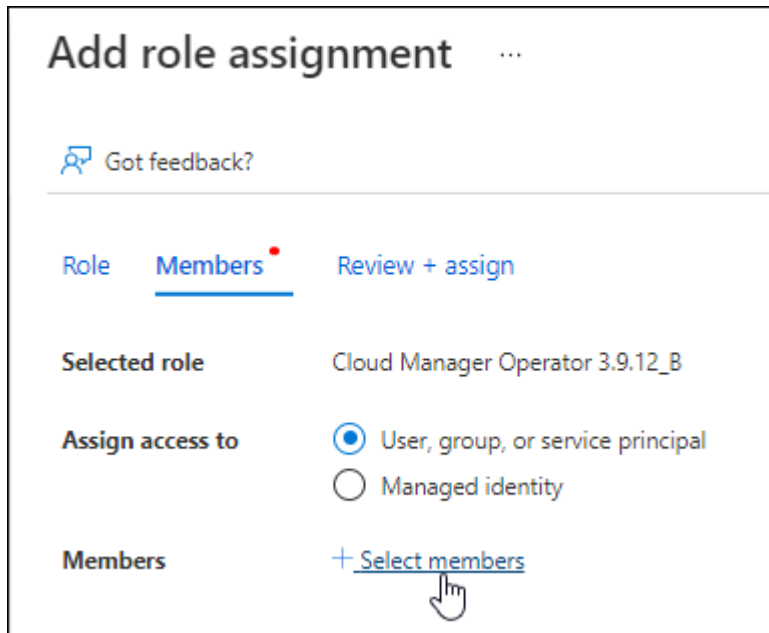
3. In the menu, click **App registrations**.
4. Click **New registration**.
5. Specify details about the application:
  - **Name**: Enter a name for the application.
  - **Account type**: Select an account type (any will work with BlueXP).
  - **Redirect URI**: You can leave this field blank.
6. Click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

You've created the AD application and service principal.

### Assign the custom role to the application

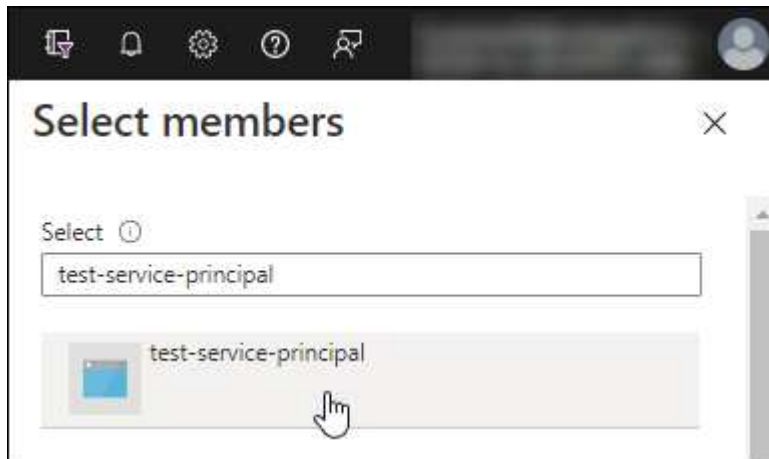
1. From the Azure portal, open the **Subscriptions** service.
2. Select the subscription.
3. Click **Access control (IAM) > Add > Add role assignment**.
4. In the **Role** tab, select the **BlueXP Operator** role and click **Next**.

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 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, click **App registrations** and select the application.
2. Click **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.

 <b>Azure Batch</b> Schedule large-scale parallel and HPC applications in the cloud	 <b>Azure Data Catalog</b> Programmatic access to Data Catalog resources to register, annotate and search data assets	 <b>Azure Data Explorer</b> Perform ad-hoc queries on terabytes of data to build near real-time and complex analytics solutions
 <b>Azure Data Lake</b> Access to storage and compute for big data analytic scenarios	 <b>Azure DevOps</b> Integrate with Azure DevOps and Azure DevOps server	 <b>Azure Import/Export</b> Programmatic control of import/export jobs
 <b>Azure Key Vault</b> Manage your key vaults as well as the keys, secrets, and certificates within your Key Vaults	 <b>Azure Rights Management Services</b> Allow validated users to read and write protected content	 <b>Azure Service Management</b> Programmatic access to much of the functionality available through the Azure portal
 <b>Azure Storage</b> Secure, massively scalable object and data lake storage for unstructured and semi-structured data	 <b>Customer Insights</b> Create profile and interaction models for your products	 <b>Data Export Service for Microsoft Dynamics 365</b> Export data from Microsoft Dynamics CRM organization to an external destination

4. Click **Access Azure Service Management as organization users** and then click **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, click **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. Click **App registrations** and select your application.
3. Click **Certificates & secrets > New client secret**.
4. Provide a description of the secret and a duration.
5. Click **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.

<a href="#">+ New client secret</a>		
DESCRIPTION	EXPIRES	VALUE
test secret	8/16/2020	*sZ1jSe2By:D*-ZRoV4NLfdAcY7:+0vA

Copy to clipboard

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.

## Google Cloud service account

Create a role and apply it to a service account that you'll use for the Connector VM instance.

## Steps

1. Create a custom role in Google Cloud:
  - a. Create a YAML file that includes the permissions defined in the [Connector policy for Google Cloud](#).
  - b. From Google Cloud, activate cloud shell.
  - c. Upload the YAML file that includes the required permissions for the Connector.
  - d. Create a custom role by using the `gcloud iam roles create` command.

The following example creates a role named "connector" at the project level:

```
gcloud iam roles create connector --project=myproject
--file=connector.yaml
```

[Google Cloud docs: Creating and managing custom roles](#)

2. Create a service account in Google Cloud:
  - a. From the IAM & Admin service, click **Service Accounts > Create Service Account**.
  - b. Enter service account details and click **Create and Continue**.
  - c. Select the role that you just created.
  - d. Finish the remaining steps to create the role.

[Google Cloud docs: Creating a service account](#)

## Result

You now have a service account that you can assign to the Connector VM instance.



## Enable Google Cloud APIs

Several APIs are required to deploy Cloud Volumes ONTAP in Google Cloud.

### Step

1. [Enable the following Google Cloud APIs in your project](#)
  - Cloud Deployment Manager V2 API
  - Cloud Logging API
  - Cloud Resource Manager API
  - Compute Engine API
  - Identity and Access Management (IAM) API

## Deploy the Connector in private mode

To set up BlueXP in private mode, you need to install the Connector, set up BlueXP by accessing the user interface that's running on the Connector, and then provide cloud permissions.

### Install the Connector

Download the product installer from the [NetApp Support Site](#) and then manually install the Connector on your own Linux host.

If you want to use BlueXP in the [AWS Commercial Cloud Services \(C2S\) environment](#) then you should follow separate instructions to get started in that environment. [Learn how to get started with Cloud Volumes ONTAP in the AWS C2S environment](#)

### Required privileges

Root privileges are required to install the Connector.

### Steps

1. Verify that docker is enabled and running.

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

2. Download the Connector software from the [NetApp Support Site](#)

Be sure to download the installer for restricted networks without internet access.

3. Copy the installer to the Linux host.
4. Assign permissions to run the script.

```
chmod +x /path/cloud-manager-connector-offline-<version>
```

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

5. Run the installation script:

```
sudo /path/cloud-manager-connector-offline-<version>
```

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

## Result

The Connector software is installed. You can now set up BlueXP.

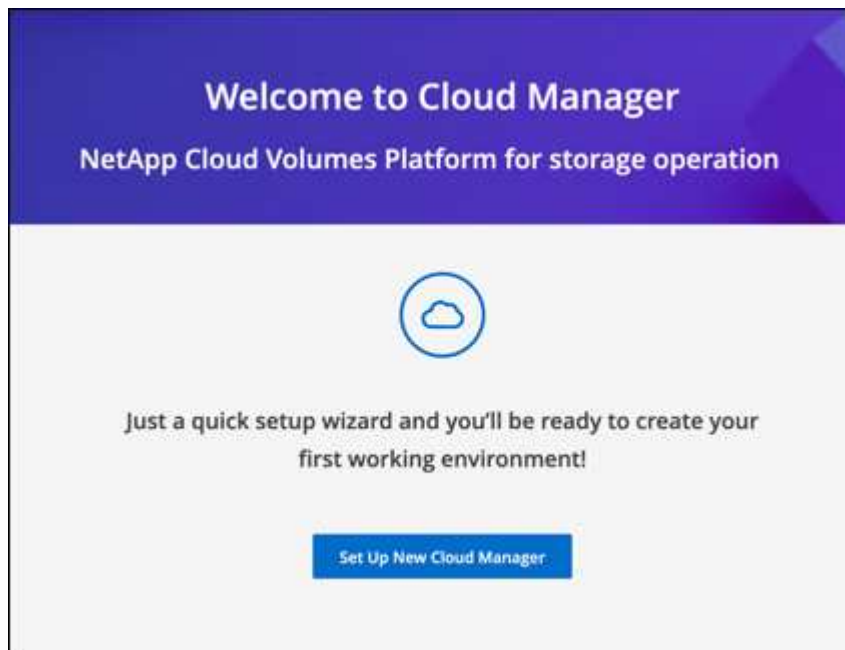
## Set up BlueXP

When you access the BlueXP console for the first time, you'll be prompted to set up BlueXP.

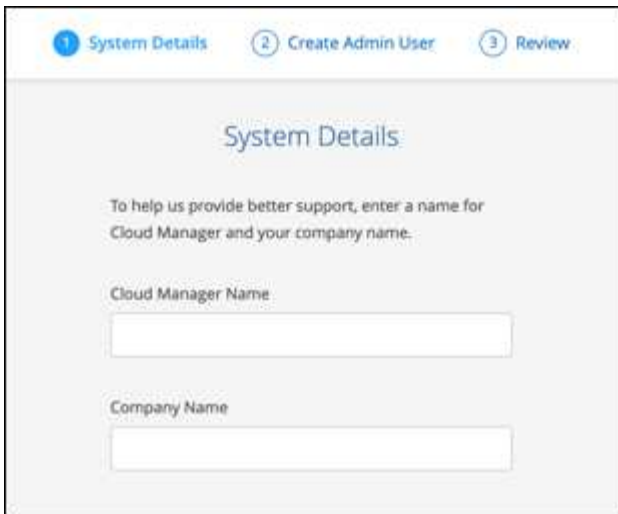
## Steps

1. Open a web browser and enter `https://ipaddress` where *ipaddress* is the IP address of the Linux host where you installed the Connector.

You should see the following screen.



2. Click **Set Up New BlueXP** and follow the prompts to set up the system.
  - **System Details:** Enter a name for the Connector and your company name.



- **Create Admin User:** Create the admin user for the system.

This user account runs locally on the system. There's no connection to the auth0 service available through BlueXP.

- **Review:** Review the details, accept the license agreement, and then click **Set Up**.

3. Log in to BlueXP using the admin user that you just created.

## Result

The Connector is now installed and set up.

When new versions of the Connector software are available, they'll be posted to the NetApp Support Site. [Learn how to upgrade the Connector.](#)

## What's next?

Provide BlueXP with the permissions that you previously set up.

## Provide permissions to BlueXP

If you want to create Cloud Volumes ONTAP working environments, you'll need to provide BlueXP with the cloud permissions that you previously set up.

[Learn how to prepare cloud permissions.](#)

## AWS IAM role

Attach the IAM role that you previously created to the Connector EC2 instance.

### Steps

1. Go to the Amazon EC2 console.
2. Select **Instances**.
3. Select the Connector instance.
4. Select **Actions > Security > Modify IAM role**.
5. Select the IAM role and click **Update IAM role**.

### Result

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

## AWS access key

Provide BlueXP with the AWS access key for an IAM user that has the required permissions.

### Steps

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



2. Click **Add Credentials** and follow the steps in the wizard.
  - a. **Credentials Location**: Select **Amazon Web Services > Connector**.
  - b. **Define Credentials**: Enter an AWS access key and secret key.
  - 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 click **Add**.

### Result

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

## Azure 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. Click **Access control (IAM) > Add > Add role assignment**.
3. In the **Role** tab, select the **BlueXP Operator** role and click **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. Click **Select members**, select the subscription in which the Connector virtual machine was created, choose **Virtual machine**, and then select the Connector virtual machine.
- c. Click **Select**.
- d. Click **Next**.
- e. Click **Review + assign**.
- f. If you want to deploy Cloud Volumes ONTAP from additional 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.

## Azure service principal

Provide BlueXP with the credentials for the Azure service principal that you previously setup.

## Steps

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



2. Click **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 click **Add**.

## Result

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

## Google Cloud service account

Associate the service account with the Connector VM.

## Steps

1. Go to the Google Cloud portal and assign the service account to the Connector VM instance.

[Google Cloud documentation: Changing the service account and access scopes for an instance](#)

2. If you want to deploy Cloud Volumes ONTAP in other projects, grant access by adding the service account with the BlueXP role to that project. You'll need to repeat this step for each project.

### Result

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

## Log in to BlueXP (private mode)

When you use BlueXP in private mode, you'll need to log in to the BlueXP console from the user interface that runs locally on the Connector.

### Log in options

Private mode supports local user management and access. Authentication is not provided through BlueXP's cloud service.

### Steps

1. Open a web browser and enter the following URL:

`https://ipaddress`

*ipaddress* can be localhost, a private IP address, or a public IP address, depending on the configuration of the host where you installed the Connector. For example, you might need to enter a private IP address from a host that has a connection to the Connector host.

2. Enter your user name and password to log in.

### Result

You're now logged in and can start using BlueXP to manage your hybrid multi-cloud infrastructure.

## What you can do next (private mode)

After you get up and running with BlueXP in private mode, you can start using the BlueXP services that are supported with private mode.

For help, refer to the following documentation:

- [Create Cloud Volumes ONTAP systems](#)
- [Discover on-premises ONTAP clusters](#)
- [Replicate data](#)
- [Scan on-prem ONTAP volume data using Cloud Data Sense](#)
- [Back up on-prem ONTAP volume data to StorageGRID using Cloud Backup](#)

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