Get started

Setup 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
- Orchestrate and protect Kubernetes persistent data

Mobility

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

- Copy and sync
- Edge caching
- Tiering

Protection

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

- Backup and recovery
- Replication

Analysis and control

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

- Classification
- Digital advisor
- Economic efficiency
- Operational resiliency

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 working environments and enable BlueXP 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 manage working environments (for example, Cloud Volumes ONTAP and on-premises ONTAP clusters) and to use many BlueXP 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

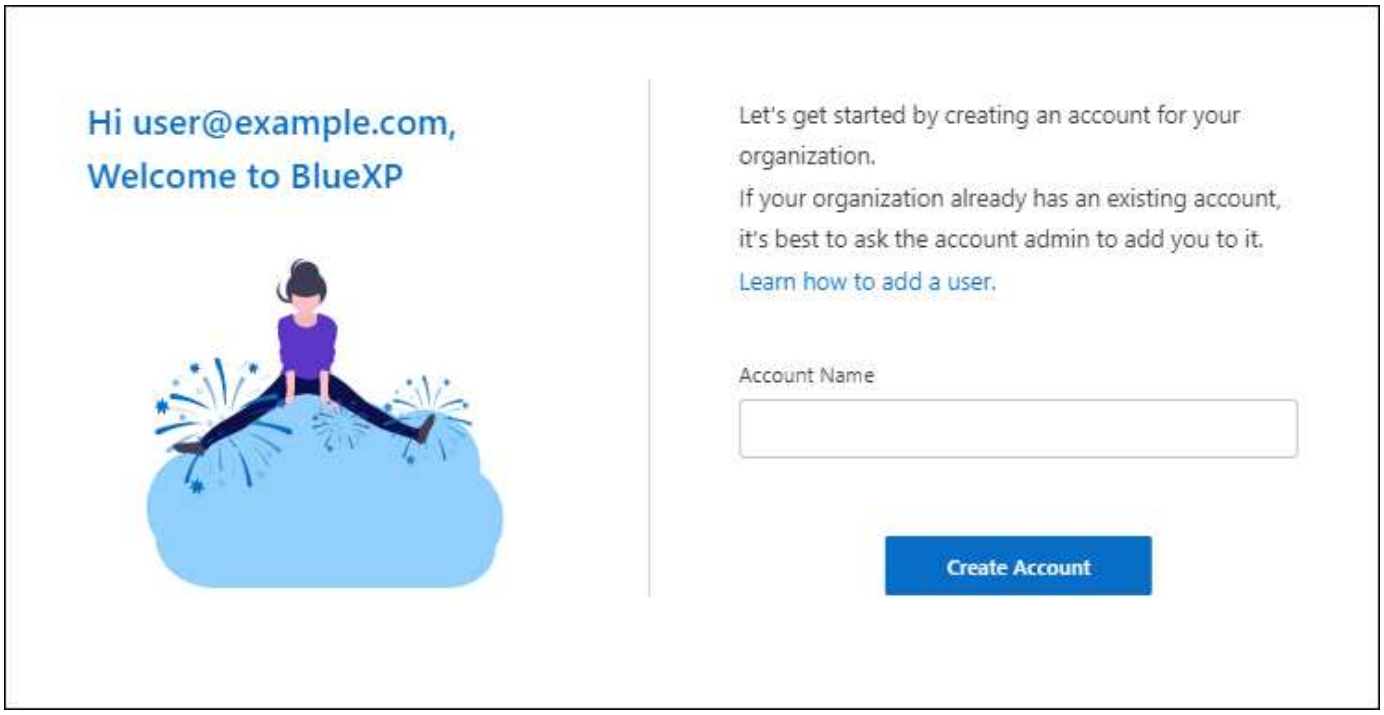
An independent certified public accountant firm and services auditor examined BlueXP and affirmed that it achieved SOC 2 Type 2 reports based on the applicable Trust Services criteria.

View NetApp's SOC 2 reports

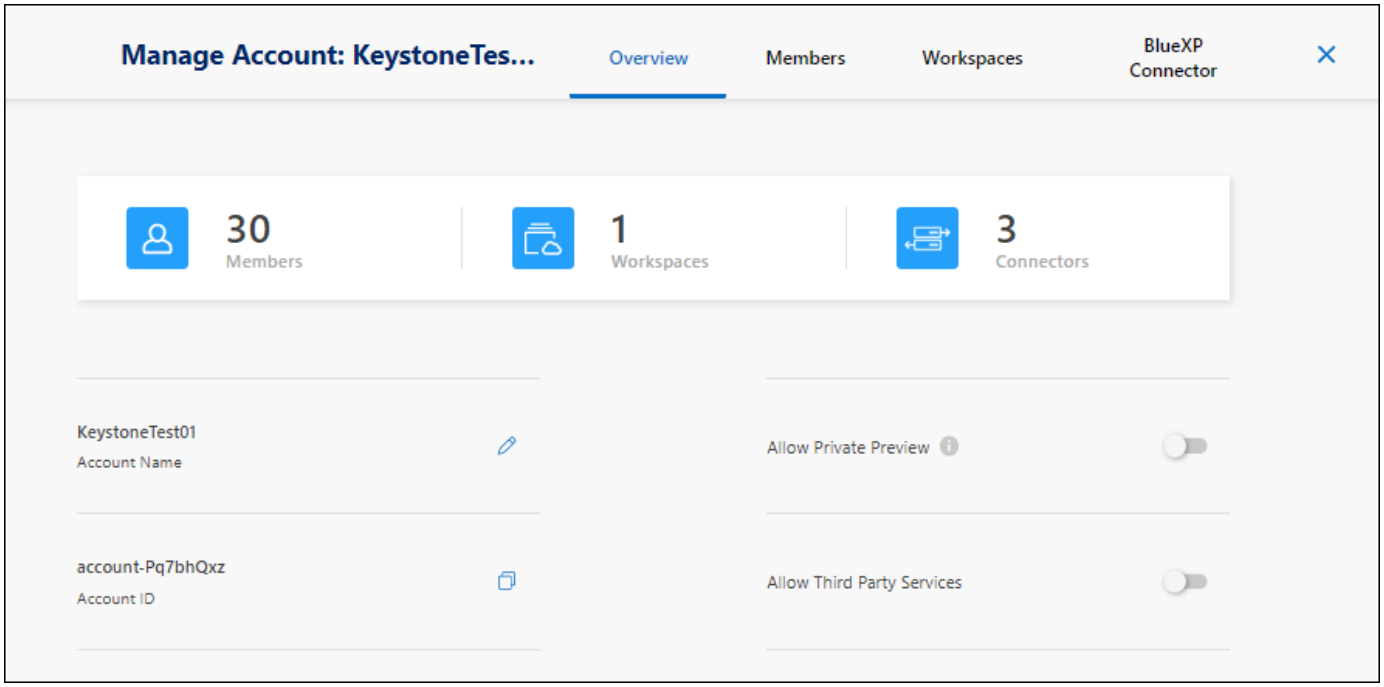
Learn about BlueXP accounts

A *BlueXP account* provides multi-tenancy for your organization, which enables you to organize users and resources in isolated *workspaces*. For example, a group of users can deploy and manage Cloud Volumes ONTAP systems in a workspace that isn't visible to other users who manage different types of working environments in a different workspace.

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:



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 compliance information for BlueXP classification and generate reports for workspaces 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 BlueXP tiering.

Learn more about Connectors.

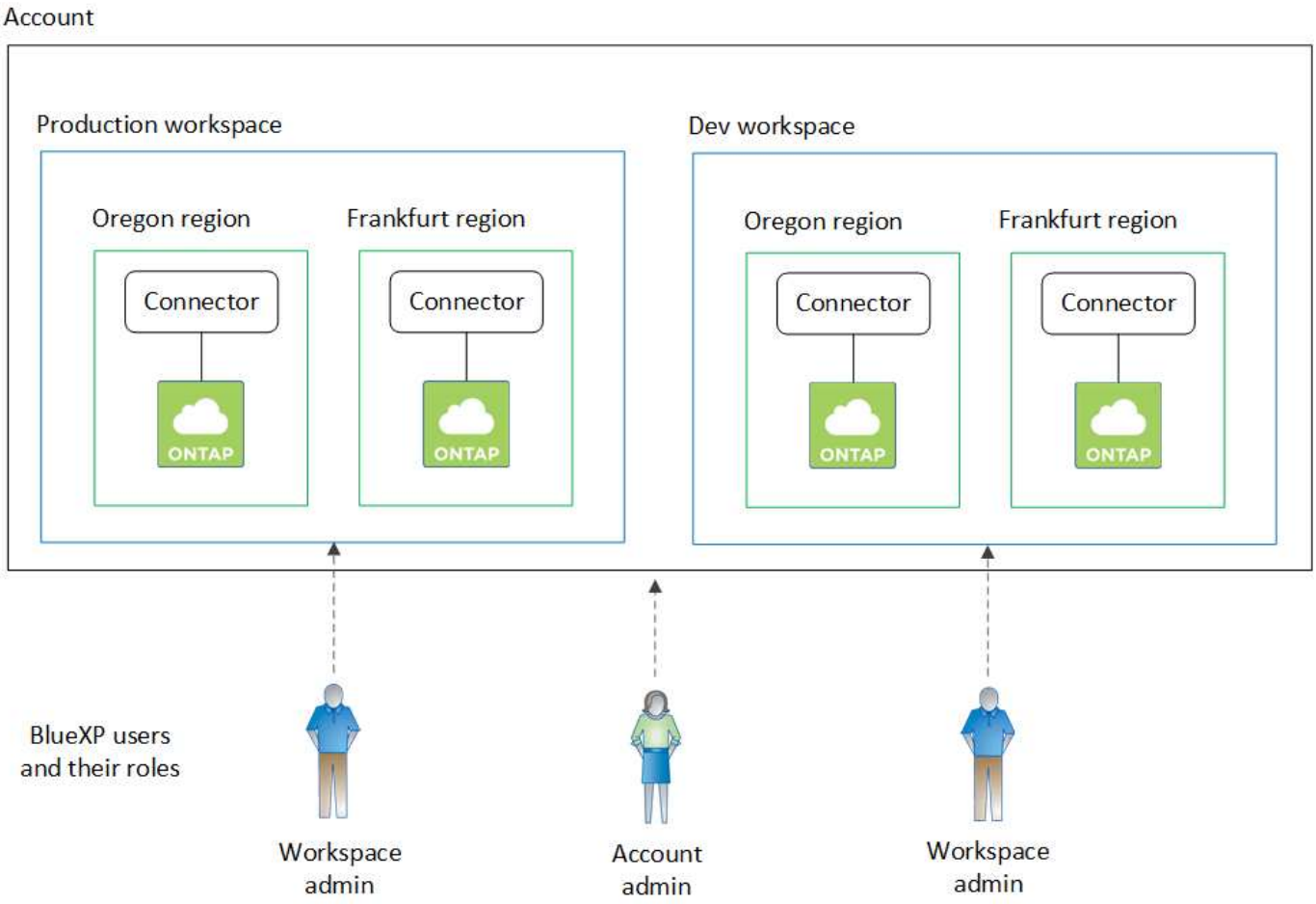
Examples

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

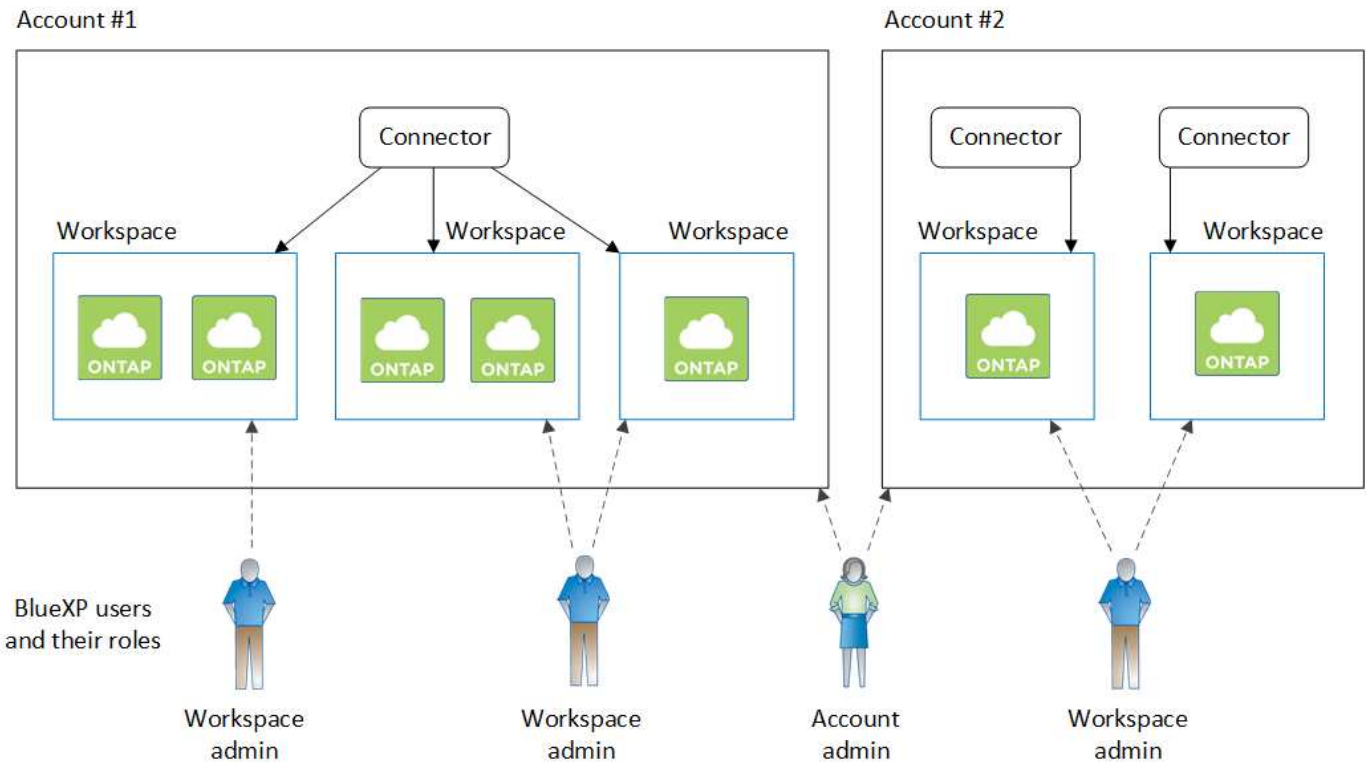
The following example shows an account that uses two workspaces to create isolated environments. The first workspace is for a production environment and the second is for a dev environment.



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 services such as BlueXP classification and BlueXP copy and sync.

- Automation catalog
- 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 BlueXP classification to scan Azure NetApp Files data.

- Cloud Volumes Service for Google Cloud

- Copy and sync
- 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

- Sustainability

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 storage
- Azure Blob storage
- Backup and recovery
- Classification
- Cloud Volumes ONTAP
- Disaster recovery
- E-Series systems
- Economic efficiency [1]
- Edge caching
- Google Cloud Storage buckets
- Kubernetes clusters
- Migration reports
- On-premises ONTAP cluster integration with BlueXP data services
- Operational resiliency [1]
- StorageGRID systems
- Tiering
- Volume caching

[1] While you can access these services without a Connector, a Connector is required to initiate actions from the services.

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.

When using BlueXP in standard mode, how you provide permissions depends on how you plan to create the Connector.

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

- Standard mode
  - Connector installation options in AWS
  - Connector installation options in Azure
  - Connector installation options in Google Cloud
  - Set up cloud permissions for on-prem deployments
- Set up permissions for restricted mode
- Set up 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 (for example, 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.

Learn about 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 Secret Cloud, AWS Top Secret Cloud, and Azure IL6

The following table provides a comparison of these modes.

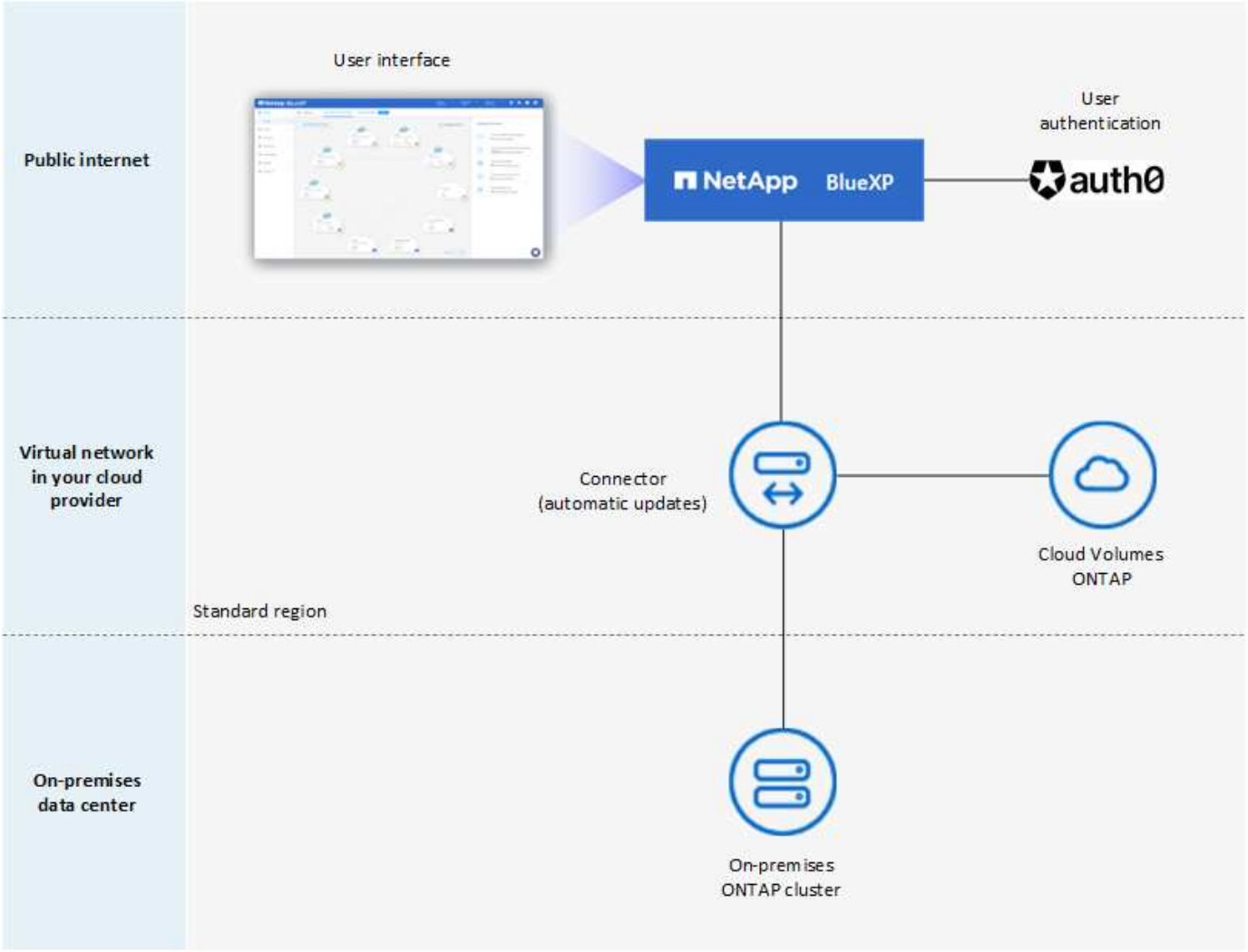
	Standard mode	Restricted mode	Private mode
Connection required to BlueXP SaaS layer?	Yes	Outbound only	No
Connection required to your cloud provider?	Yes	Yes, within the region	Yes, within the region (if using Cloud Volumes ONTAP)

	Standard mode	Restricted mode	Private mode
Connector installation	From BlueXP, cloud marketplace, or manual install	Cloud marketplace or manual install	Manual install
Connector upgrades	Automatic upgrades of NetApp Connector software	Automatic upgrades of NetApp Connector software	Manual upgrade required
UI access	From the BlueXP SaaS layer	Locally from the Connector VM	Locally from the Connector VM
API endpoint	The BlueXP SaaS layer	The BlueXP SaaS layer	The Connector
Authentication	Through SaaS using auth0, NSS login, or identity federation	Through SaaS using auth0 or identity federation	Local user authentication
Storage and data services	All are supported	Many are supported	Several are supported
Licensing options	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.

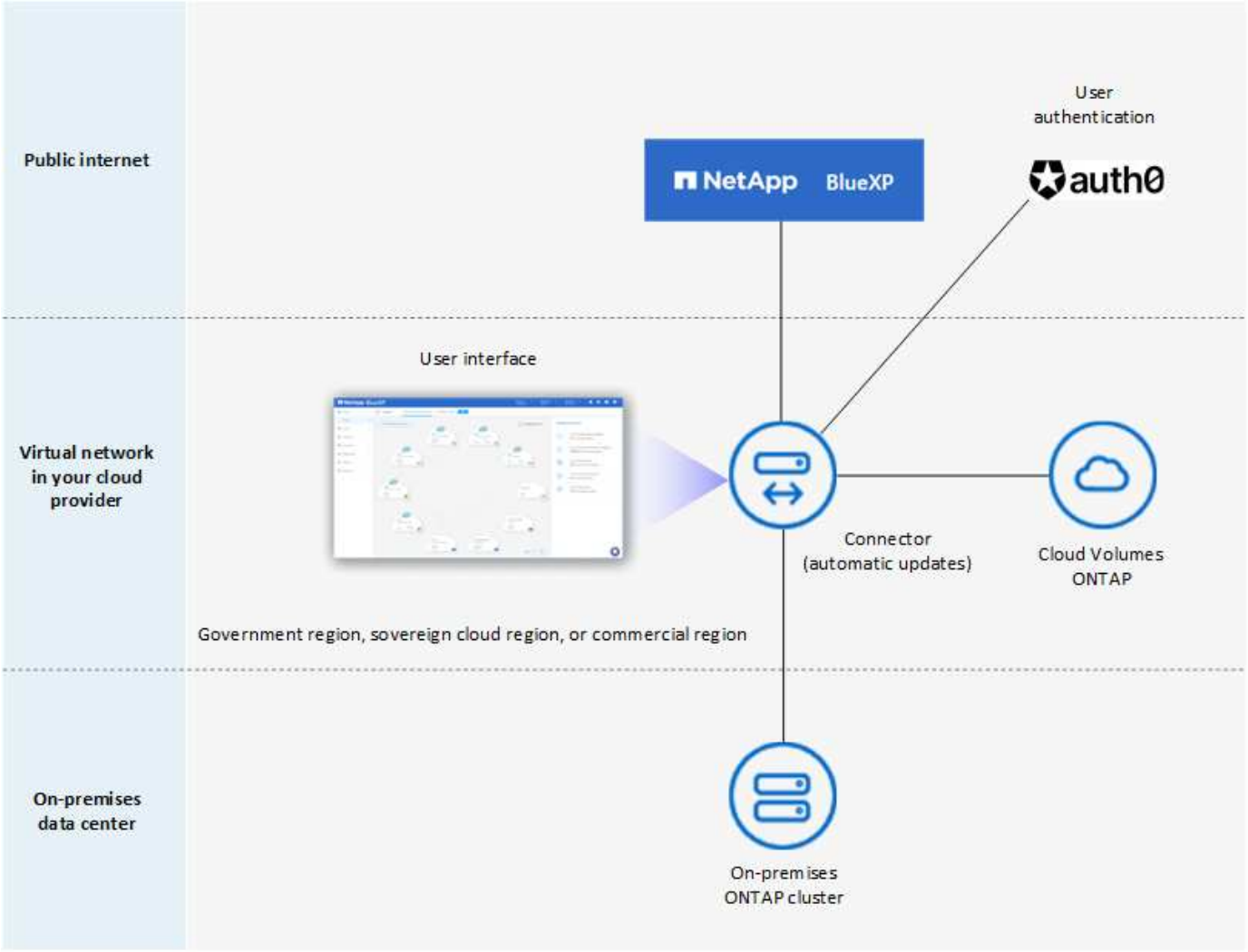
How to get started with standard mode

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
Backup and recovery	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.
Classification	Supported in Government regions with restricted mode. Not supported in commercial regions or in sovereign regions with restricted mode. The following limitations apply: • OneDrive accounts, SharePoint accounts, and Google Drive accounts can't be scanned. • Microsoft Azure Information Protection (AIP) label functionality can't be integrated.
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.

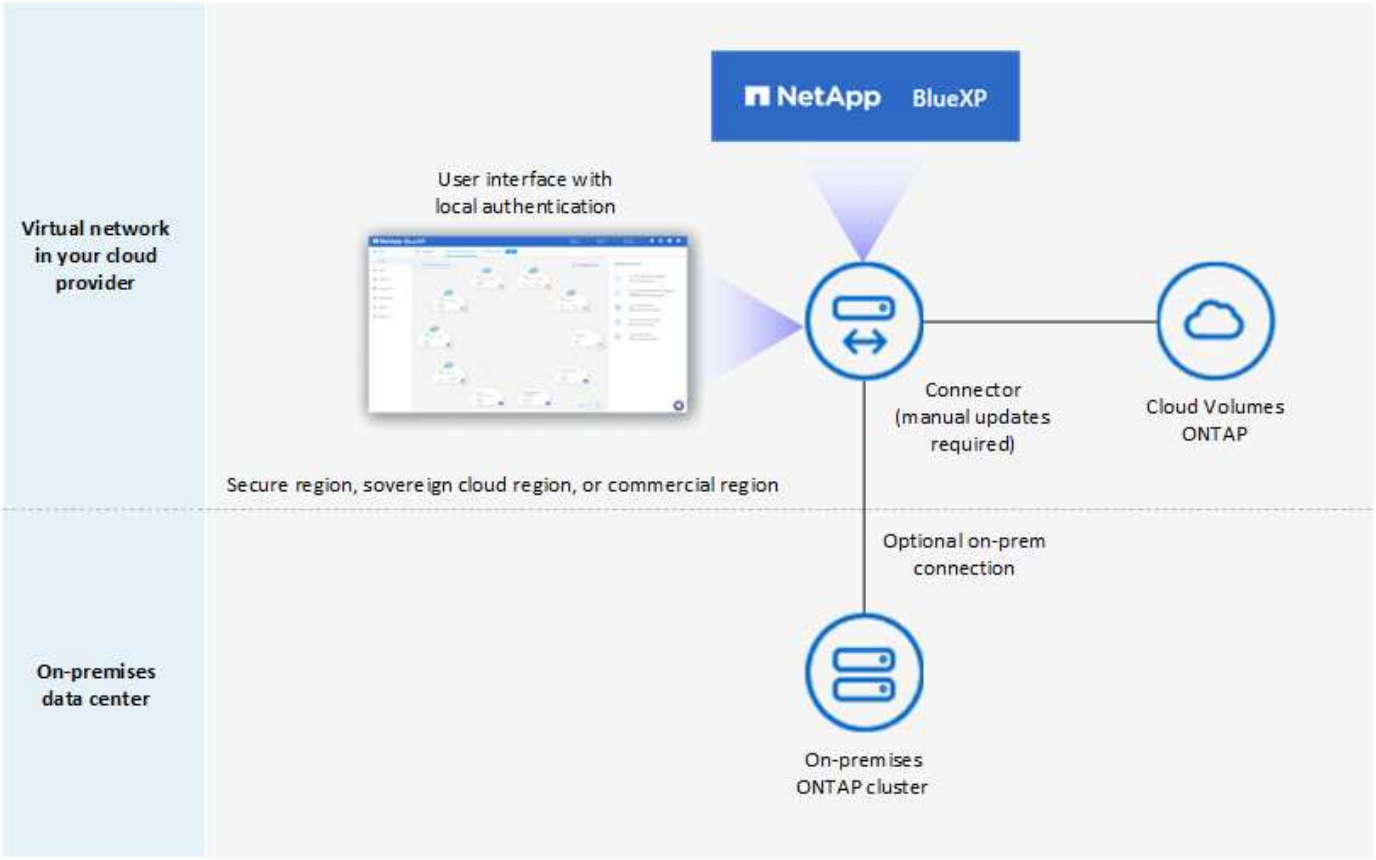
Note that you can't change the restricted mode setting after BlueXP creates the account. You can't enable restricted mode later and you can't disable it later. It must be set at time of account creation.

- Learn how to get started with restricted mode.
- Learn how to create an additional BlueXP account.

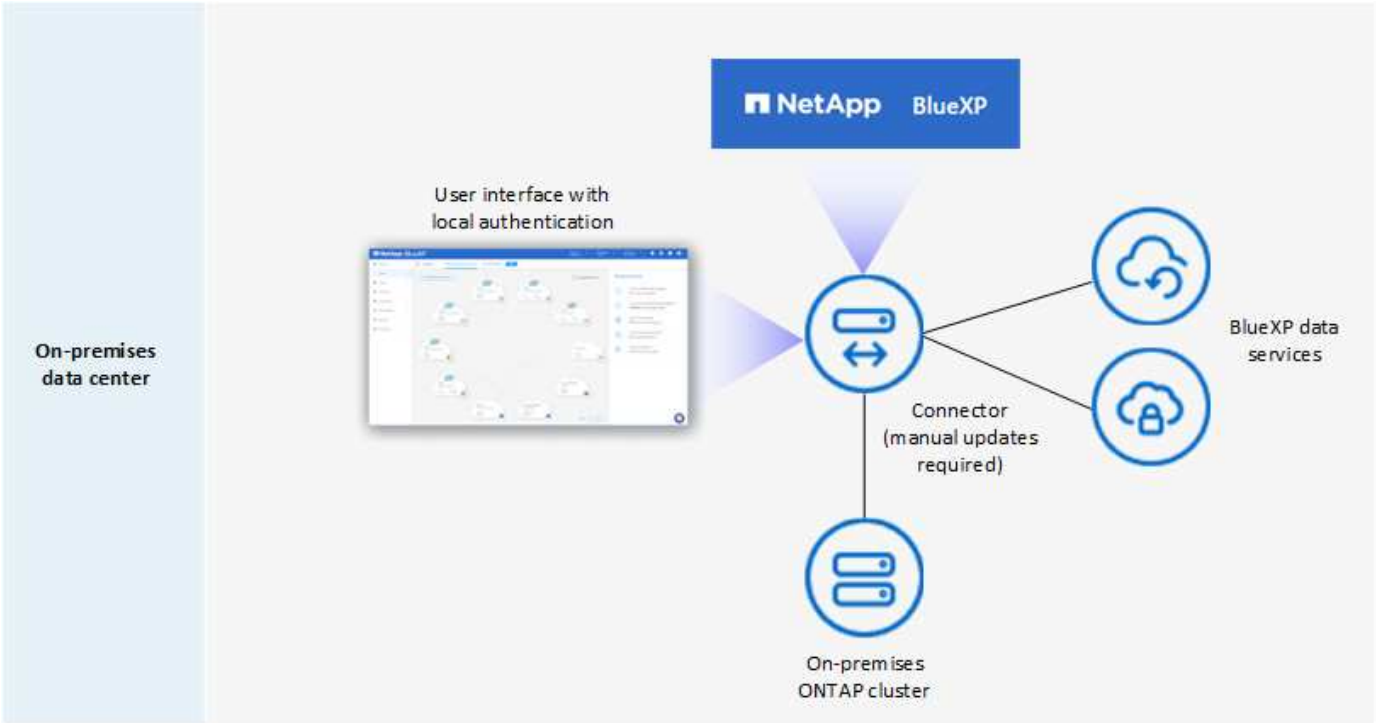
Private mode

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 to the BlueXP SaaS layer. 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
Backup and recovery	Supported in AWS and Azure commercial regions. Not supported in Google Cloud or in AWS Secret Cloud, AWS Top Secret Cloud, or Azure IL6
Cloud Volumes ONTAP	Because there's no internet access, the following features aren't available: automated software upgrades and AutoSupport.
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
Backup and recovery	Only back up and restore of on-prem ONTAP volumes to StorageGRID systems is supported. Learn how to back up on-prem ONTAP data to StorageGRID
Classification	• The only supported data sources are the ones that you can discover locally. View the sources that you can discover locally • Features that require outbound internet access are not supported. View the feature limitations
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 BlueXP digital wallet.

Learn how to add licenses to the BlueXP 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.

> If you want to use BlueXP in the AWS Secret Cloud or the AWS Top Secret Cloud, then you should follow separate instructions to get started in those environments. Learn how to get started with Cloud Volumes ONTAP in the AWS Secret Cloud or Top Secret Cloud

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.

Product area	BlueXP service or feature	Restricted mode	Private mode
Working environments	Amazon FSx for ONTAP	Yes	No
	Amazon S3	No	No
	Azure Blob	No	No
	Azure NetApp Files	Yes	No
	Cloud Volumes ONTAP	Yes	Yes
	Cloud Volumes Service for Google Cloud	No	No
	Google Cloud Storage	No	No
	Kubernetes clusters	No	No
	On-prem ONTAP clusters	Yes	Yes
	E-Series	No	No
	StorageGRID	No	No
Services	Backup and recovery	Yes	Yes
	Classification	Yes	Yes
	Cloud ops	No	No
	Copy and sync	No	No
	Digital advisor	No	No
	Digital wallet	Yes	Yes
	Disaster recovery	No	No
	Economic efficiency	No	No
	Edge caching	No	No
	Migration reports	No	No
	Operational resiliency	No	No
	Remediation	No	No
	Replication	Yes	Yes
	Sustainability	No	No
	Tiering	No	No
	Volume caching	No	No
Features	Credentials	Yes	Yes
	NSS accounts	Yes	No
	Notifications	Yes	No
	Search	Yes	No
	Timeline	Yes	Yes

Get started with standard mode

Getting started workflow (standard mode)

Get started with BlueXP in standard mode by preparing networking for the BlueXP console, signing up and creating an account, optionally creating a Connector, and subscribing to BlueXP.

Before you get started, you should have an understanding of BlueXP accounts, Connectors, and deployment modes.

1 Prepare networking for using the BlueXP console

Computers that access the BlueXP console should have connections to specific endpoints to complete a few administrative tasks. If your network restricts outbound access, you should ensure that these endpoints are allowed.

2 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.

3 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.

4 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.

Prepare networking for using the BlueXP console

As you use the BlueXP web-based console that's provided through the SaaS layer, it contacts several endpoints when completing a few administrative tasks. Computers that access the BlueXP console should have connections to these endpoints.

These endpoints are contacted from a user's computer when completing specific actions from the BlueXP console. You should also refer to networking requirements for the Connector and for specific BlueXP services. For details, refer to the related links at the end of this page.

Endpoints	Purpose
https://console.bluexp.netapp.com https://*.console.bluexp.netapp.com	Your web browser contacts these URLs when you use the BlueXP web-based console.
AWS services (amazonaws.com): • CloudFormation • Elastic Compute Cloud (EC2) • Key Management Service (KMS) • Security Token Service (STS) • Simple Storage Service (S3)	Required to deploy a Connector from BlueXP in AWS. The exact endpoint depends on the region in which you deploy the Connector. Refer to AWS documentation for details.
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.

Beyond these endpoints, you also need to ensure that the Connector has outbound internet access to contact specific endpoints for day-to-day operations. You can find the list of these endpoints by following the links in the next section below.

Related links

- Prepare networking for the Connector
  - Set up AWS networking
  - Set up Azure networking
  - Set up Google Cloud networking
  - Set up on-prem networking
- Prepare networking for BlueXP services

  Refer to the documentation for each BlueXP service.

  BlueXP documentation

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.

About this task

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. If you have a NetApp Support Site account, enter the email address associated with your NSS account directly on the **Log in** page.

   You can skip the sign up page if you have an NSS account. BlueXP will sign you up as part of this initial login.

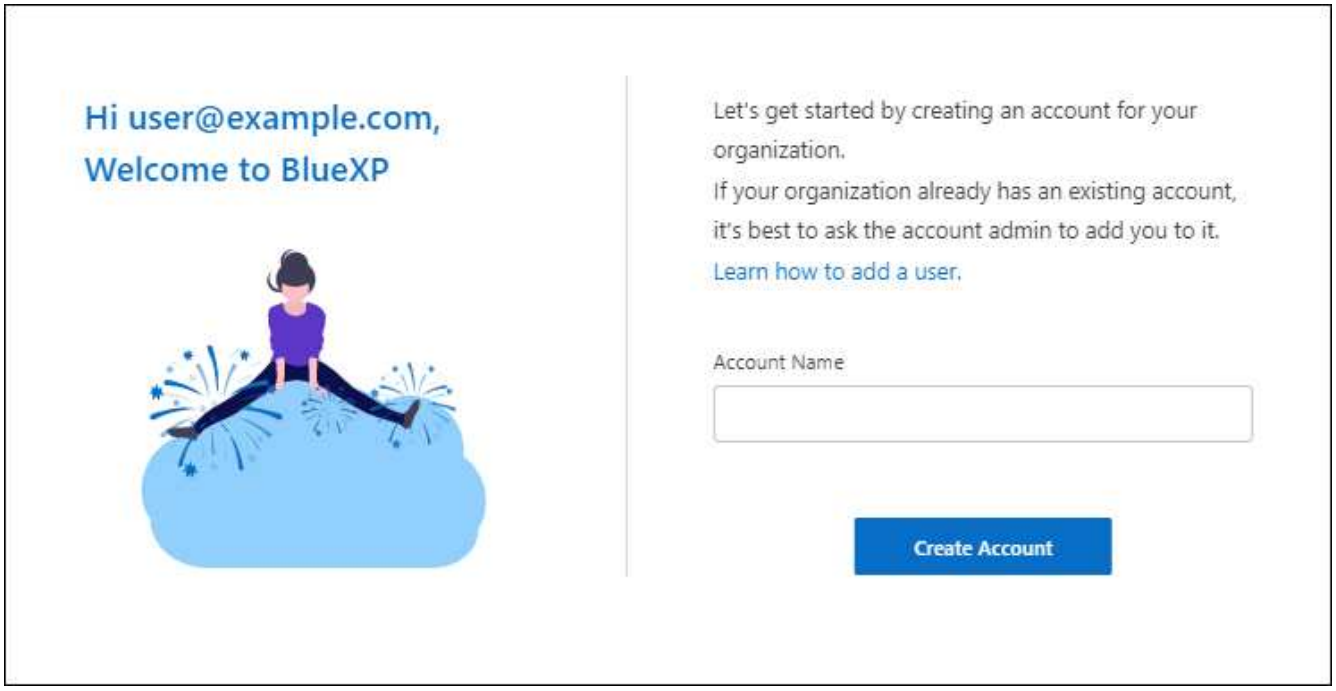
3. If you don’t have an NSS account and you want to sign up by creating a NetApp cloud login, select **Sign up**.
4. On the **Sign up** page, enter the required information to create a NetApp cloud login.

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

5. When prompted, review the End User License Agreement and accept the terms.
6. 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.



7. 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.

Create a Connector

AWS

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, but the deployment is initiated directly from the AWS Marketplace, rather than from BlueXP.

- Download and manually install the software on your own Linux host

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

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

Before you begin

You should review Connector limitations.

Step 1: Set up networking

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

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. For example, the network where you plan to create Cloud Volumes ONTAP systems or a storage system in your on-premises environment.

Outbound internet access

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

Endpoints contacted from the Connector

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

Endpoints	Purpose
AWS services (amazonaws.com): • CloudFormation • Elastic Compute Cloud (EC2) • Identity and Access Management (IAM) • Key Management Service (KMS) • Security Token Service (STS) • Simple Storage Service (S3)	To manage resources in AWS. The exact endpoint depends on the AWS region that you're using. Refer to AWS documentation for details
https://support.netapp.com	To obtain licensing information and to send AutoSupport messages to NetApp support.

Endpoints	Purpose
https://*.api.bluexp.netapp.com https://api.bluexp.netapp.com https://*.cloudmanager.cloud.netapp.com https://cloudmanager.cloud.netapp.com https://netapp-cloud-account.auth0.com	To provide SaaS features and services within BlueXP. Note that the Connector is currently contacting "cloudmanager.cloud.netapp.com" but it will start contacting "api.bluexp.netapp.com" in an upcoming release.
https://*.blob.core.windows.net https://cloudmanagerinfraprod.azurecr.io	To upgrade the Connector and its Docker components.

Endpoints contacted from the BlueXP console

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

View the list of endpoints contacted from the BlueXP console.

Proxy server

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

- IP address
- Credentials
- HTTPS certificate

Ports

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

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

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

Step 2: Set up AWS permissions

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 manage AWS resources.

Steps

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

   As a reminder, this policy contains only the permissions needed to launch the Connector instance in AWS from BlueXP. View permissions required for the Connector instance itself.

```
{
    "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. Select **Next** and add tags, if needed.
6. Select **Next** and enter a name and description.
7. Select **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, select **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, select **Users** and then select the user name.
     b. Select **Add permissions > Attach existing policies directly**.
     c. Select the policy that you created.
     d. Select **Next** and then select **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.

Step 3: Create the Connector

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

About this task

Creating the Connector from BlueXP deploys an EC2 instance in AWS using a default configuration. Learn about the default configuration for the Connector.

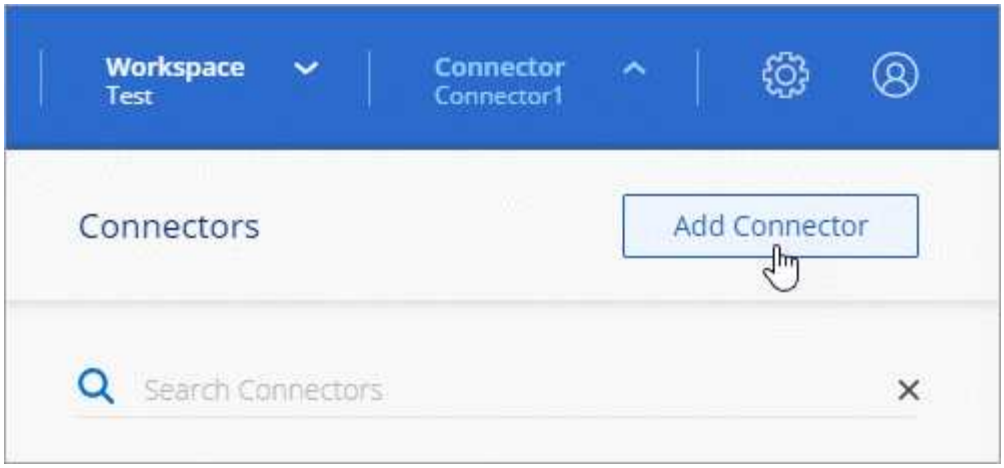
Before you begin

You should have the following:

- An AWS authentication method: either an IAM role or access keys for an IAM user with the required permissions.
- A VPC and subnet that meets 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. Select the **Connector** drop-down and select **Add Connector**.



2. Choose **Amazon Web Services** as your cloud provider and select **Continue**.
3. On the **Deploying a Connector** page, review the details about what you'll need. You have two options:
   a. Select **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. Select **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 the required inbound and outbound rules.

     View security group rules for AWS.

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

5. Select **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.

Create a Connector from the AWS Marketplace

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

Before you begin

You should review Connector limitations.

Step 1: Set up networking

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

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. For example, the network where you plan to create Cloud Volumes ONTAP systems or a storage system in your on-premises environment.

Outbound internet access

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

Endpoints contacted from the Connector

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

Endpoints	Purpose
AWS services (amazonaws.com): • CloudFormation • Elastic Compute Cloud (EC2) • Identity and Access Management (IAM) • Key Management Service (KMS) • Security Token Service (STS) • Simple Storage Service (S3)	To manage resources in AWS. The exact endpoint depends on the AWS region that you're using. Refer to AWS documentation for details

Endpoints	Purpose
https://support.netapp.com	To obtain licensing information and to send AutoSupport messages to NetApp support.
https://*.api.bluexp.netapp.com https://api.bluexp.netapp.com https://*.cloudmanager.cloud.netapp.com https://cloudmanager.cloud.netapp.com https://netapp-cloud-account.auth0.com	To provide SaaS features and services within BlueXP. Note that the Connector is currently contacting "cloudmanager.cloud.netapp.com" but it will start contacting "api.bluexp.netapp.com" in an upcoming release.
https://*.blob.core.windows.net https://cloudmanagerinfraprod.azurecr.io	To upgrade the Connector and its Docker components.

Proxy server

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

- IP address
- Credentials
- HTTPS certificate

Ports

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

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

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

Step 2: Set up AWS permissions

To prepare for a marketplace deployment, 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. Log in to the AWS console and navigate to the IAM service.
2. Create a policy:

a. Select **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.

3. Create an IAM role:

a. Select **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 that you can associate with the EC2 instance during deployment from the AWS Marketplace.

Step 3: Review instance requirements

When you create the Connector, you need to choose an EC2 instance type that meets the following requirements.

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.

Step 4: Create the Connector

Create the Connector directly from the AWS Marketplace.

About this task

Creating the Connector from the AWS Marketplace deploys an EC2 instance in AWS using a default configuration. Learn about the default configuration for the Connector.

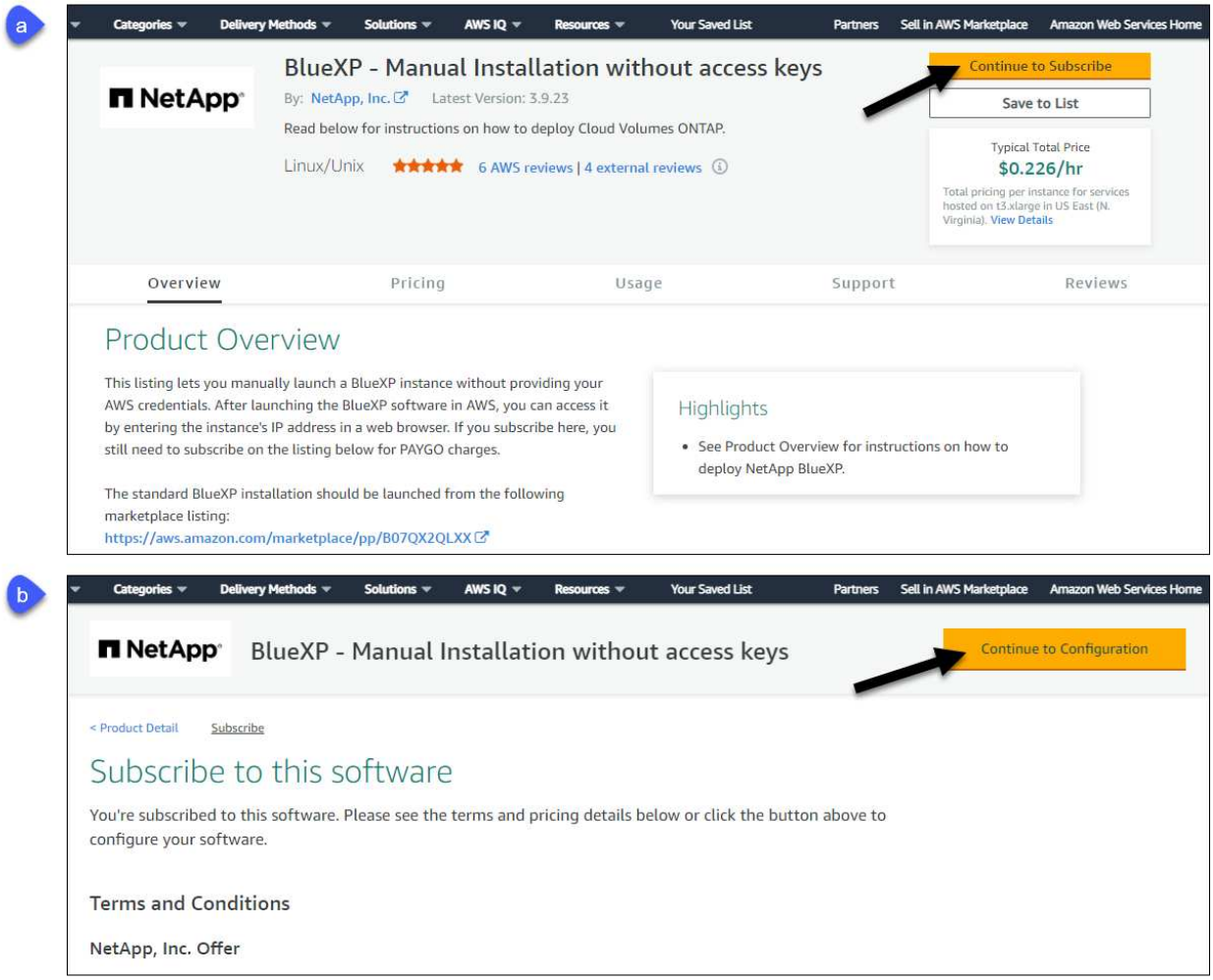
Before you begin

You should have the following:

- A VPC and subnet that meets networking requirements.
- An IAM role with an attached policy that includes the required permissions for the Connector.
- Permissions to subscribe and unsubscribe from the AWS Marketplace for your IAM user.
- An understanding of CPU and RAM requirements for the instance.
- A key pair for the EC2 instance.

Steps

1. Go to the BlueXP page on the AWS Marketplace
2. On the Marketplace page, select **Continue to Subscribe** and then select **Continue to Configuration**.



3. Change any of the default options and select **Continue to Launch**.
4. Under **Choose Action**, select **Launch through EC2** and then select **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 an instance type that meets RAM and CPU requirements (t3.xlarge is recommended).
   - **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.

  A few more rule are required for specific configurations.

  View security group rules for AWS.

- **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.
- **Summary**: Review the summary and select **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. Select **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.

Manually install the Connector in AWS

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

Before you begin

You should review Connector limitations.

Step 1: Review host requirements

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

Dedicated host

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

Supported operating systems

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

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

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

Hypervisor

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

Red Hat Solution: Which hypervisors are certified to run Red Hat Enterprise Linux?

CPU

4 cores or 4 vCPUs

RAM

14 GB

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, 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

Step 2: Set up networking

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

Connections to target networks

A Connector requires a network connection to the location where you're planning to create and manage working environments. For example, the network where you plan to create Cloud Volumes ONTAP systems

or a storage system in your on-premises environment.

Outbound internet access

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

Endpoints contacted during manual installation

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

- https://support.netapp.com
- https://mysupport.netapp.com
- https://cloudmanager.cloud.netapp.com/tenancy
- https://stream.cloudmanager.cloud.netapp.com
- https://production-artifacts.cloudmanager.cloud.netapp.com
- https://*.blob.core.windows.net
- https://cloudmanagerinfraprod.azurecr.io

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

Endpoints contacted from the Connector

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

Endpoints	Purpose
AWS services (amazonaws.com): • CloudFormation • Elastic Compute Cloud (EC2) • Identity and Access Management (IAM) • Key Management Service (KMS) • Security Token Service (STS) • Simple Storage Service (S3)	To manage resources in AWS. The exact endpoint depends on the AWS region that you're using. Refer to AWS documentation for details
https://support.netapp.com	To obtain licensing information and to send AutoSupport messages to NetApp support.

Endpoints	Purpose
https://*.api.bluexp.netapp.com https://api.bluexp.netapp.com https://*.cloudmanager.cloud.netapp.com https://cloudmanager.cloud.netapp.com https://netapp-cloud-account.auth0.com	To provide SaaS features and services within BlueXP. Note that the Connector is currently contacting "cloudmanager.cloud.netapp.com" but it will start contacting "api.bluexp.netapp.com" in an upcoming release.
https://*.blob.core.windows.net https://cloudmanagerinfraprod.azurecr.io	To upgrade the Connector and its Docker components.

Proxy server

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

- IP address
- Credentials
- HTTPS certificate

Ports

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

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

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

Step 3: Set up permissions

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

- 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 the AWS access key for an IAM user who has the required permissions.

Follow the steps to prepare permissions for BlueXP.

IAM role

Steps

1. Log in to the AWS console and navigate to the IAM service.
2. Create a policy:
   a. Select **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.
3. Create an IAM role:
   a. Select **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 that you can associate with the EC2 instance after you install the Connector.

AWS access key

Steps

1. Log in to the AWS console and navigate to the IAM service.
2. Create a policy:
   a. Select **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.
3. Attach the policies to an IAM user.
   - AWS Documentation: Creating IAM Roles
   - AWS Documentation: Adding and Removing IAM Policies
4. 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.

Step 4: Install the Connector

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

Before you begin

You should have the following:

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

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

- A CA-signed certificate, if the proxy server uses HTTPS or if the proxy is an intercepting proxy.

About this task

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

Steps

1. Verify that docker is enabled and running.

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

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

   ```
   unset http_proxy
   unset https_proxy
   ```

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

3. Download the Connector software from the NetApp Support Site, and then copy it to the Linux host.

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

4. Assign permissions to run the script.

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

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

5. Run the installation script.

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

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

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

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

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

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

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

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

6. Wait for the installation to complete.

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

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

   https://*ipaddress*

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

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

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

Result

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

Step 5: Provide permissions to BlueXP

Now that you've installed the Connector, you need to provide BlueXP with the AWS permissions that you

previously set up. Providing the permissions enables BlueXP to manage your data and storage infrastructure in 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 select **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, select the Settings icon, and select **Credentials**.

3. Select **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 select **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

Connector installation options in Azure

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

the most common way.

The following installation options are available:

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

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

- Create a Connector from the Azure Marketplace

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

- Download and manually install the software on your own Linux host

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

Create a Connector in Azure from BlueXP

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

Before you begin

You should review Connector limitations.

Step 1: Set up networking

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

Azure region

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

Learn how Cloud Volumes ONTAP uses an Azure Private Link

VNet and subnet

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

Connections to target networks

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

Outbound internet access

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

Endpoints contacted from the Connector

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

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

Endpoints contacted from the BlueXP console

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

View the list of endpoints contacted from the BlueXP console.

Proxy server

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

- IP address
- Credentials
- HTTPS certificate

Ports

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

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

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

Step 2: Create a custom role

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

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

Steps

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

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

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

```
        "Microsoft.Network/networkInterfaces/join/action",
        "Microsoft.Network/networkInterfaces/read",
        "Microsoft.Network/networkInterfaces/write",
        "Microsoft.Network/networkInterfaces/delete",
        "Microsoft.Network/networkSecurityGroups/join/action",
        "Microsoft.Network/networkSecurityGroups/read",
        "Microsoft.Network/networkSecurityGroups/write",

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

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

"Microsoft.Network/locations/virtualNetworkAvailableEndpointServices/rea
d",
        "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/agreem
ents/read",

"Microsoft.MarketplaceOrdering/offertypes/publishers/offers/plans/agreem
ents/write",
```

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

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

   Example

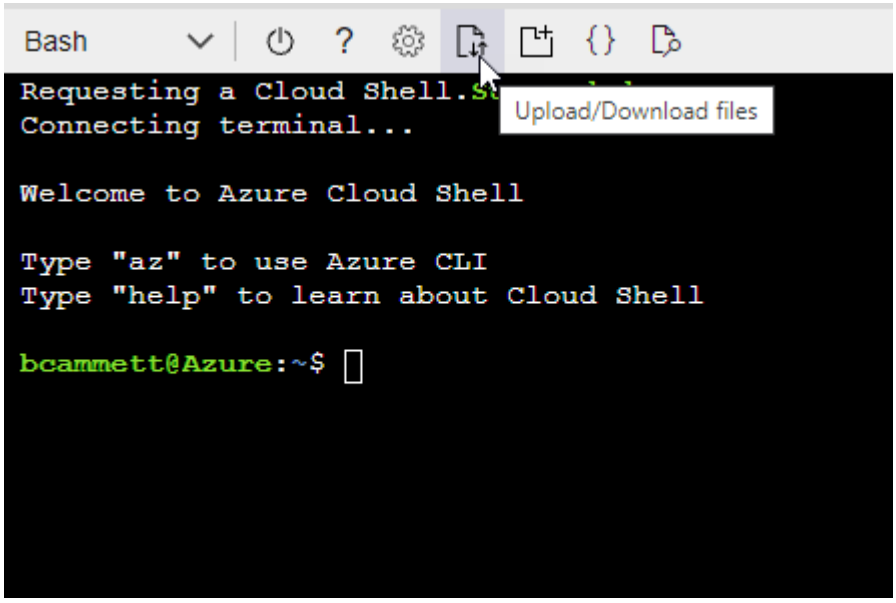
   ```
   "AssignableScopes": [
   "/subscriptions/d333af45-0d07-4154-943d-c25fbzzzzzzz"
   ],
   ```

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

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

   a. Start Azure Cloud Shell and choose the Bash environment.

   b. Upload the JSON file.



   c. Enter the following Azure CLI command:

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

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

Step 3: Set up authentication

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

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

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

Azure account

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

Steps

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

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

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

Result

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

Service principal

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

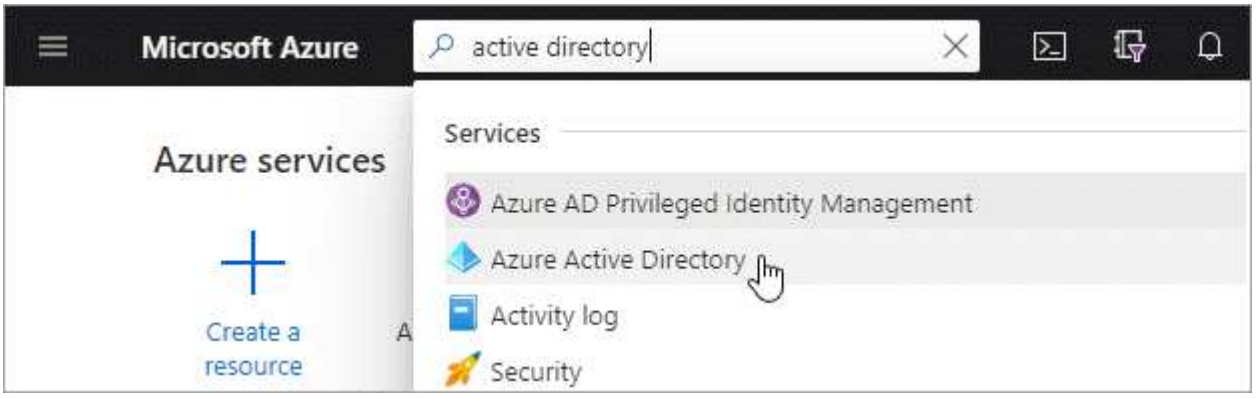
Create and set up a service principal in Azure Active Directory and obtain the Azure credentials that BlueXP needs.

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

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

   For details, refer to Microsoft Azure Documentation: Required permissions

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



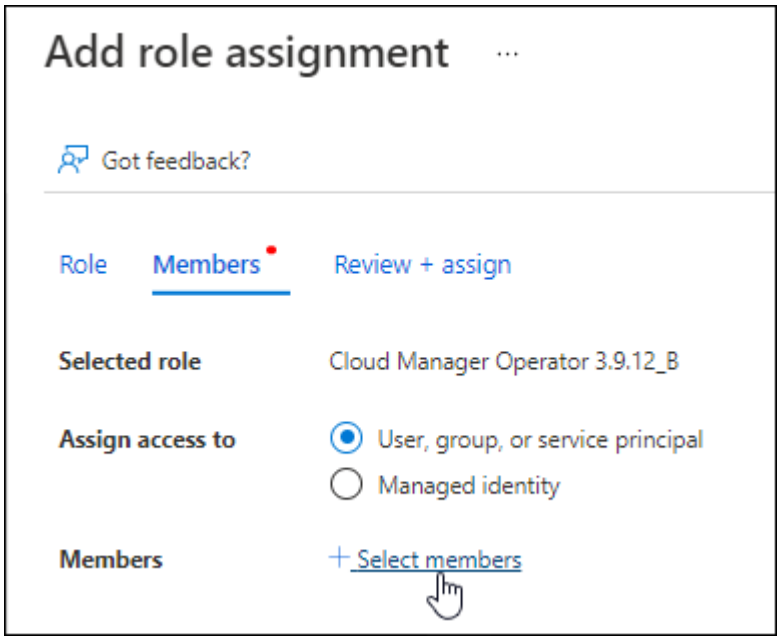
3. In the menu, select **App registrations**.

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

   You've created the AD application and service principal.

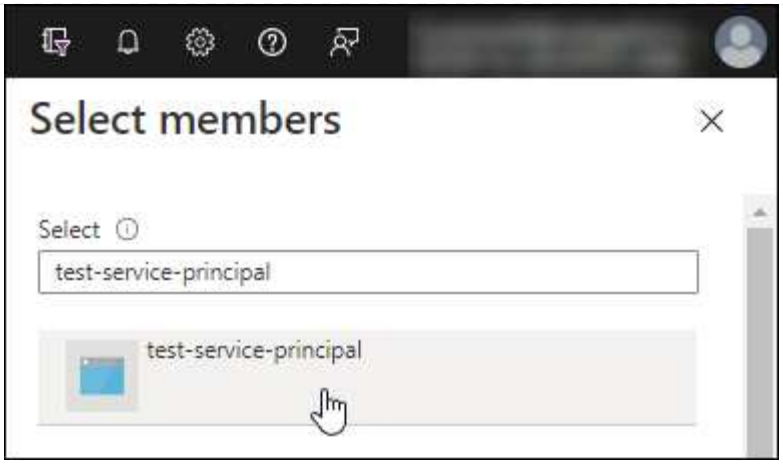
Assign the custom role to the application

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



   c. Search for the name of the application.

      Here's an example:



d. Select the application and click **Select**.

e. Click **Next**.

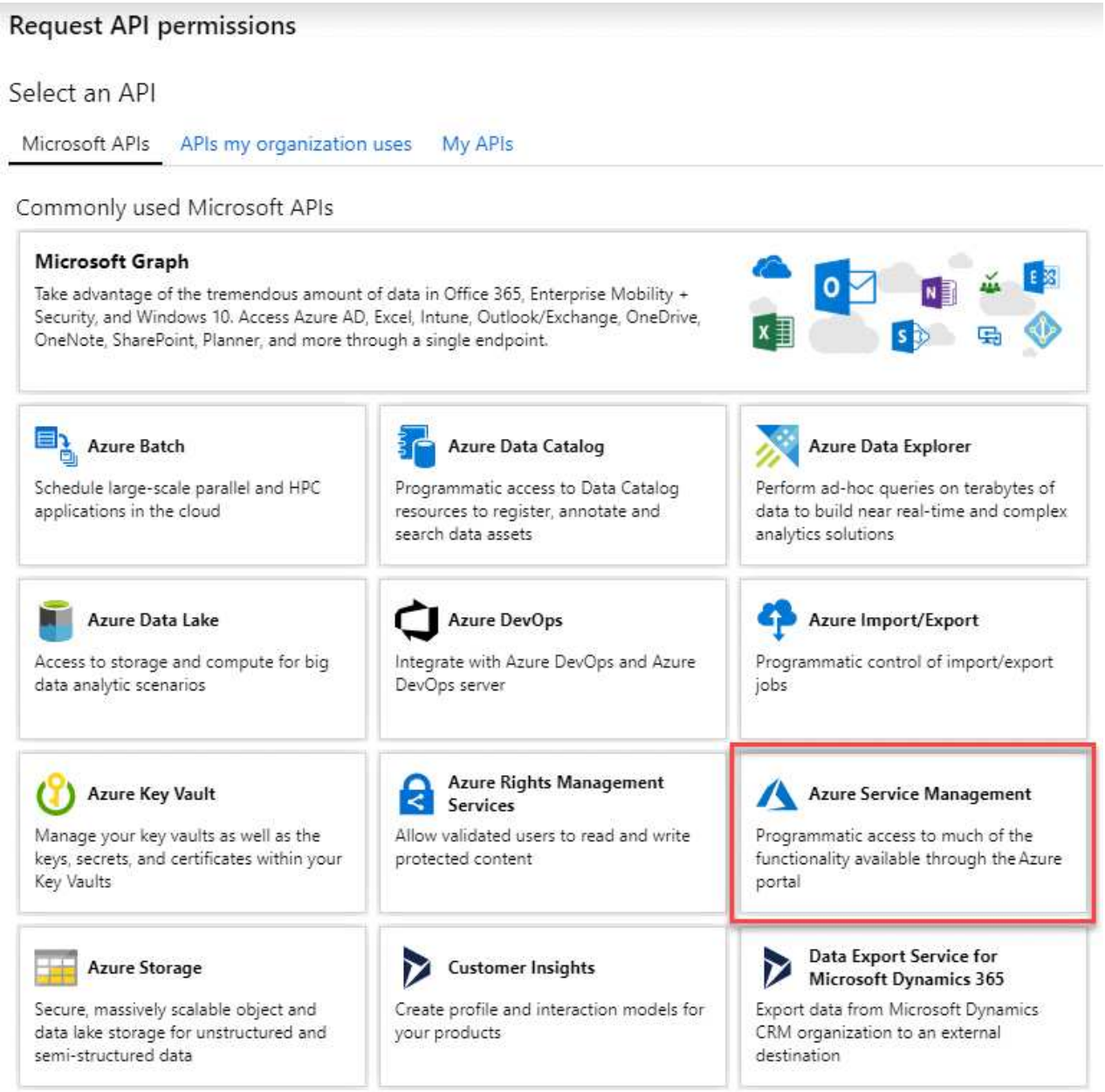
6. Click **Review + assign**.

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

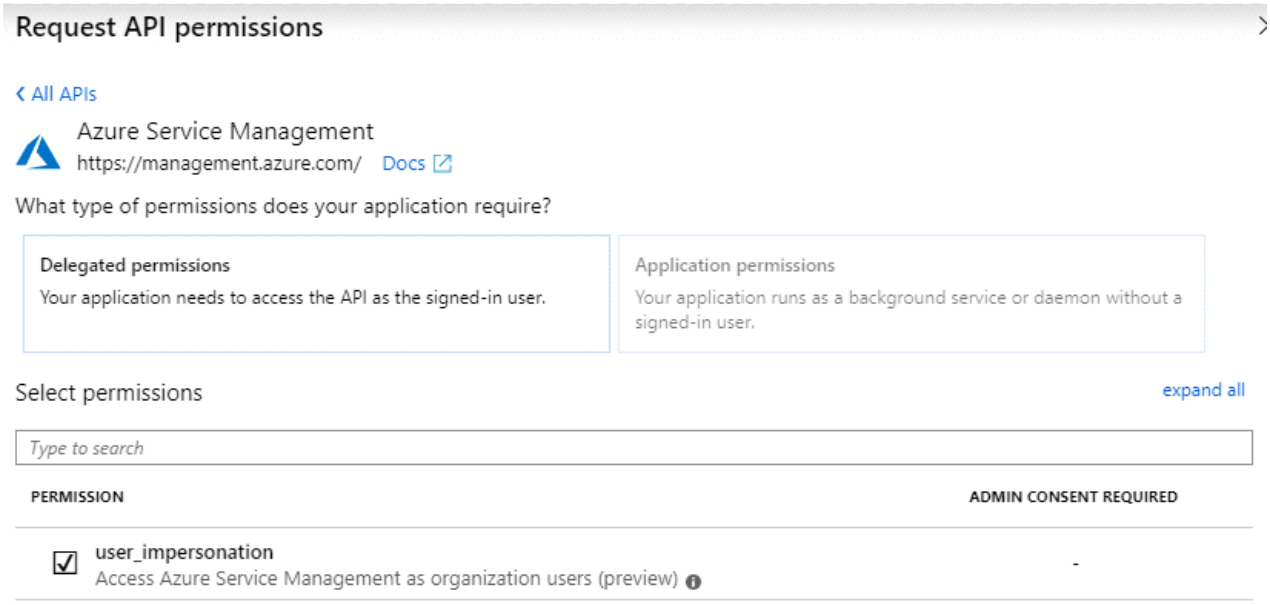
   If you want to manage resources in multiple Azure subscriptions, then you must bind the service principal to each of those subscriptions. For example, BlueXP enables you to select the subscription that you want to use when deploying Cloud Volumes ONTAP.

Add Windows Azure Service Management API permissions

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

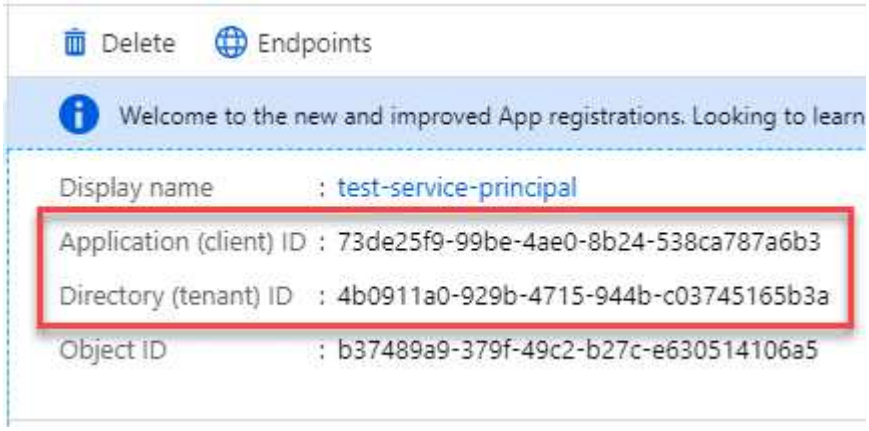


4. Select **Access Azure Service Management as organization users** and then select **Add permissions**.



Get the application ID and directory ID for the application

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



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

Create a client secret

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

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

Result

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

Step 4: Create the Connector

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

About this task

Creating the Connector from BlueXP deploys a virtual machine in Azure using a default configuration. Learn about the default configuration for the Connector.

Before you begin

You should have the following:

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

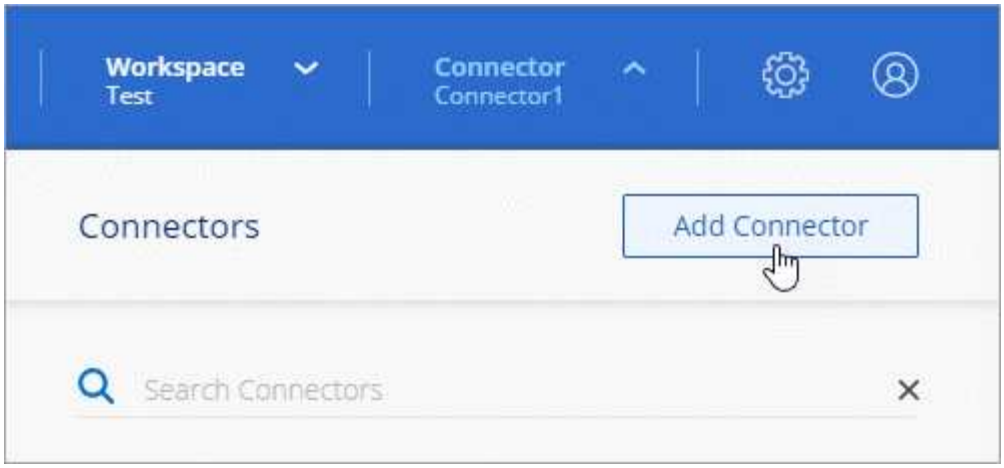
  Learn about connecting to a Linux VM in Azure

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

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

Steps

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



2. Choose **Microsoft Azure** as your cloud provider.
3. On the **Deploying a Connector** page:

   a. Under **Authentication**, select the authentication option that matches how you set up Azure permissions:

      - Select **Azure user account** to log in to your Microsoft account, which should have the required permissions.

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

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

      - Select **Active Directory service principal** to enter information about the Azure Active Directory service principal that grants the required permissions:

        - Application (client) ID
        - Directory (tenant) ID
        - Client Secret

   Learn how to obtain these values for a service principal.

4. Follow the steps in the wizard to create the Connector:

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

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

     Learn about connecting to a Linux VM in Azure

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

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

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

  View security group rules for Azure.

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

5. Click **Add**.

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

Result

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

Create a Connector from the Azure Marketplace

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

Before you begin

You should review Connector limitations.

Step 1: Set up networking

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

Azure region

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

Learn how Cloud Volumes ONTAP uses an Azure Private Link

VNet and subnet

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

Connections to target networks

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

Outbound internet access

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

Endpoints contacted from the Connector

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

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

Proxy server

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

- IP address
- Credentials
- HTTPS certificate

Ports

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

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

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

Step 2: Review VM requirements

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

CPU

4 cores or 4 vCPUs

RAM

14 GB

Azure VM size

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

Step 3: Set up permissions

You can provide permissions in the following ways:

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

Follow these steps to set up permissions for BlueXP.

Custom role

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

Steps

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

   Microsoft Azure documentation: Configure managed identities for Azure resources on a VM using the Azure portal

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

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

   Example

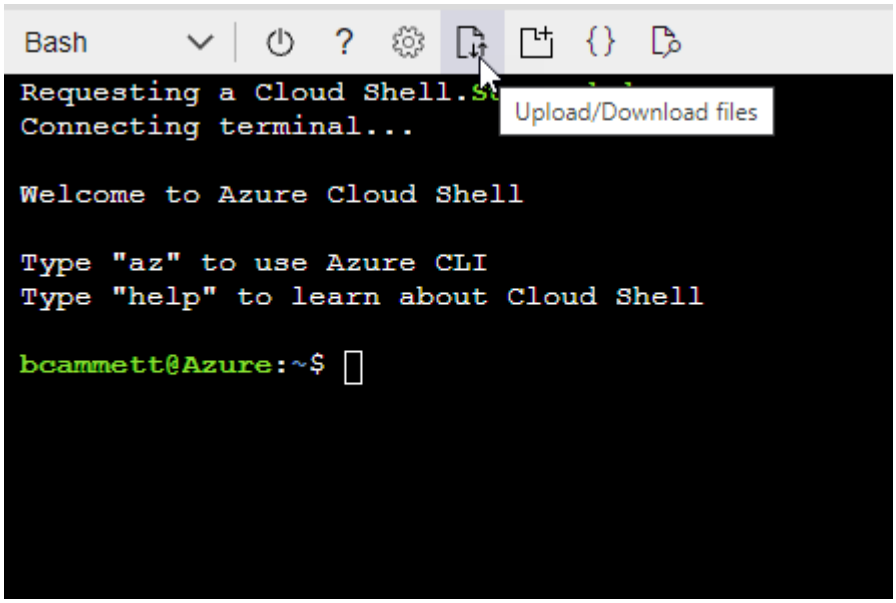
   ```
   "AssignableScopes": [
   "/subscriptions/d333af45-0d07-4154-943d-c25fbzzzzzzz",
   "/subscriptions/54b91999-b3e6-4599-908e-416e0zzzzzzz",
   "/subscriptions/398e471c-3b42-4ae7-9b59-ce5bbzzzzzzz"
   ```

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

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

   a. Start Azure Cloud Shell and choose the Bash environment.

   b. Upload the JSON file.



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

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

Result

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

Service principal

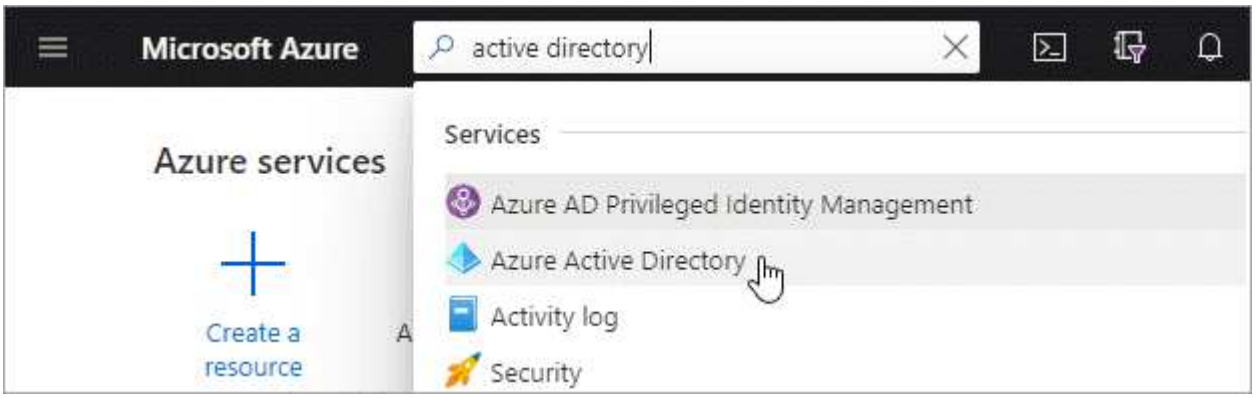
Create and set up a service principal in Azure Active Directory and obtain the Azure credentials that BlueXP needs.

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

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

   For details, refer to Microsoft Azure Documentation: Required permissions

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



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

   You've created the AD application and service principal.

Assign the application to a role

1. Create a custom role:

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

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.

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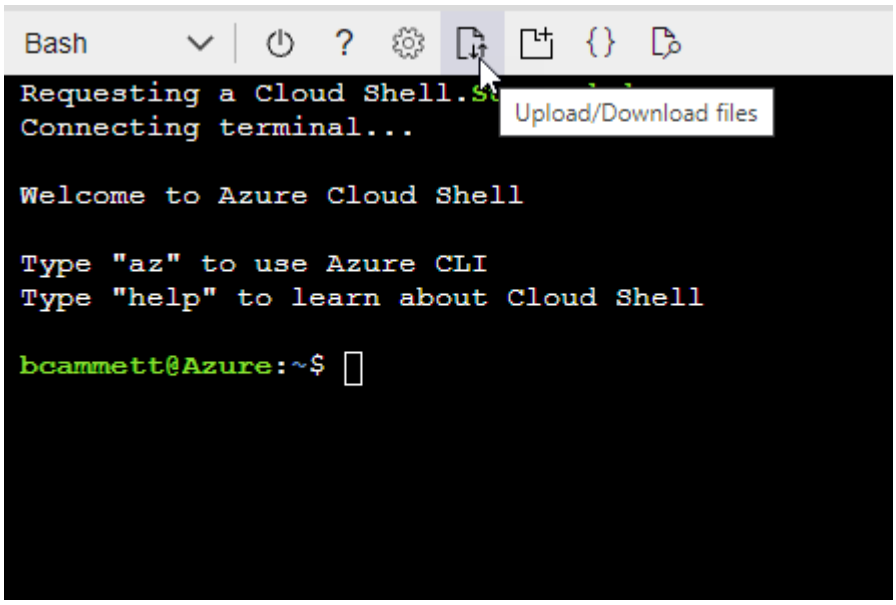
- Start Azure Cloud Shell and choose the Bash environment.
- Upload the JSON file.



- Use the Azure CLI to create the custom role:

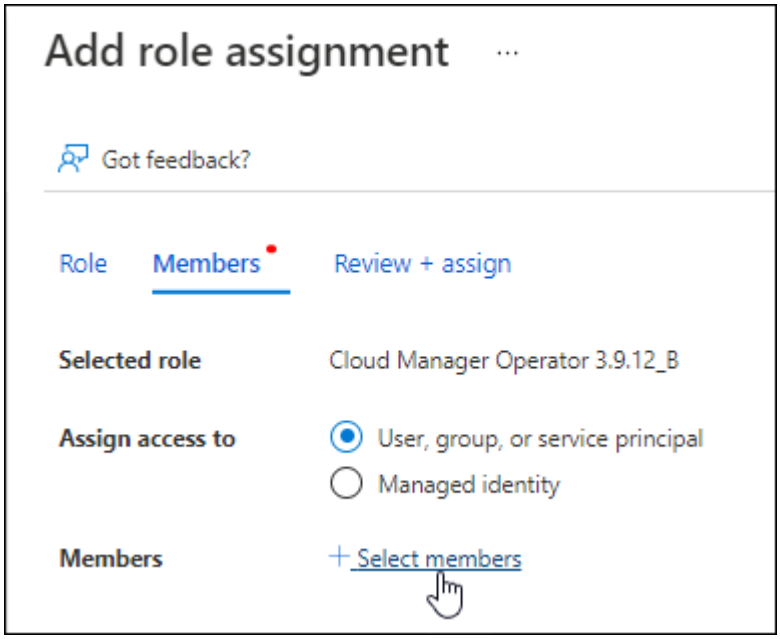
```
az role definition create --role-definition
Connector_Policy.json
```

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

2. Assign the application to the role:

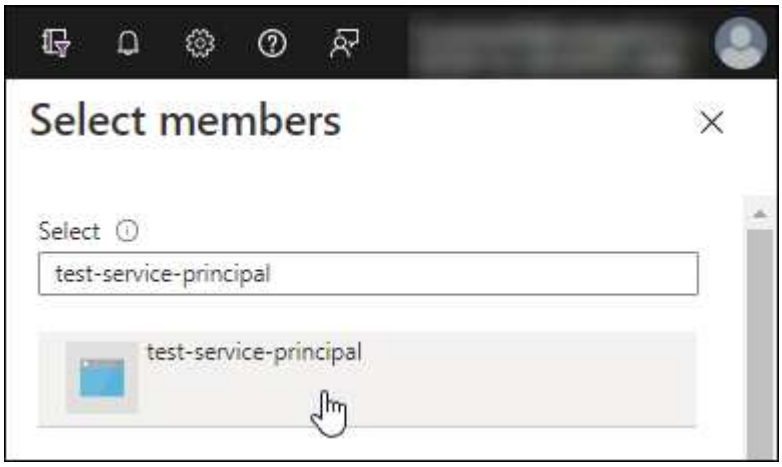
a. From the Azure portal, open the **Subscriptions** service.

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



   - Search for the name of the application.

     Here's an example:



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

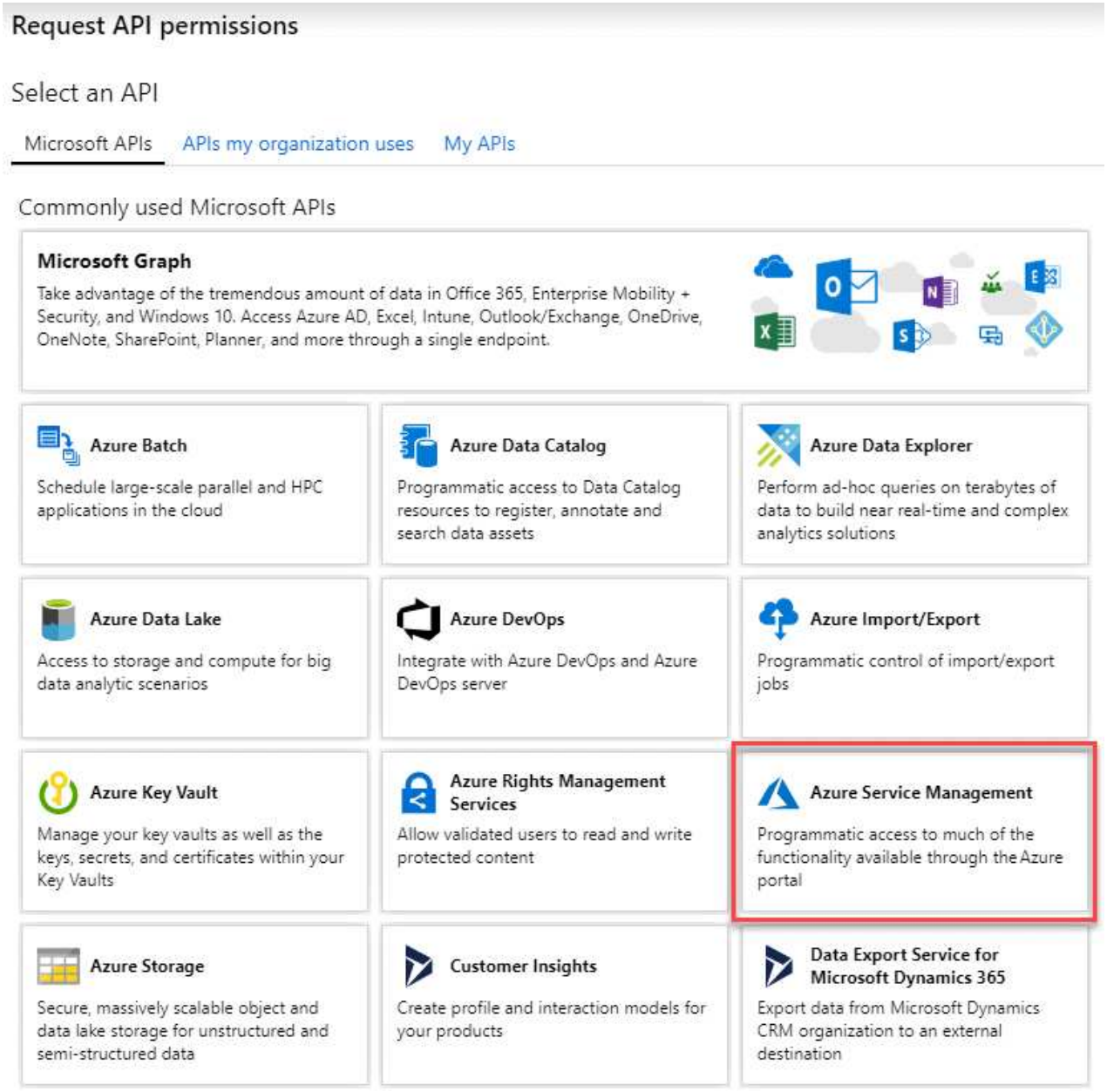
The service principal now has the required Azure permissions to deploy the Connector.

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

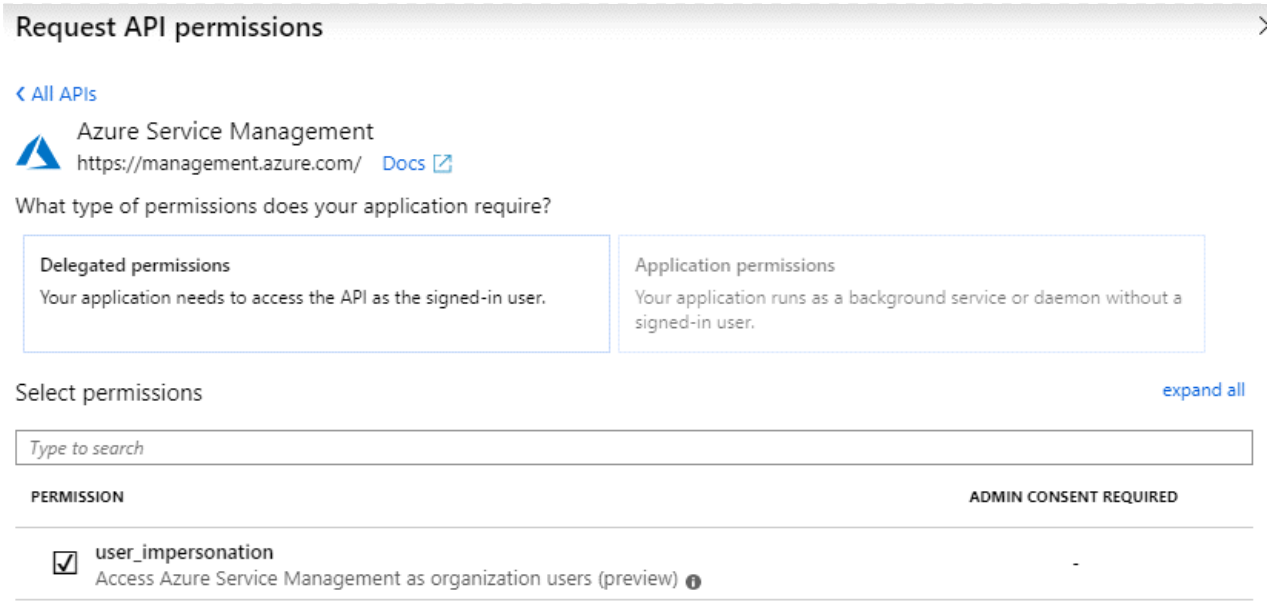
bind the service principal to each of those subscriptions. BlueXP enables you to select the subscription that you want to use when deploying Cloud Volumes ONTAP.

Add Windows Azure Service Management API permissions

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

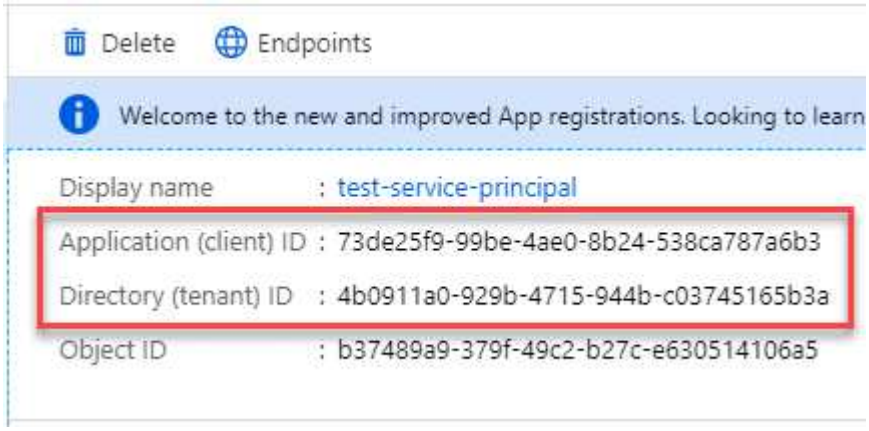


4. Select **Access Azure Service Management as organization users** and then select **Add permissions**.



Get the application ID and directory ID for the application

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



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

Create a client secret

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

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

Result

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

Step 4: Create the Connector

Launch the Connector directly from the Azure Marketplace.

About this task

Creating the Connector from the Azure Marketplace deploys a virtual machine in Azure using a default configuration. Learn about the default configuration for the Connector.

Before you begin

You should have the following:

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

  Learn about connecting to a Linux VM in Azure

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

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

Steps

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

   Azure Marketplace page for commercial regions

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

   Note the following as you configure the VM:

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

     View security group rules for Azure.

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

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

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

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

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

   https://*ipaddress*

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

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

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

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

Step 5: Provide permissions to BlueXP

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

Custom role

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

Steps

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

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

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

Result

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

What's next?

Go to the BlueXP console to start using the Connector with BlueXP.

Service principal

Steps

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

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

subscribing now or by selecting an existing subscription.

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

Result

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

Manually install the Connector in Azure

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

Before you begin

You should review Connector limitations.

Step 1: Review host requirements

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

Dedicated host

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

Supported operating systems

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

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

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

Hypervisor

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

Red Hat Solution: Which hypervisors are certified to run Red Hat Enterprise Linux?

CPU

4 cores or 4 vCPUs

RAM

14 GB

Azure VM size

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

Disk space in /opt

100 GiB of space must be available

Disk space in /var

20 GiB of space must be available

Docker Engine

Docker Engine version 19.3.1 or later is required on the host before you install the Connector. View installation instructions

Step 2: Set up networking

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

Azure region

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

Learn how Cloud Volumes ONTAP uses an Azure Private Link

Connections to target networks

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

Outbound internet access

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

Endpoints contacted during manual installation

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

- https://support.netapp.com
- https://mysupport.netapp.com
- https://cloudmanager.cloud.netapp.com/tenancy
- https://stream.cloudmanager.cloud.netapp.com
- https://production-artifacts.cloudmanager.cloud.netapp.com
- https://*.blob.core.windows.net
- https://cloudmanagerinfraprod.azurecr.io

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

Endpoints contacted from the Connector

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

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

Proxy server

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

- IP address
- Credentials
- HTTPS certificate

Ports

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

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

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

Step 3: Set up permissions

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

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

Follow the steps to prepare permissions for BlueXP.

Custom role

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

Steps

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

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

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

   Example

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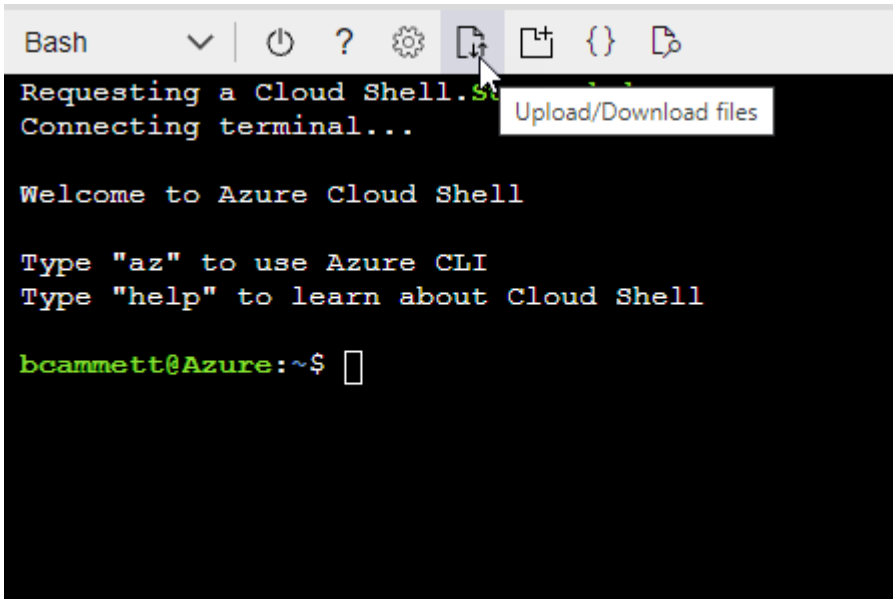

4. Use the JSON file to create a custom role in Azure.

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

   a. Start Azure Cloud Shell and choose the Bash environment.

   b. Upload the JSON file.



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

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

Result

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

Service principal

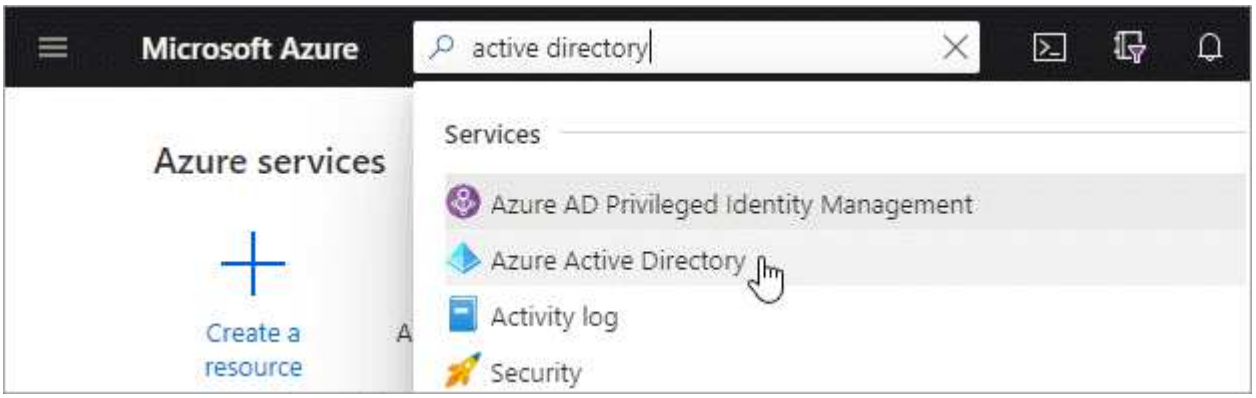
Create and set up a service principal in Azure Active Directory and obtain the Azure credentials that BlueXP needs.

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

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

   For details, refer to Microsoft Azure Documentation: Required permissions

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



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

   You've created the AD application and service principal.

Assign the application to a role

1. Create a custom role:

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

a. Copy the contents of the custom role permissions for the Connector and save them in a JSON file.

b. Modify the JSON file by adding Azure subscription IDs to the assignable scope.

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

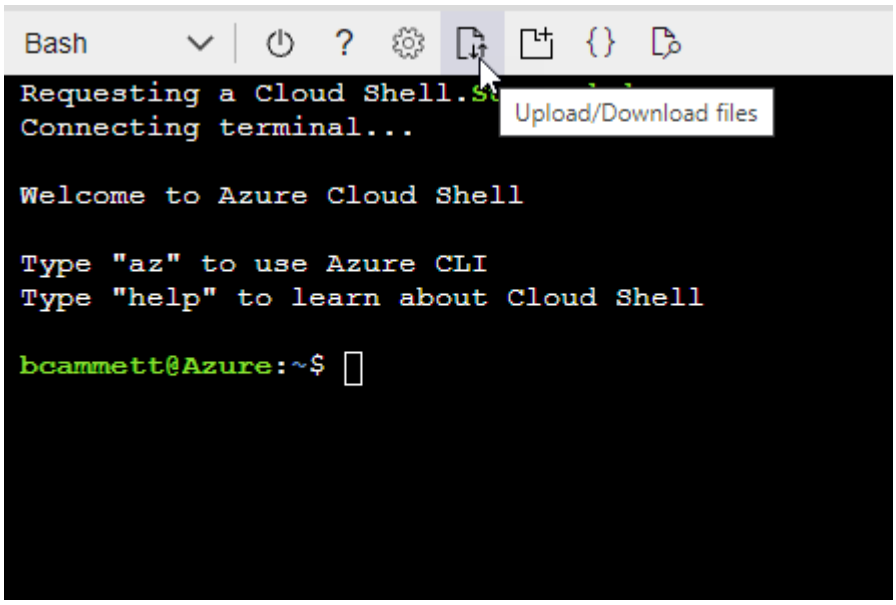
Example

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

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

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

- Start Azure Cloud Shell and choose the Bash environment.
- Upload the JSON file.



- Use the Azure CLI to create the custom role:

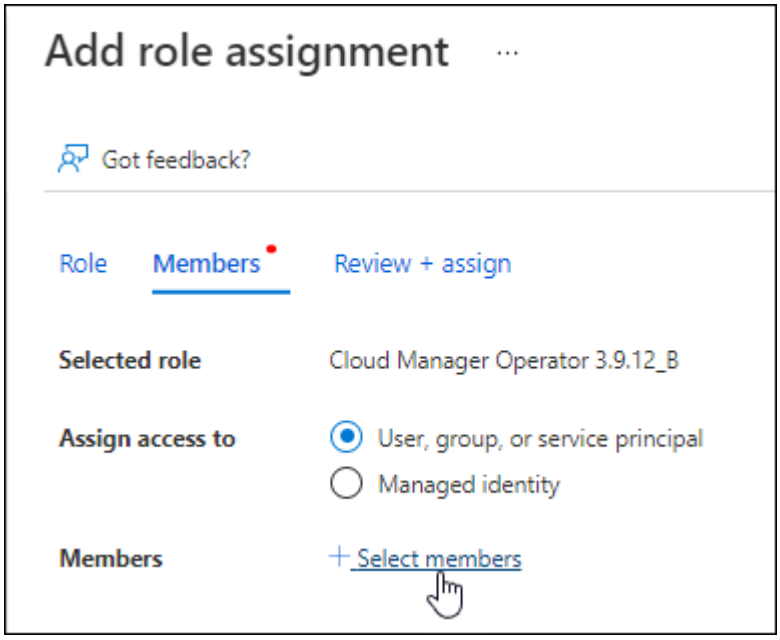
```
az role definition create --role-definition
Connector_Policy.json
```

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

2. Assign the application to the role:

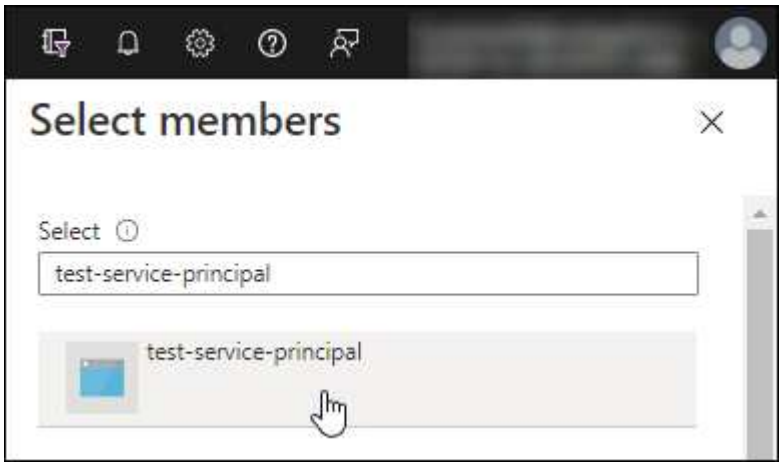
a. From the Azure portal, open the **Subscriptions** service.

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



   - Search for the name of the application.

     Here's an example:



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

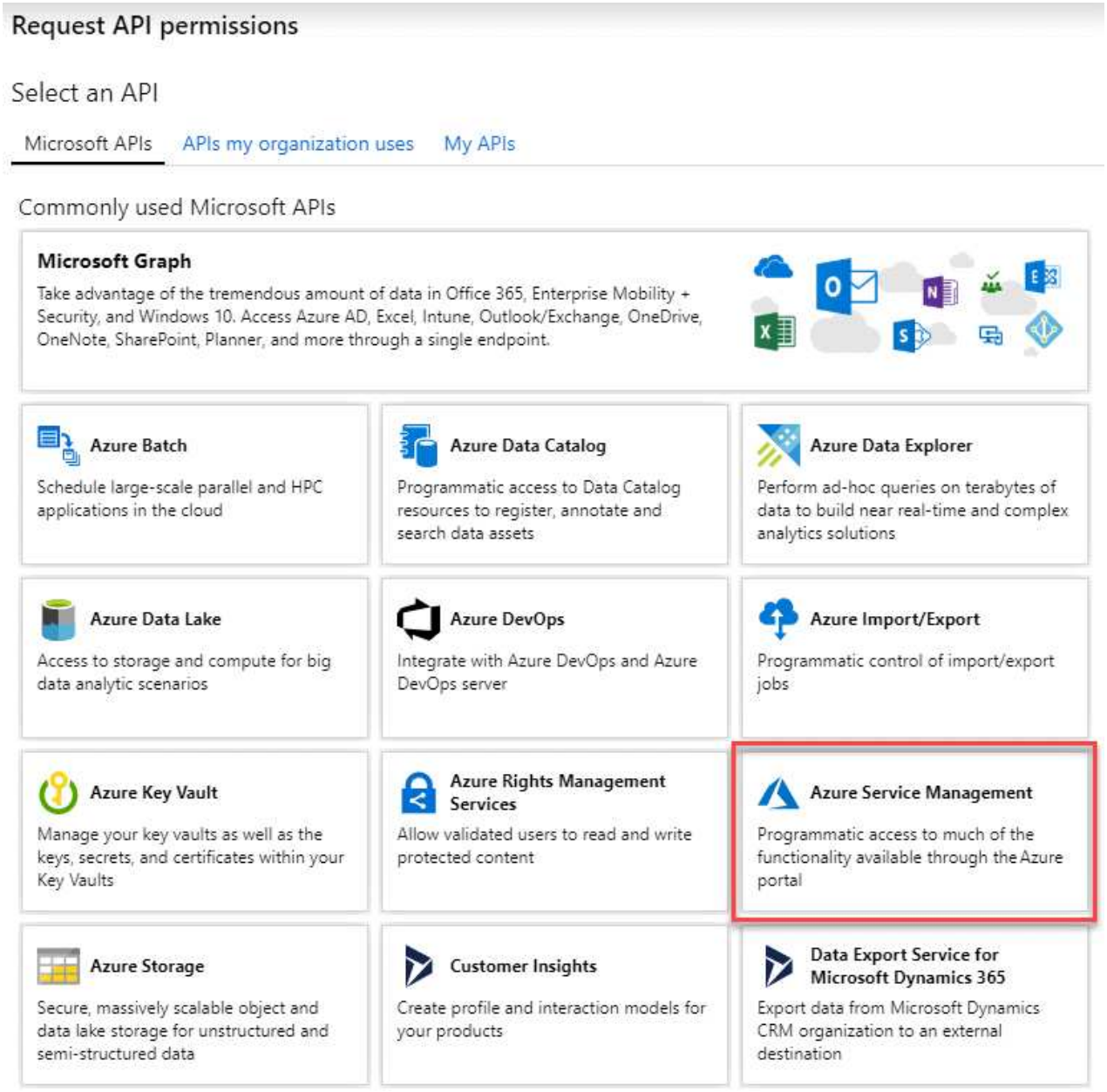
The service principal now has the required Azure permissions to deploy the Connector.

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

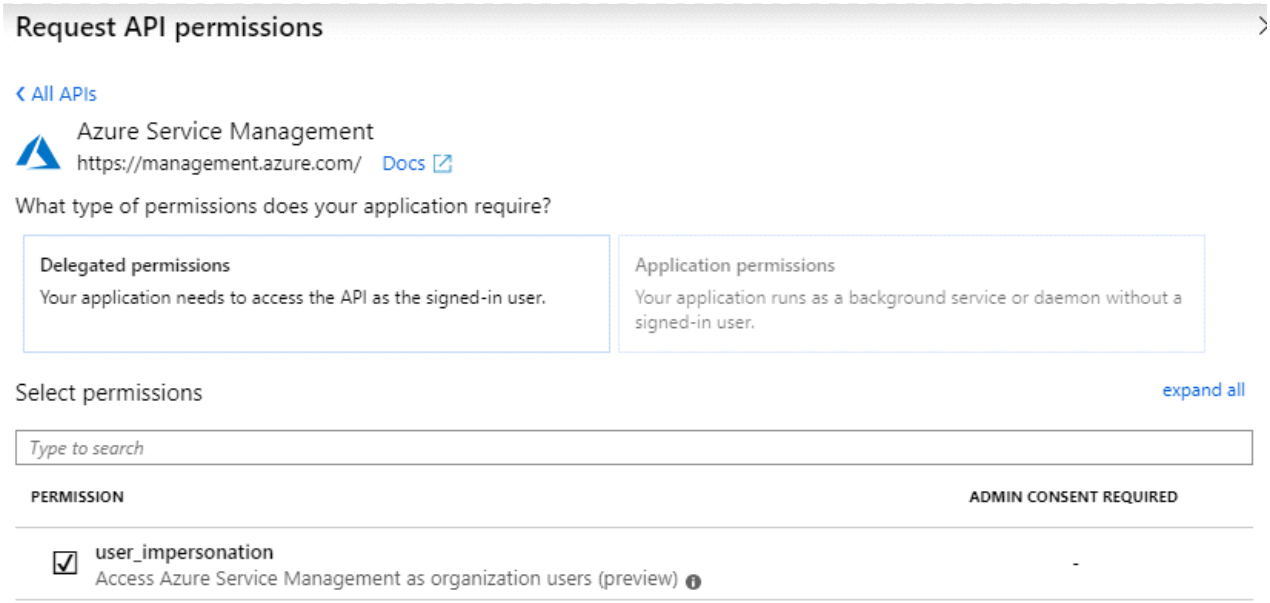
bind the service principal to each of those subscriptions. BlueXP enables you to select the subscription that you want to use when deploying Cloud Volumes ONTAP.

Add Windows Azure Service Management API permissions

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

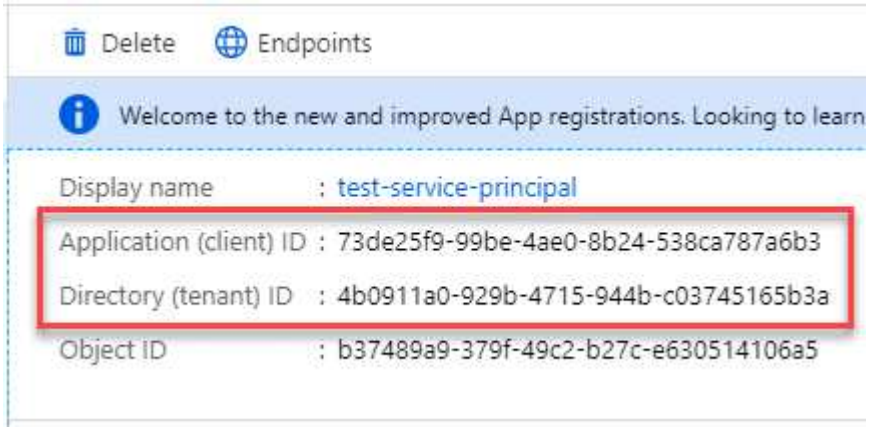


4. Select **Access Azure Service Management as organization users** and then select **Add permissions**.



Get the application ID and directory ID for the application

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



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

Create a client secret

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

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

Result

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

Step 4: Install the Connector

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

Before you begin

You should have the following:

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

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

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

  Microsoft Azure documentation: Configure managed identities for Azure resources on a VM using the Azure portal

About this task

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

Steps

1. Verify that docker is enabled and running.

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

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

```
unset http_proxy
unset https_proxy
```

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

3. Download the Connector software from the NetApp Support Site, and then copy it to the Linux host.

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

4. Assign permissions to run the script.

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

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

5. Run the installation script.

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

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

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

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

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

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

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

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

6. Wait for the installation to complete.

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

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

   https://*ipaddress*

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

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

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

Result

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

Step 5: Provide permissions to BlueXP

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

Custom role

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

Steps

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

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

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

Result

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

What's next?

Go to the BlueXP console to start using the Connector with BlueXP.

Service principal

Steps

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

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

subscribing now or by selecting an existing subscription.

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

Result

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

Google Cloud

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, but the deployment is initiated directly from Google Cloud, rather than from BlueXP.

- Download and manually install the software on your own Linux host

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

Create a Connector in Google Cloud from BlueXP or gcloud

To create a Connector in Google Cloud from BlueXP or by using gcloud, you need to set up your networking, prepare Google Cloud permissions, enable Google Cloud APIs, and then create the Connector.

Before you begin

You should review Connector limitations.

Step 1: Set up networking

Set up your networking so the Connector can manage resources and processes within your hybrid cloud environment. For example, you need to ensure that connections are available to target networks and that outbound internet access is available.

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. For example, the network where you plan to create Cloud Volumes ONTAP systems or a storage system in your on-premises environment.

Outbound internet access

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

Endpoints contacted from the Connector

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

Endpoints	Purpose
https://www.googleapis.com/compute/v1/ https://compute.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.
https://support.netapp.com	To obtain licensing information and to send AutoSupport messages to NetApp support.
https://*.api.bluexp.netapp.com https://api.bluexp.netapp.com https://*.cloudmanager.cloud.netapp.com https://cloudmanager.cloud.netapp.com https://netapp-cloud-account.auth0.com	To provide SaaS features and services within BlueXP. Note that the Connector is currently contacting "cloudmanager.cloud.netapp.com" but it will start contacting "api.bluexp.netapp.com" in an upcoming release.
https://*.blob.core.windows.net https://cloudmanagerinfraprod.azurecr.io	To upgrade the Connector and its Docker components.

Endpoints contacted from the BlueXP console

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

View the list of endpoints contacted from the BlueXP console.

Proxy server

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

- IP address

- Credentials
- HTTPS certificate

Ports

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

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

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

Step 2: Set up permissions to create the Connector

Before you can deploy a Connector from BlueXP or by using gcloud, you need to set up permissions for the Google Cloud user who will deploy the Connector VM.

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.

Step 3: Set up permissions for the Connector

A Google Cloud service account is required to provide the Connector with the permissions that BlueXP needs to manage resources in Google Cloud. When you create the Connector, you'll 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 and assign the role to the service account:
   a. From the IAM & Admin service, select **Service Accounts > Create Service Account**.
   b. Enter service account details and select **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

3. 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.

   a. From the IAM & Admin service, select the Google Cloud project where you want to create Cloud Volumes ONTAP systems.
   b. 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.
- Select **Save**.

For more details, refer to Google Cloud documentation

Result

The service account for the Connector VM is set up.

Step 4: 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.

View shared VPC permissions

Identity	Creator	Hosted in	Service project permissions	Host project permissions	Purpose
Google account to deploy the Connector	Custom	Service Project	Connector deployment policy	compute.networkUser	Deploying the Connector in the service project
Connector service account	Custom	Service project	Connector service account policy	compute.networkUser deploymentmanager.editor	Deploying and maintaining Cloud Volumes ONTAP and services in the service project
Cloud Volumes ONTAP service account	Custom	Service project	storage.admin member: BlueXP service account as serviceAccount.user	N/A	(Optional) For data tiering and BlueXP backup and recovery
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.
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.

Step 5: Enable Google Cloud APIs

Several Google Cloud APIs must be enabled before you can 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
    - Cloud Key Management Service (KMS) API

      (Required only if you are planning to use BlueXP backup and recovery with customer-managed encryption keys (CMEK))

Google Cloud documentation: Enabling APIs

Step 6: Create the Connector

Create a Connector directly from the BlueXP web-based console or by using gcloud.

About this task

Creating the Connector deploys a virtual machine instance in Google Cloud using a default configuration. Learn about the default configuration for the Connector.

BlueXP

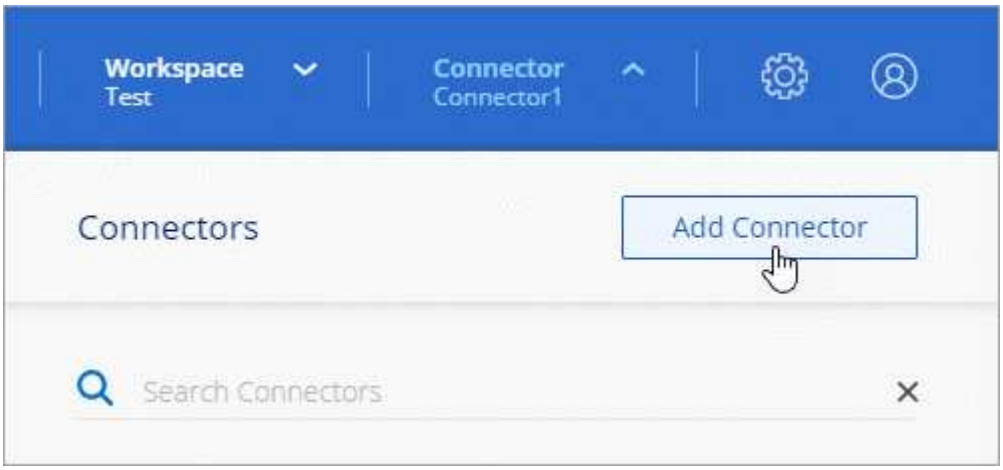
Before you begin

You should have the following:

- The required Google Cloud permissions to create the Connector and a service account for the Connector VM.
- A VPC and subnet that meets networking requirements.
- Details about a proxy server, if a proxy is required for internet access from the Connector.

Steps

1. Select 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. Select **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. Select **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 the required inbound and outbound rules.

     Firewall rules in Google Cloud

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

5. Select **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

Before you begin

You should have the following:

- The required Google Cloud permissions to create the Connector and a service account for the Connector VM.
- A VPC and subnet that meets networking requirements.
- An understanding of VM instance requirements.
  - **CPU**: 4 cores or 4 vCPUs
  - **RAM**: 14 GB
  - **Machine type**: We recommend n2-standard-4.

    The Connector is supported in Google Cloud on a VM instance with an OS that supports Shielded VM features.

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.

Manually install the Connector in Google Cloud

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

Before you begin

You should review Connector limitations.

Step 1: Review host requirements

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

Dedicated host

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

Supported operating systems

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

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

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

Hypervisor

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

Red Hat Solution: Which hypervisors are certified to run Red Hat Enterprise Linux?

CPU

4 cores or 4 vCPUs

RAM

14 GB

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

Step 2: Set up networking

Set up your networking so the Connector can manage resources and processes within your hybrid cloud environment. For example, you need to ensure that connections are available to target networks and that outbound internet access is available.

Connections to target networks

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

Outbound internet access

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

Endpoints contacted during manual installation

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

- https://support.netapp.com
- https://mysupport.netapp.com
- https://cloudmanager.cloud.netapp.com/tenancy
- https://stream.cloudmanager.cloud.netapp.com
- https://production-artifacts.cloudmanager.cloud.netapp.com
- https://*.blob.core.windows.net
- https://cloudmanagerinfraprod.azurecr.io

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

Endpoints contacted from the Connector

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

Endpoints	Purpose
https://www.googleapis.com/compute/v1/ https://compute.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.
https://support.netapp.com	To obtain licensing information and to send AutoSupport messages to NetApp support.
https://*.api.bluexp.netapp.com https://api.bluexp.netapp.com https://*.cloudmanager.cloud.netapp.com https://cloudmanager.cloud.netapp.com https://netapp-cloud-account.auth0.com	To provide SaaS features and services within BlueXP. Note that the Connector is currently contacting "cloudmanager.cloud.netapp.com" but it will start contacting "api.bluexp.netapp.com" in an upcoming release.
https://*.blob.core.windows.net https://cloudmanagerinfraprod.azurecr.io	To upgrade the Connector and its Docker components.

Proxy server

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

- IP address
- Credentials
- HTTPS certificate

Ports

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

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

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

Step 3: Set up permissions for the Connector

A Google Cloud service account is required to provide the Connector with the permissions that BlueXP needs to manage resources in Google Cloud. When you create the Connector, you'll 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 and assign the role to the service account:
   a. From the IAM & Admin service, select **Service Accounts > Create Service Account**.
   b. Enter service account details and select **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

3. 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.

   a. From the IAM & Admin service, select the Google Cloud project where you want to create Cloud Volumes ONTAP systems.
   b. 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.
      - Select **Save**.

   For more details, refer to Google Cloud documentation

Result

The service account for the Connector VM is set up.

Step 4: 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.

View shared VPC permissions

Identity	Creator	Hosted in	Service project permissions	Host project permissions	Purpose
Google account to deploy the Connector	Custom	Service Project	Connector deployment policy	compute.networkUser	Deploying the Connector in the service project
Connector service account	Custom	Service project	Connector service account policy	compute.networkUser deploymentmanager.editor	Deploying and maintaining Cloud Volumes ONTAP and services in the service project
Cloud Volumes ONTAP service account	Custom	Service project	storage.admin member: BlueXP service account as serviceAccount.user	N/A	(Optional) For data tiering and BlueXP backup and recovery
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.
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.

Step 5: Enable Google Cloud APIs

Several Google Cloud APIs must be enabled before you can deploy Cloud Volumes ONTAP systems 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
    - Cloud Key Management Service (KMS) API

      (Required only if you are planning to use BlueXP backup and recovery with customer-managed encryption keys (CMEK))

Google Cloud documentation: Enabling APIs

Step 6: Install the Connector

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

Before you begin

You should have the following:

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

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

- A CA-signed certificate, if the proxy server uses HTTPS or if the proxy is an intercepting proxy.

About this task

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

Steps

1. Verify that docker is enabled and running.

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

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

```
unset http_proxy
unset https_proxy
```

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

3. Download the Connector software from the NetApp Support Site, and then copy it to the Linux host.

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

4. Assign permissions to run the script.

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

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

5. Run the installation script.

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

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

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

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

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

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

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

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

6. Wait for the installation to complete.

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

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

https://*ipaddress*

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

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

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

Result

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

Step 7: Provide permissions to BlueXP

You need to provide BlueXP with the Google Cloud permissions that you previously set up. Providing the permissions enables BlueXP to manage your data and storage infrastructure in Google Cloud.

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 manage resources in other Google Cloud 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.

Install and set up a Connector on premises

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

Before you begin

You should review Connector limitations.

Step 1: Review host requirements

The Connector software must run on a host that meets specific operating system requirements, RAM requirements, port requirements, and so on. Ensure that your host meets these requirements before you install the Connector.

Dedicated host

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

Supported operating systems

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

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

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

Hypervisor

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

Red Hat Solution: Which hypervisors are certified to run Red Hat Enterprise Linux?

CPU

4 cores or 4 vCPUs

RAM

14 GB

Disk space in /opt

100 GiB of space must be available

Disk space in /var

20 GiB of space must be available

Docker Engine

Docker Engine version 19.3.1 or later is required on the host before you install the Connector. View installation instructions

Step 2: Set up networking

Set up your networking so the Connector can manage resources and processes within your hybrid cloud environment. For example, you need to ensure that connections are available to target networks and that outbound internet access is available.

Connections to target networks

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

Outbound internet access

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

Endpoints contacted during manual installation

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

- https://support.netapp.com
- https://mysupport.netapp.com
- https://cloudmanager.cloud.netapp.com/tenancy
- https://stream.cloudmanager.cloud.netapp.com
- https://production-artifacts.cloudmanager.cloud.netapp.com
- https://*.blob.core.windows.net
- https://cloudmanagerinfraprod.azurecr.io

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

Endpoints contacted from the Connector

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

Endpoints	Purpose
AWS services (amazonaws.com): • CloudFormation • Elastic Compute Cloud (EC2) • Identity and Access Management (IAM) • Key Management Service (KMS) • Security Token Service (STS) • Simple Storage Service (S3)	To manage resources in AWS. The exact endpoint depends on the AWS region that you're using. Refer to AWS documentation for details
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.chinacloudapi.cn https://login.chinacloudapi.cn https://blob.core.chinacloudapi.cn https://core.chinacloudapi.cn	To manage resources in Azure China regions.

Endpoints	Purpose
https://www.googleapis.com/compute/v1/ https://compute.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.
https://support.netapp.com	To obtain licensing information and to send AutoSupport messages to NetApp support.
https://*.api.bluexp.netapp.com https://api.bluexp.netapp.com https://*.cloudmanager.cloud.netapp.com https://cloudmanager.cloud.netapp.com https://netapp-cloud-account.auth0.com	To provide SaaS features and services within BlueXP. Note that the Connector is currently contacting "cloudmanager.cloud.netapp.com" but it will start contacting "api.bluexp.netapp.com" in an upcoming release.
https://*.blob.core.windows.net https://cloudmanagerinfraprod.azurecr.io	To upgrade the Connector and its Docker components.

Proxy server

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

- IP address
- Credentials
- HTTPS certificate

Ports

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

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

  If Cloud Volumes ONTAP systems don't have an outbound internet connection to send AutoSupport

messages, BlueXP automatically configures those systems to use a proxy server that's included with the Connector. The only requirement is to ensure that the Connector's security group allows inbound connections over port 3128. You'll need to open this port after you deploy the Connector.

Step 3: Set up cloud permissions

If you want to use BlueXP services in AWS or Azure with an on-premises 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 reside 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. Log in to the AWS console and navigate to the IAM service.
2. Create a policy:
   a. Select **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.
3. Attach the policies to an IAM user.
   - AWS Documentation: Creating IAM Roles
   - AWS Documentation: Adding and Removing IAM Policies
4. Ensure that the user has an access key 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.

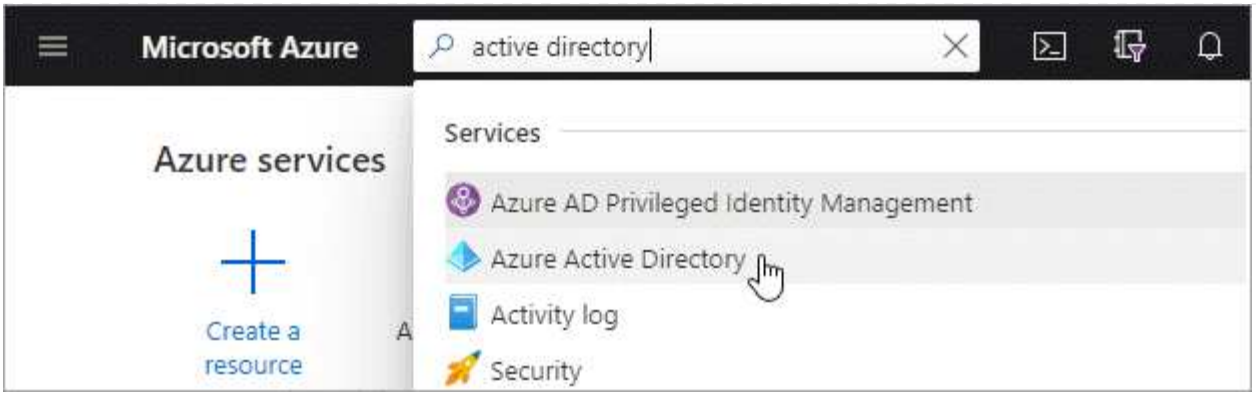
Azure

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

   You've created the AD application and service principal.

Assign the application to a role

1. Create a custom role:

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

   a. Copy the contents of the custom role permissions for the Connector and save them in a JSON file.

   b. Modify the JSON file by adding Azure subscription IDs to the assignable scope.

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

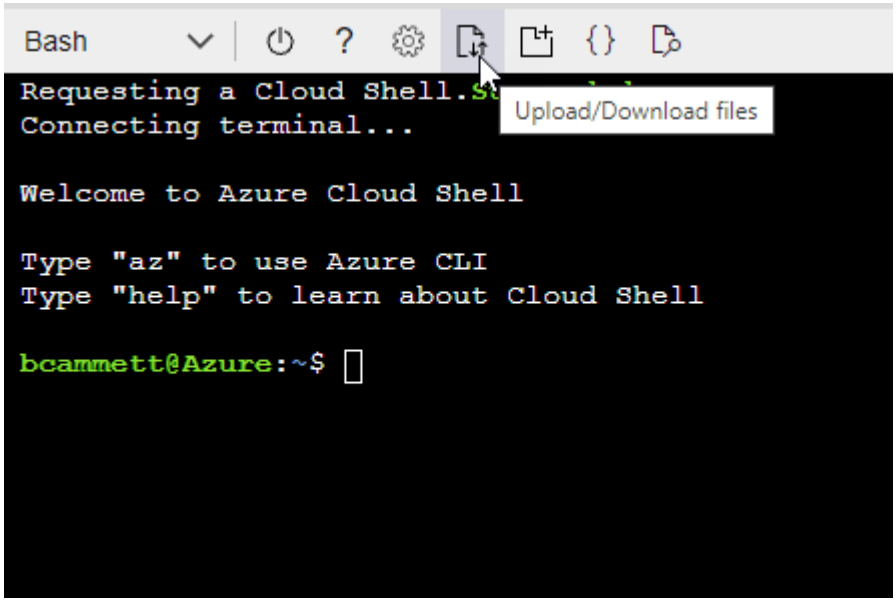
      Example

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

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

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

      - Start Azure Cloud Shell and choose the Bash environment.
      - Upload the JSON file.

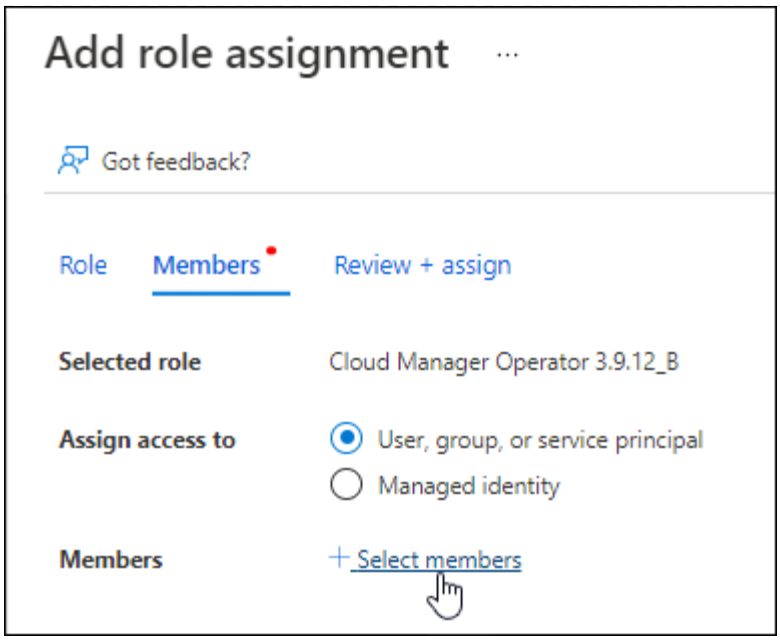


- Use the Azure CLI to create the custom role:

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

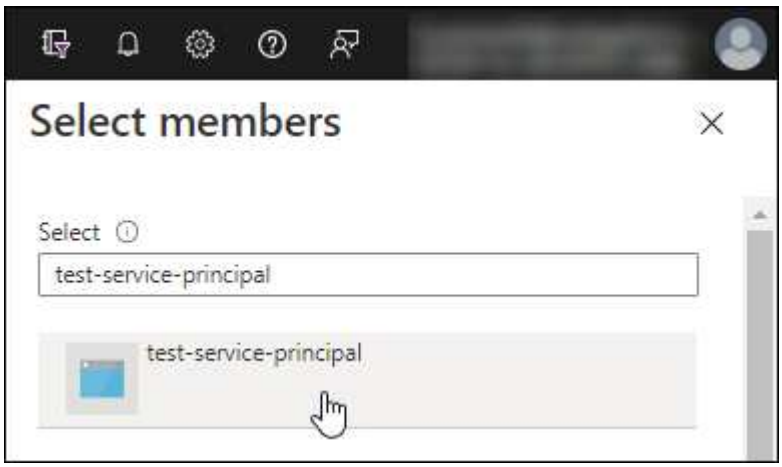
You should now have a custom role called BlueXP Operator that you can assign to the Connector virtual machine.

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



- Search for the name of the application.

  Here's an example:



- Select the application and select **Select**.
- Select **Next**.

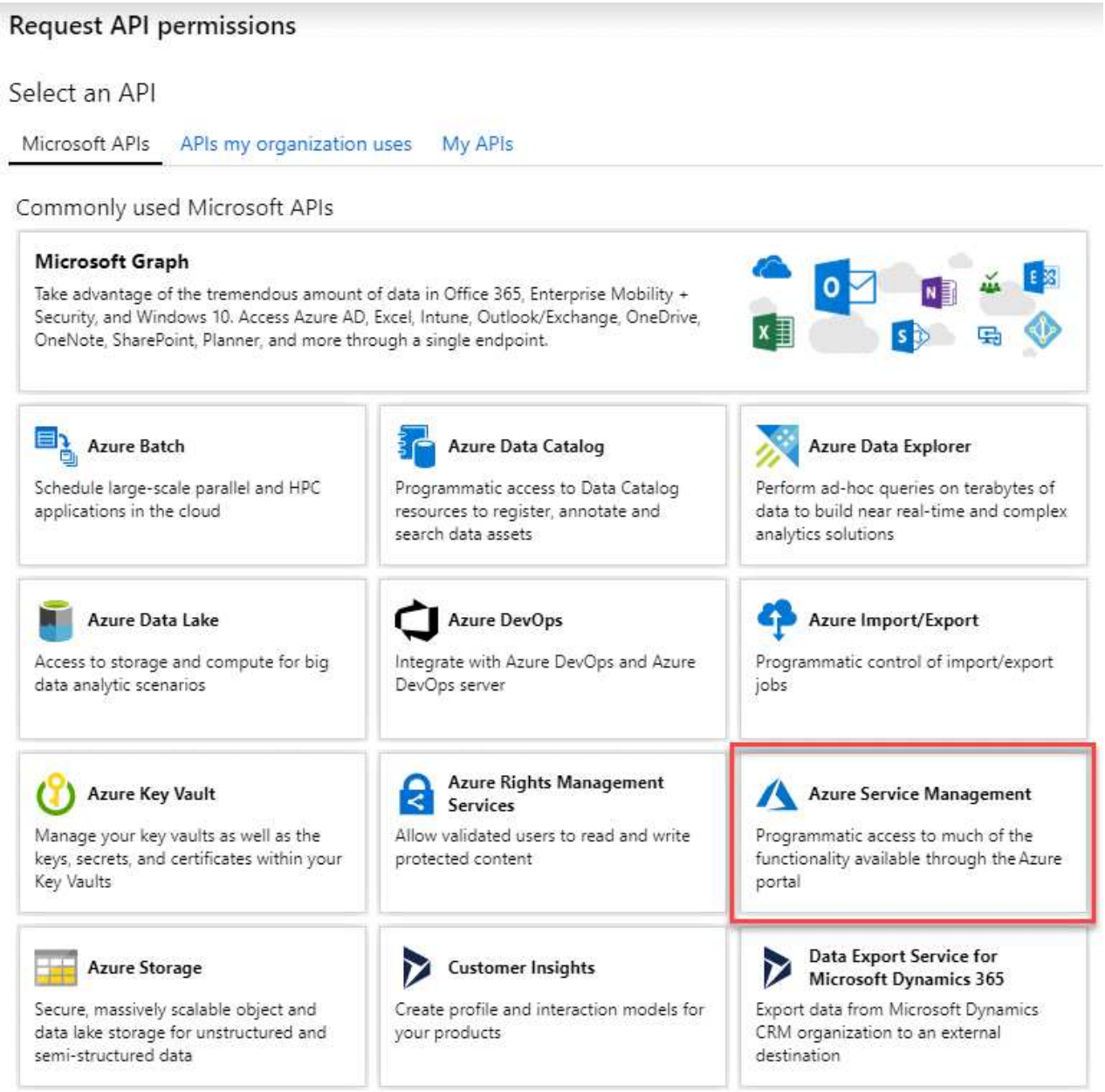
f. Select **Review + assign**.

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

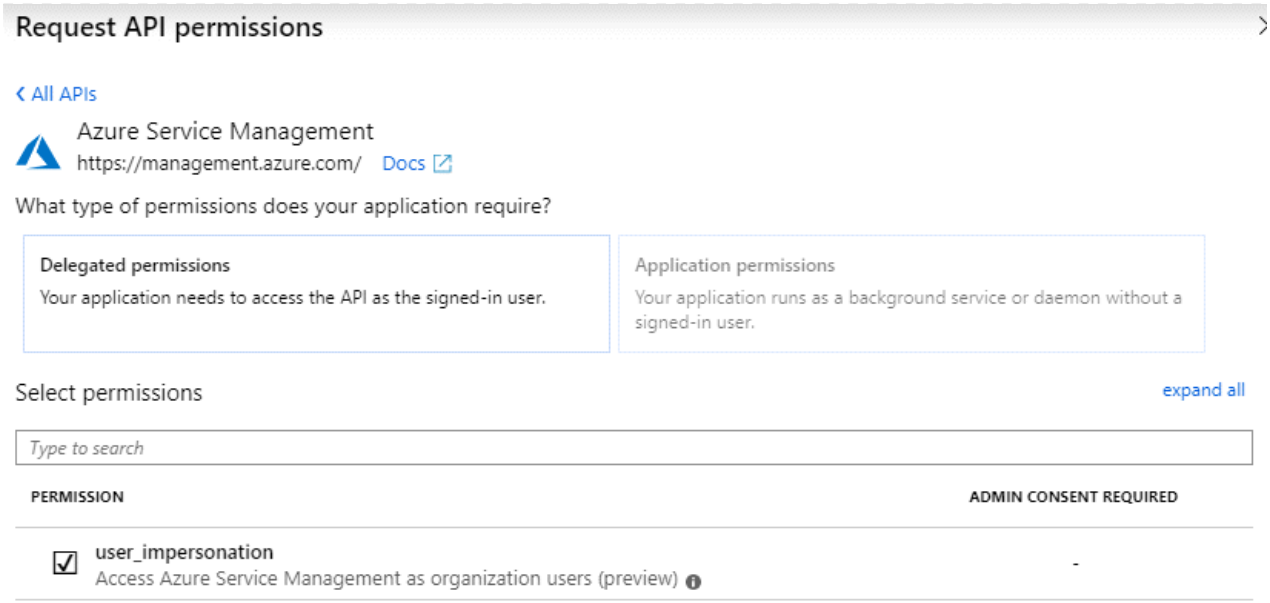
If you want to deploy Cloud Volumes ONTAP from multiple Azure subscriptions, then you must bind the service principal to each of those subscriptions. BlueXP enables you to select the subscription that you want to use when deploying Cloud Volumes ONTAP.

Add Windows Azure Service Management API permissions

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

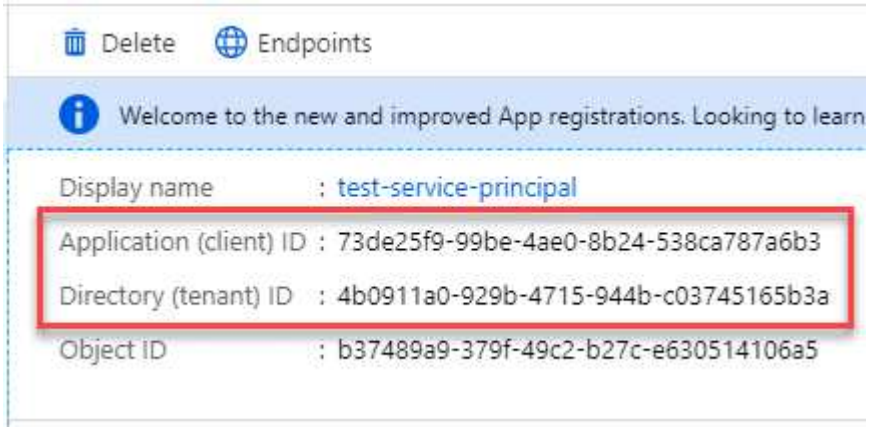


4. Select **Access Azure Service Management as organization users** and then select **Add permissions**.



Get the application ID and directory ID for the application

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



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

Create a client secret

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

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.

Step 4: Install the Connector

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

Before you begin

You should have the following:

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

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

- A CA-signed certificate, if the proxy server uses HTTPS or if the proxy is an intercepting proxy.

About this task

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

Steps

1. Verify that docker is enabled and running.

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

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

   ```
   unset http_proxy
   unset https_proxy
   ```

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

3. Download the Connector software from the NetApp Support Site, and then copy it to the Linux host.

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

4. Assign permissions to run the script.

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

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

5. Run the installation script.

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

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

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

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

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

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

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

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

Result

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

Step 5: Set up the Connector

Sign up or log in and then set up the Connector to work with your BlueXP 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. Select **Let's start**.

Result

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

Step 6: Provide permissions to BlueXP

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

AWS

Before you begin

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, select the Settings icon, and select **Credentials**.

2. Select **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 select **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 begin

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, select the Settings icon, and select **Credentials**.

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

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

Result

BlueXP now has the permissions that it needs to perform actions in Azure on your behalf. 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. If you purchased a license from NetApp (BYOL), you also need to subscribe to the marketplace offering. Your license is always charged first, but you'll be charged at the hourly rate if you exceed your licensed capacity or if the license's term expires.

A marketplace subscription enables charging for the following BlueXP services:

- Backup and recovery
- Classification
- Cloud Volumes ONTAP
- Tiering

Before you begin

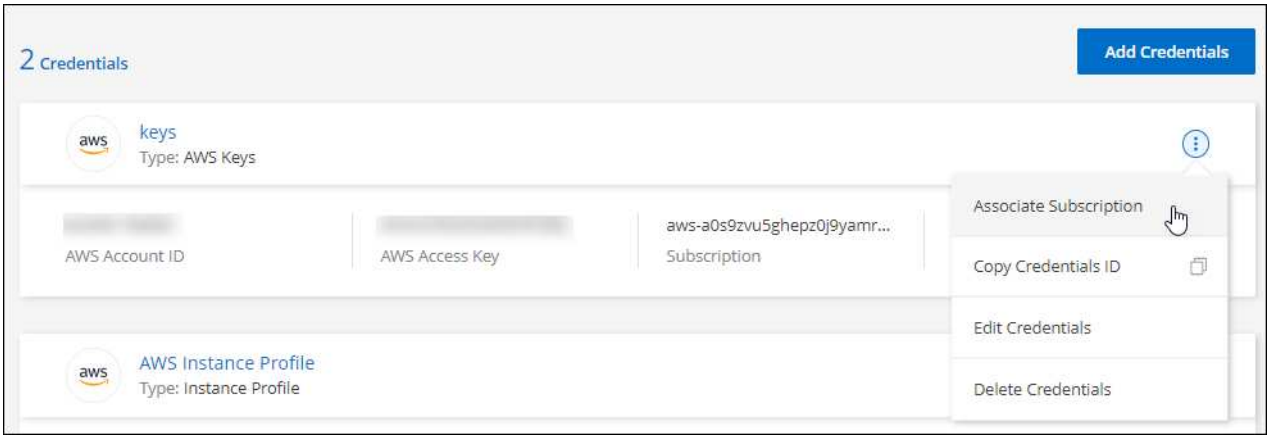
Subscribing to BlueXP involves associating a marketplace subscription with the cloud credentials that are associated with a Connector. If you followed the "Get started with standard mode" workflow, then you should already have a Connector. To learn more, view the Quick start for BlueXP in standard mode.

AWS

Steps

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

   You must select credentials that are associated with a Connector. You can't associate a marketplace subscription with credentials that are associated with BlueXP.



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

      - Select **Save**.

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

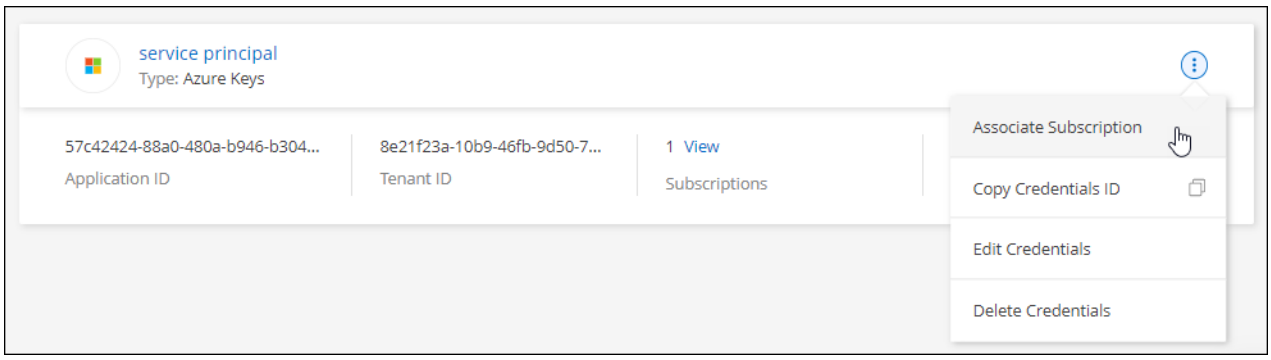
        Subscribe to BlueXP from the AWS Marketplace

Azure

Steps

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

   You must select credentials that are associated with a Connector. You can't associate a marketplace subscription with credentials that are associated with BlueXP.



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

      - Select **Save**.

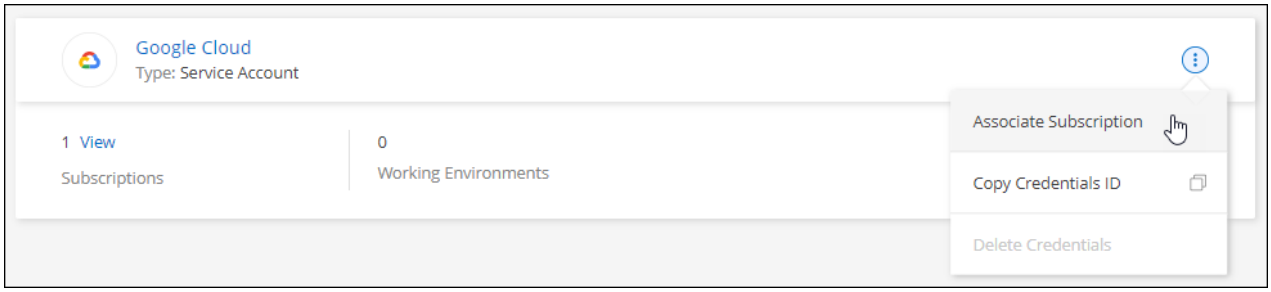
        The following video shows the steps to subscribe from the Azure Marketplace:

        Subscribe to BlueXP from the Azure Marketplace

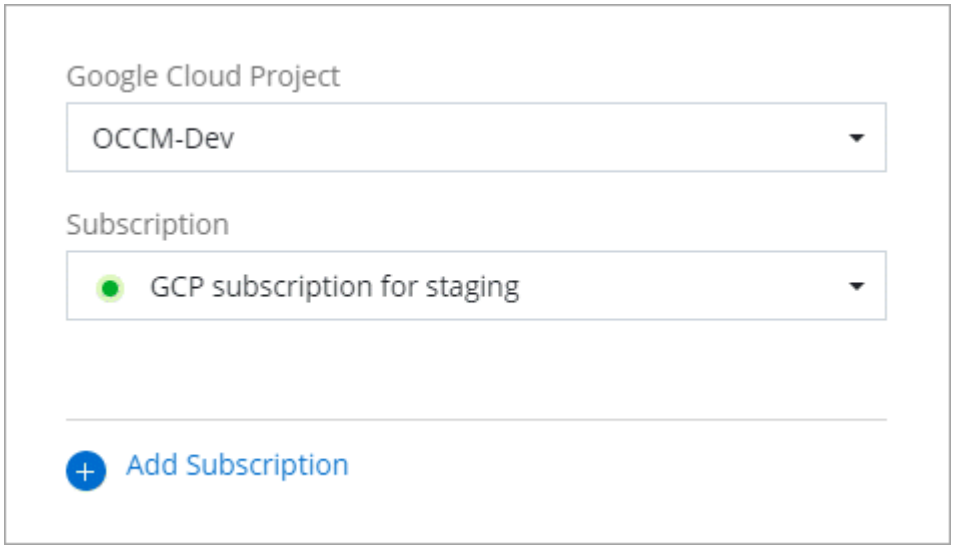
Google Cloud

Steps

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



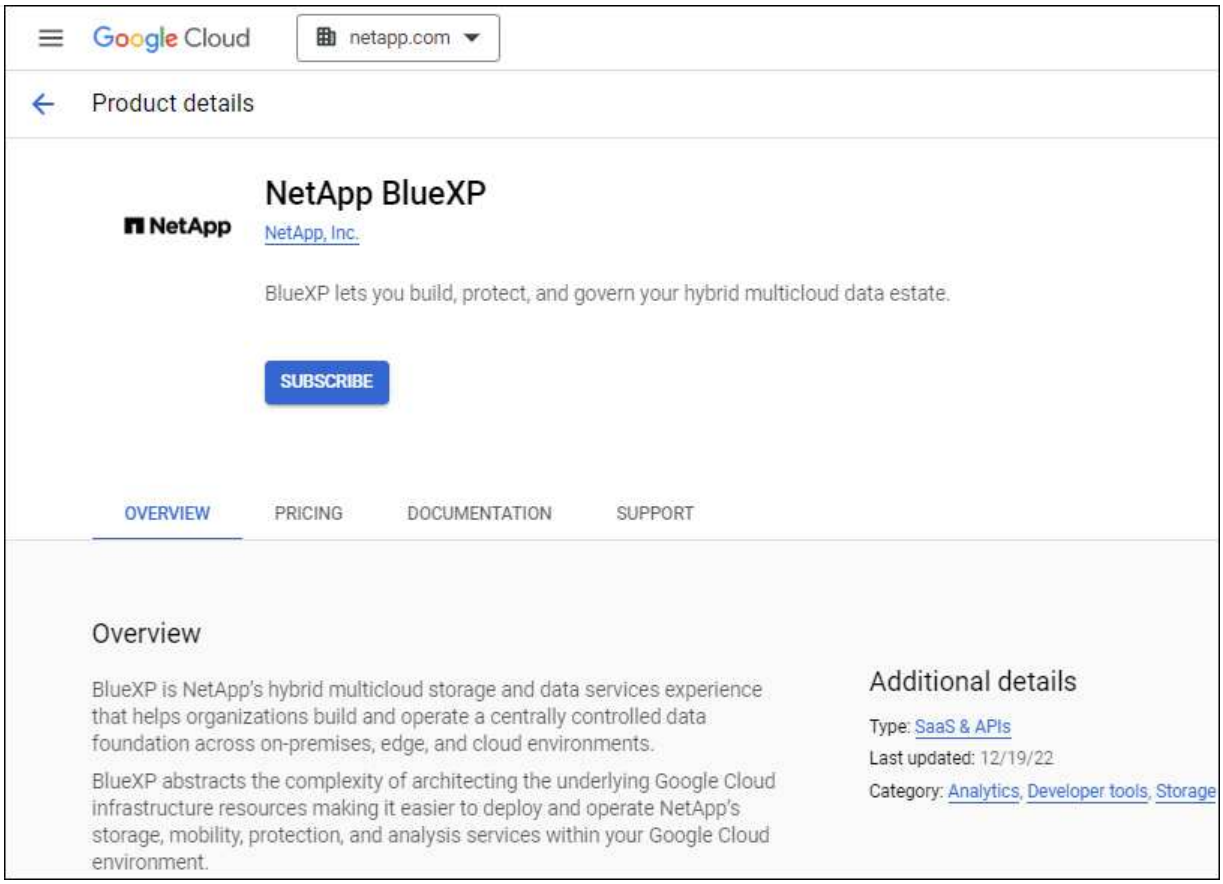
3. To associate the credentials with an existing subscription, select a Google Cloud project and subscription from the down-down list, and then select **Associate**.



4. If you don't already have a subscription, select **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.



b. Select **Subscribe**.

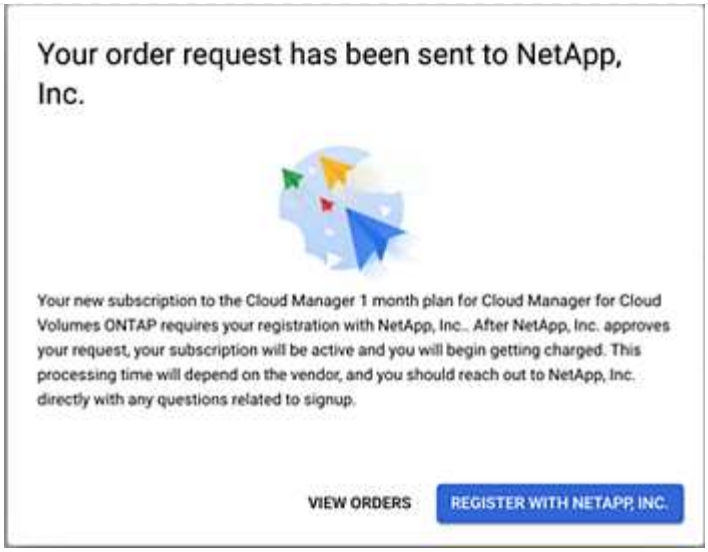
c. Select the appropriate billing account and agree to the terms and conditions.

d. Select **Subscribe**.

   This step sends your transfer request to NetApp.

e. On the pop-up dialog box, select **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.



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.

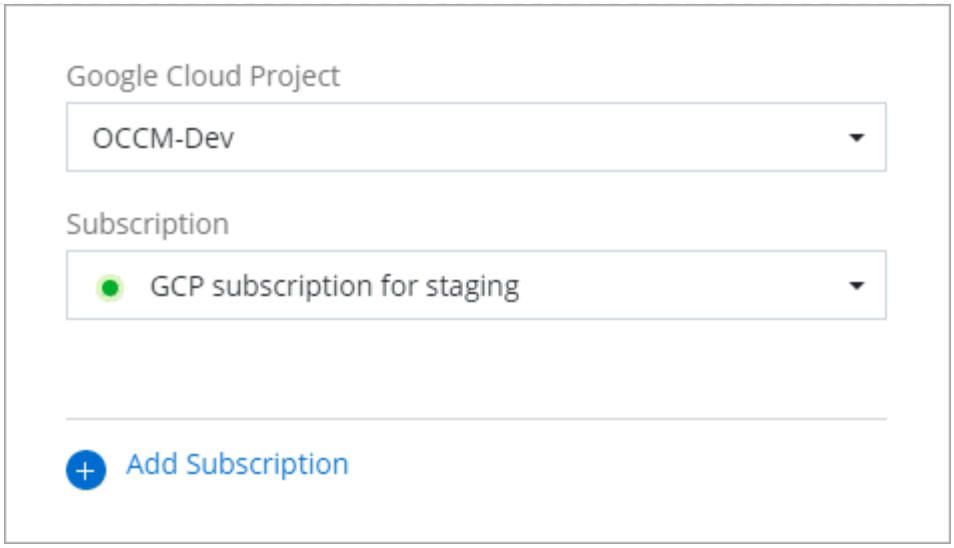
  For all other accounts, you'll need to manually associate the subscription by repeating these steps.

- Select **Save**.

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

  Subscribe to BlueXP from the Google Cloud Marketplace

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



Related links

- Manage BYOL capacity-based licenses for Cloud Volumes ONTAP
- Manage BYOL licenses for BlueXP data services
- Manage AWS credentials and subscriptions for BlueXP
- Manage Azure credentials and subscriptions for BlueXP
- Manage Google Cloud credentials and subscriptions for BlueXP

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.

Related link

BlueXP deployment modes

Get started with restricted mode

Getting started workflow (restricted mode)

Get started with BlueXP in restricted mode by preparing your environment, deploying the Connector, and subscribing to BlueXP.

Before you get started, you should have an understanding of BlueXP accounts, Connectors, and deployment modes.

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, outbound internet access for manual installations, and outbound internet for day-to-day access.

c. Set up permissions in your cloud provider so that you can associate those permissions with the Connector instance after you deploy it.

2 Deploy the Connector

a. 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.

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.

Prepare for deployment in restricted mode

Prepare your environment before you deploy BlueXP in restricted mode. For example, you need to review host requirements, prepare networking, set up permissions, and more.

Step 1: 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.

Step 2: 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

Step 3: 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

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

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

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

Hypervisor

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

Red Hat Solution: Which hypervisors are certified to run Red Hat Enterprise Linux?

CPU

4 cores or 4 vCPUs

RAM

14 GB

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

Step 4: Prepare networking

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.

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. These endpoints are contacted from a user's computer when completing specific actions from the BlueXP console.

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 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.

Endpoints contacted during manual installation

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

- https://support.netapp.com
- https://mysupport.netapp.com
- https://cloudmanager.cloud.netapp.com/tenancy
- https://stream.cloudmanager.cloud.netapp.com
- https://production-artifacts.cloudmanager.cloud.netapp.com
- https://*.blob.core.windows.net
- https://cloudmanagerinfraprod.azurecr.io

  This endpoint is not required in Azure Government regions.

- https://occmclientinfragov.azurecr.us

  This endpoint is only required in Azure Government regions.

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

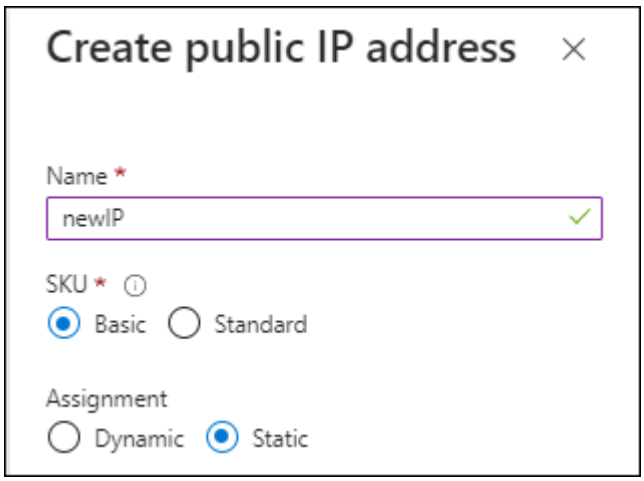
The network location where you deploy the Connector must have an outbound internet connection. The Connector requires outbound internet access to contact the following endpoints in order to manage resources and processes within your public cloud environment.

Endpoints	Purpose
AWS services (amazonaws.com): • CloudFormation • Elastic Compute Cloud (EC2) • Identity and Access Management (IAM) • Key Management Service (KMS) • Security Token Service (STS) • Simple Storage Service (S3)	To manage resources in AWS. The exact endpoint depends on the AWS region that you're using. Refer to AWS documentation for details
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.usgovcloudapi.net https://login.microsoftonline.us https://blob.core.usgovcloudapi.net https://core.usgovcloudapi.net	To manage resources in Azure Government regions.
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://compute.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.
https://support.netapp.com	To obtain licensing information and to send AutoSupport messages to NetApp support.

Endpoints	Purpose
https://*.api.bluexp.netapp.com https://api.bluexp.netapp.com https://*.cloudmanager.cloud.netapp.com https://cloudmanager.cloud.netapp.com https://netapp-cloud-account.auth0.com	To provide SaaS features and services within BlueXP. Note that the Connector is currently contacting "cloudmanager.cloud.netapp.com" but it will start contacting "api.bluexp.netapp.com" in an upcoming release.
https://*.blob.core.windows.net https://cloudmanagerinfraprod.azurecr.io This endpoint is not required in Azure Government regions. https://occmclientinfragov.azurecr.us This endpoint is only required in Azure Government regions.	To upgrade the Connector and its Docker components.

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.



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

Proxy server

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

- IP address

- Credentials
- HTTPS certificate

Ports

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

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

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

Step: 5 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. Select **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. Select **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. Log in to the AWS console and navigate to the IAM service.
2. Create a policy:
   a. Select **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.

3. Attach the policies to an IAM user.
   - AWS Documentation: Creating IAM Roles
   - AWS Documentation: Adding and Removing IAM Policies

4. Ensure that the user has an access key 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.

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

Steps

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

   Microsoft Azure documentation: Configure managed identities for Azure resources on a VM using the Azure portal

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

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

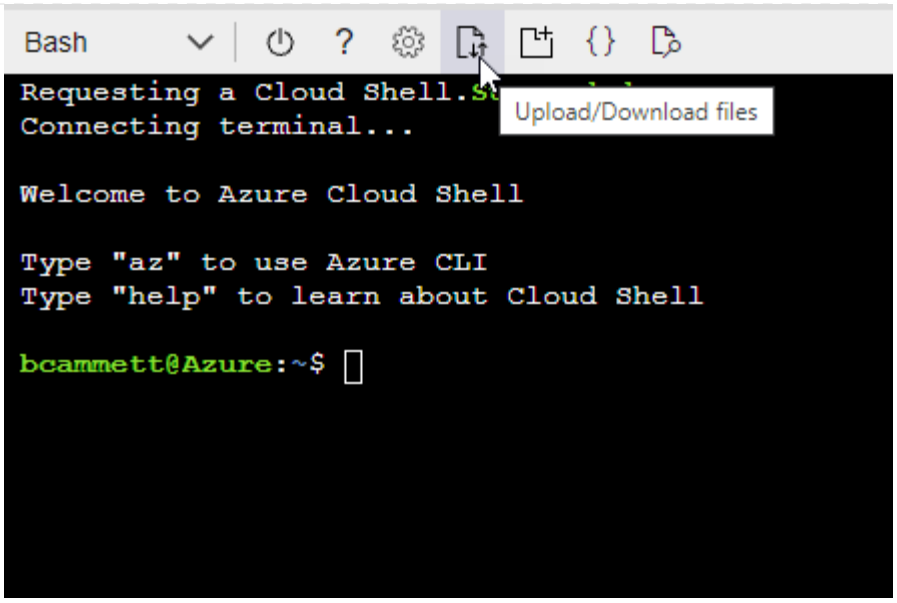
   Example

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

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

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

   a. Start Azure Cloud Shell and choose the Bash environment.
   b. Upload the JSON file.



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

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

Result

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

Azure service principal

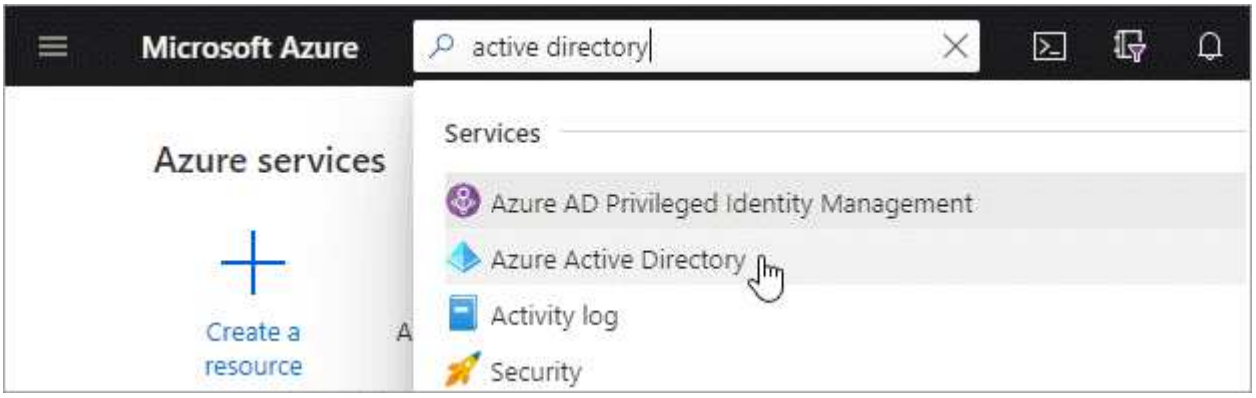
Create and set up a service principal in Azure Active Directory and obtain the Azure credentials that BlueXP needs. You'll need to provide BlueXP with these credentials after you install the Connector and set up BlueXP.

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

   You've created the AD application and service principal.

Assign the application to a role

1. Create a custom role:

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

   a. Copy the contents of the custom role permissions for the Connector and save them in a JSON file.

   b. Modify the JSON file by adding Azure subscription IDs to the assignable scope.

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

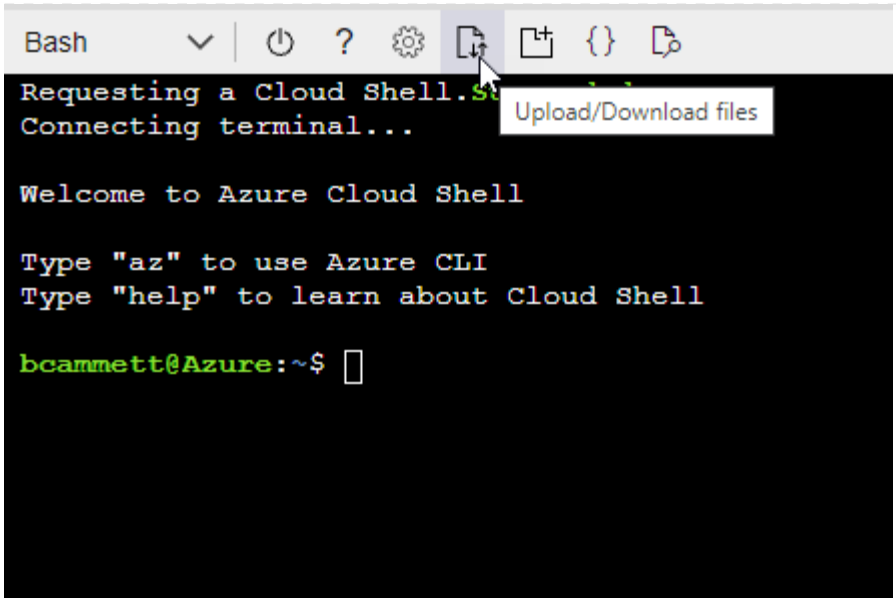
      Example

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

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

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

      - Start Azure Cloud Shell and choose the Bash environment.
      - Upload the JSON file.

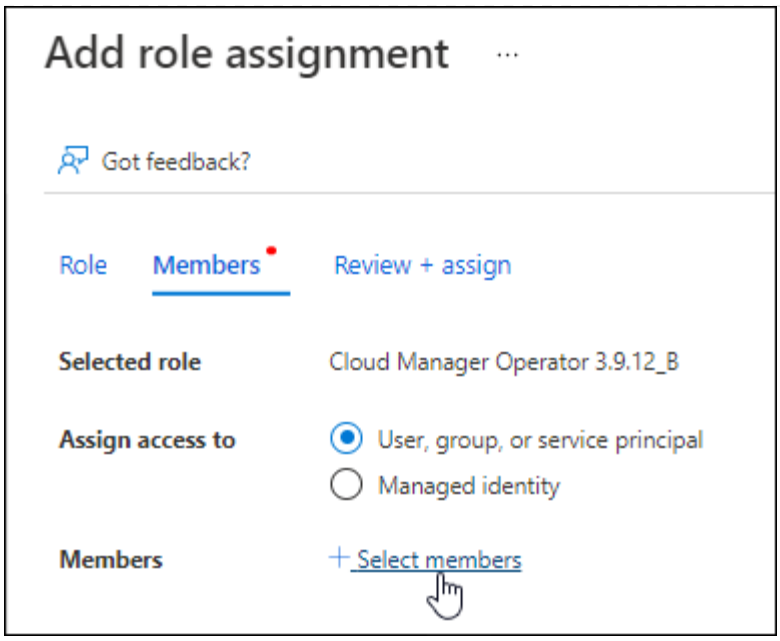


- Use the Azure CLI to create the custom role:

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

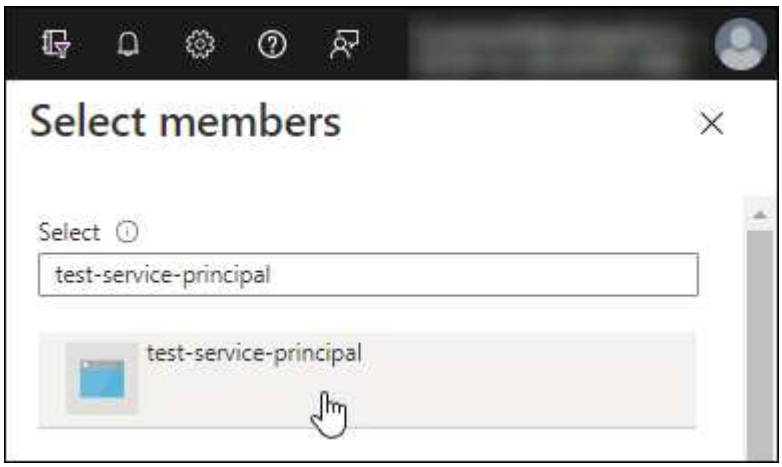
You should now have a custom role called BlueXP Operator that you can assign to the Connector virtual machine.

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



- Search for the name of the application.

  Here's an example:



- Select the application and select **Select**.
- Select **Next**.

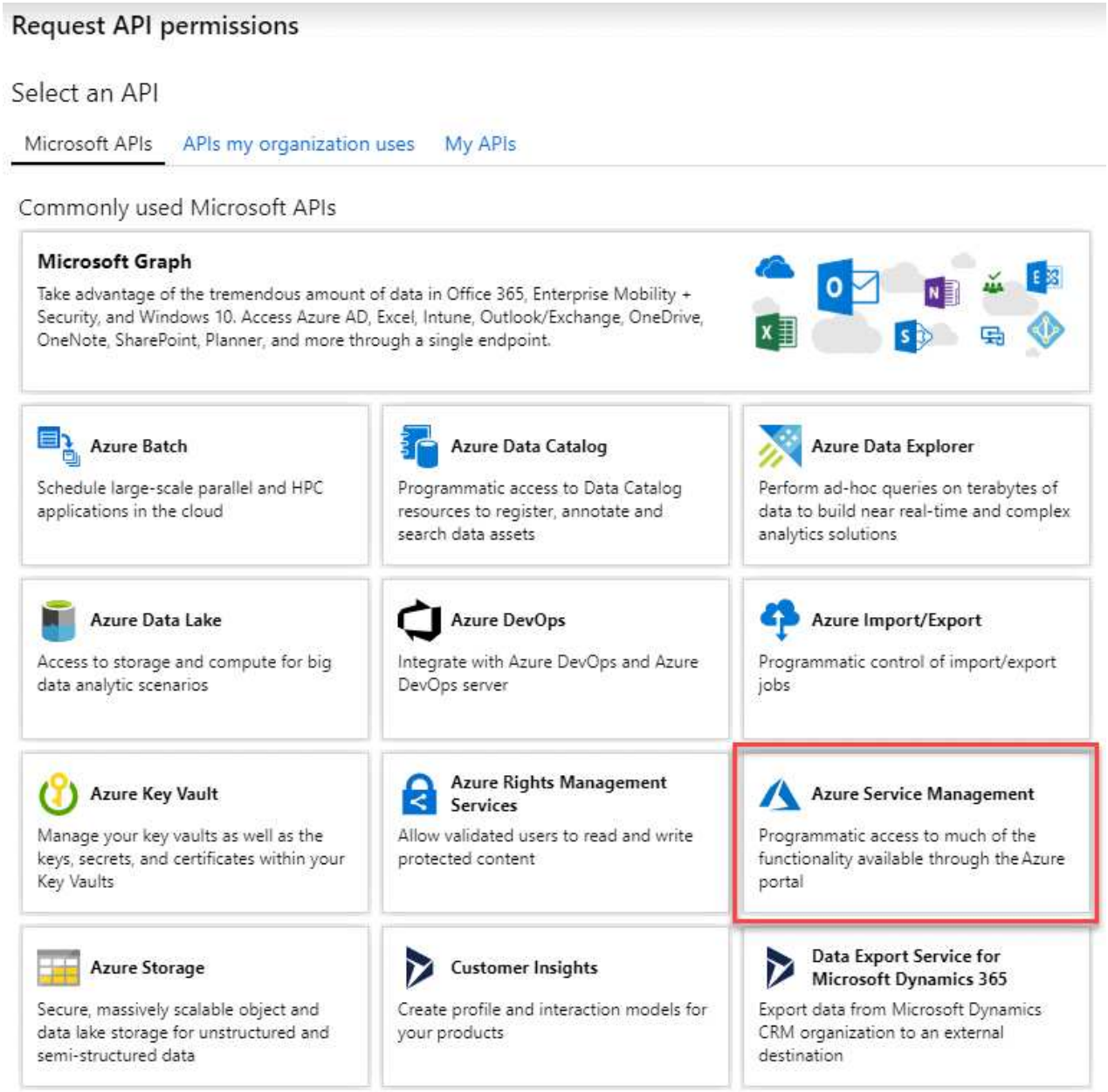
f. Select **Review + assign**.

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

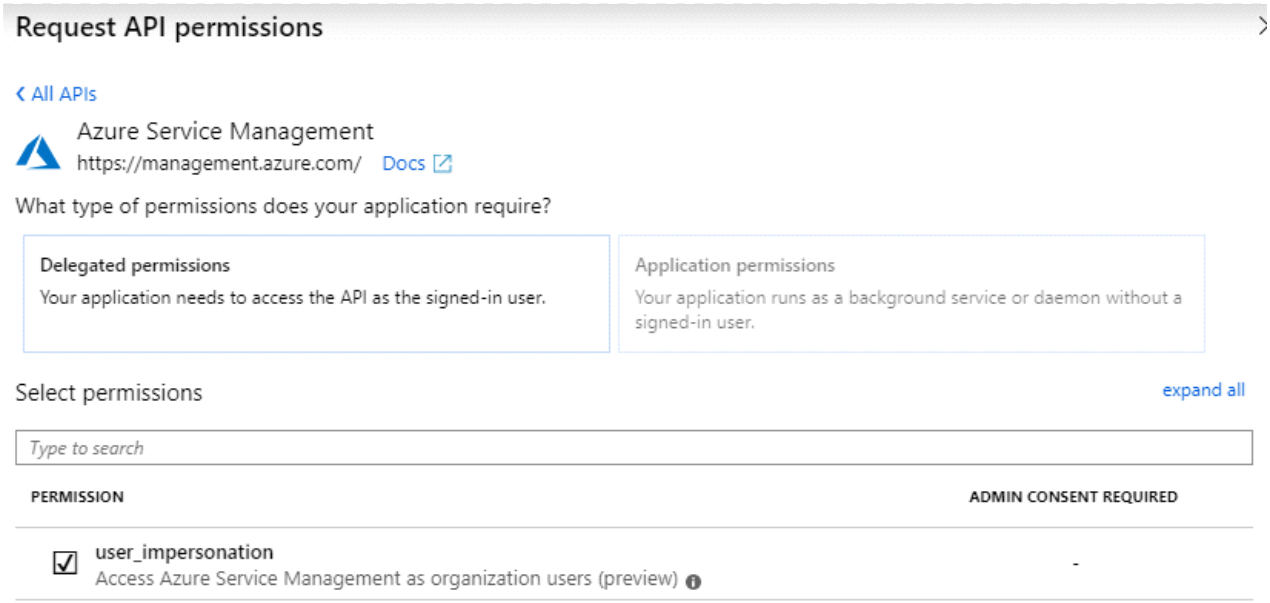
If you want to deploy Cloud Volumes ONTAP from multiple Azure subscriptions, then you must bind the service principal to each of those subscriptions. BlueXP enables you to select the subscription that you want to use when deploying Cloud Volumes ONTAP.

Add Windows Azure Service Management API permissions

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

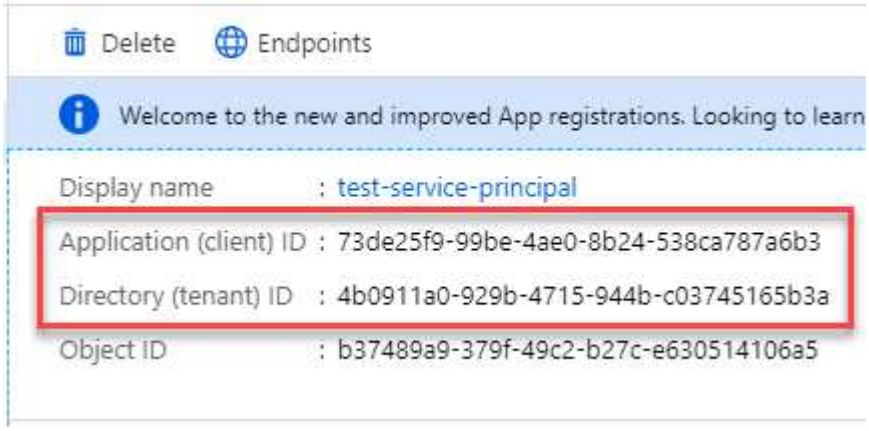


4. Select **Access Azure Service Management as organization users** and then select **Add permissions**.



Get the application ID and directory ID for the application

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



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

Create a client secret

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

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, select **Service Accounts > Create Service Account**.
   b. Enter service account details and select **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.

Step 6: 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
   - Cloud Key Management Service (KMS) API

     (Required only if you are planning to use BlueXP backup and recovery with customer-managed encryption keys (CMEK))

Deploy the Connector in restricted mode

Deploy the Connector in restricted mode so that you can use BlueXP with limited outbound connectivity to the BlueXP SaaS layer. To get started, install the Connector, set up BlueXP by accessing the user interface that's running on the Connector, and then provide the cloud permissions that you previously set up.

Step 1: 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

Before you begin

You should have the following:

- 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

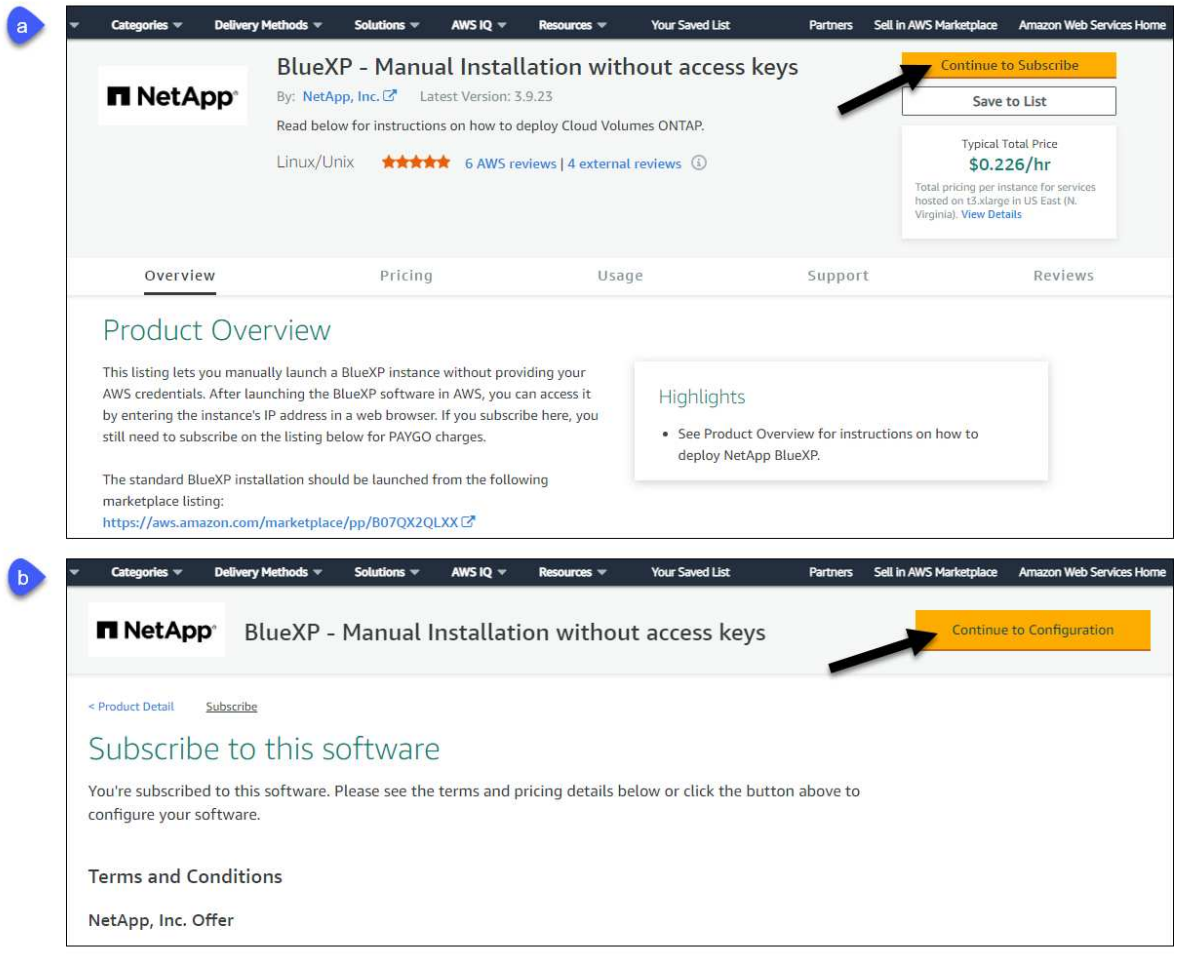
- Permissions to subscribe and unsubscribe from the AWS Marketplace for your IAM user.
- An understanding of CPU and RAM requirements for the instance.

  Review instance requirements.

- A key pair for the EC2 instance.

Steps

1. Go to the BlueXP page on the AWS Marketplace
2. On the Marketplace page, select **Continue to Subscribe** and then select **Continue to Configuration**.



3. Change any of the default options and select **Continue to Launch**.
4. Under **Choose Action**, select **Launch through EC2** and then select **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 an instance type that meets RAM and CPU requirements (t3.xlarge is recommended).
   - **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.

       A few more rule are required for specific configurations.

       View security group rules for AWS.
   - **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.
   - **Summary**: Review the summary and select **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

Before you begin

You should have the following:

- 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.

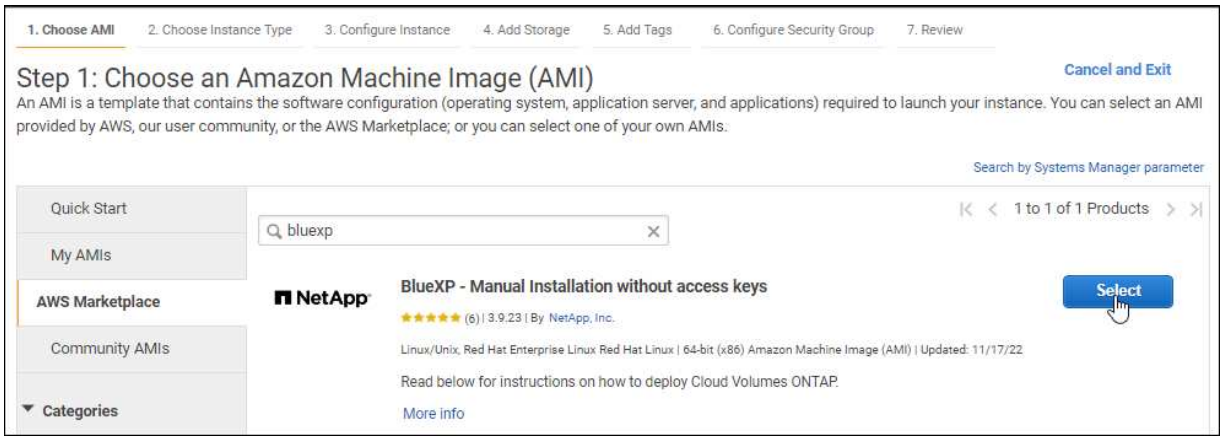
  Learn how to set up AWS permissions

- Permissions to subscribe and unsubscribe from the AWS Marketplace for your IAM user.

- A key pair for the EC2 instance.

Steps

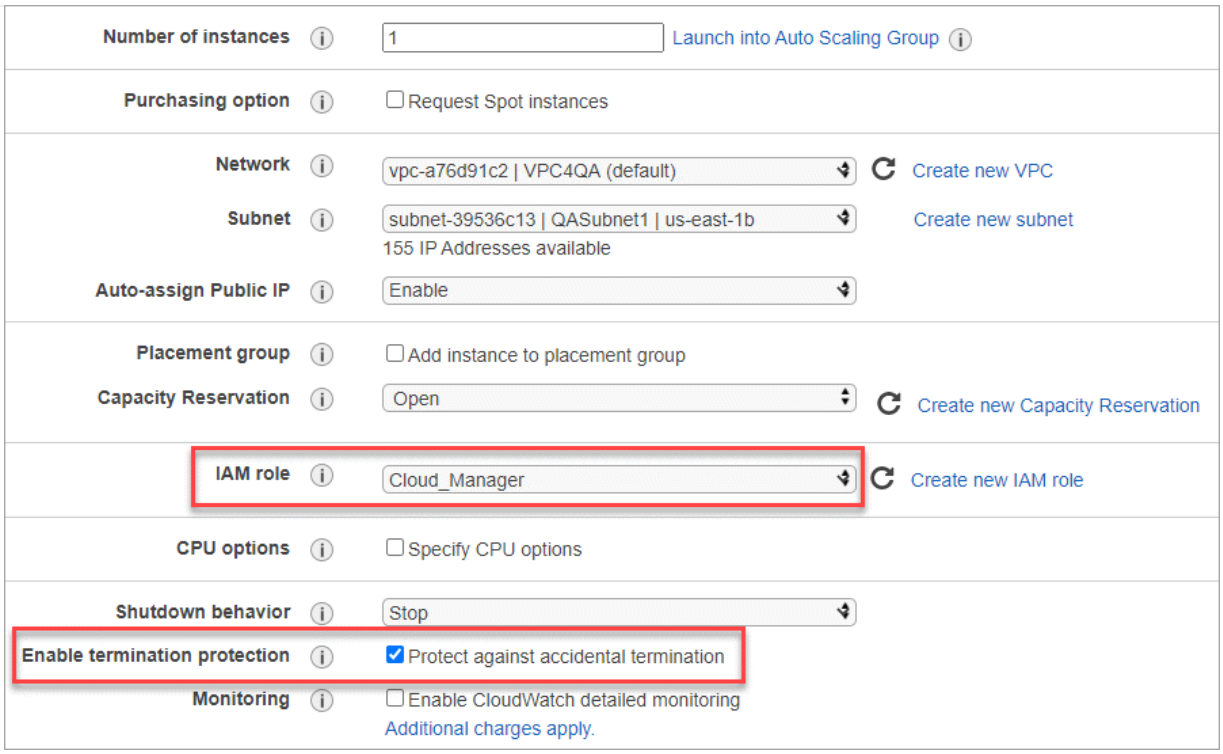
1. Go to the BlueXP offering in the AWS Marketplace.
   a. Open the EC2 service and select **Launch instance**.
   b. Select **AWS Marketplace**.
   c. Search for BlueXP and select the offering.



   d. Select **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.



- **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 select **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

Before you begin

You should have the following:

- 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

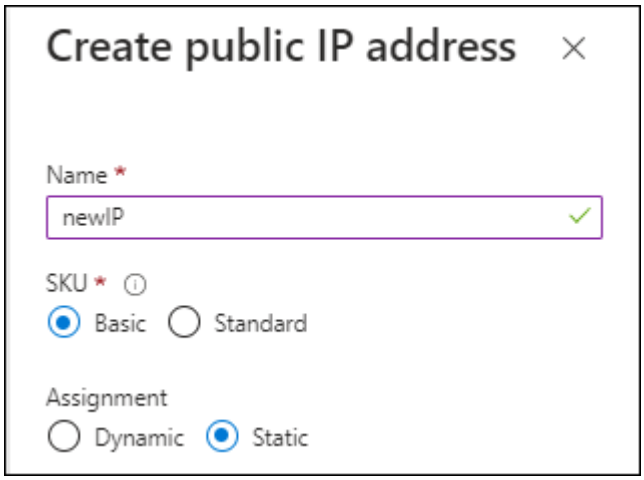
1. Go to the NetApp Connector VM page in the Azure Marketplace.
   - Azure Marketplace page for commercial regions

- Azure Marketplace page for Azure Government regions

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

   Note the following as you configure the VM:

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

     View security group rules for Azure.

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

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

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

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

Before you begin

You should have the following:

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

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

- A CA-signed certificate, if the proxy server uses HTTPS or if the proxy is an intercepting proxy.

About this task

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

Steps

1. Verify that docker is enabled and running.

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

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

   ```
   unset http_proxy
   unset https_proxy
   ```

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

3. Download the Connector software from the NetApp Support Site, and then copy it to the Linux host.

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

4. Assign permissions to run the script.

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

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

5. Run the installation script.

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

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

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

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

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

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

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

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

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.

Step 2: 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.

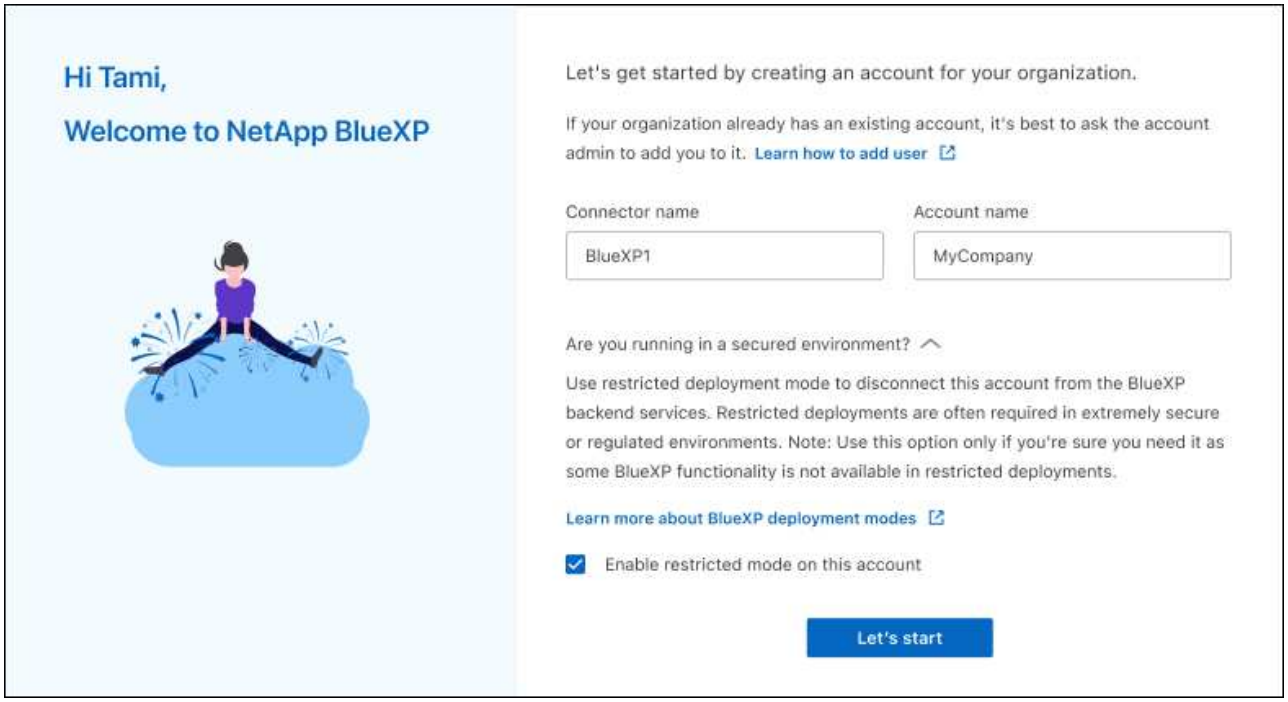
      You can select an existing account if your log in is already associated with a BlueXP account.

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.



e. Select **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.

Step 3: 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 select **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, select the Settings icon, and select **Credentials**.

2. Select **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 select **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. Select **Access control (IAM)** > **Add** > **Add role assignment**.
3. In the **Role** tab, select the **BlueXP Operator** role and select **Next**.

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

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

Result

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

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, select the Settings icon, and select **Credentials**.

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

Result

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

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 manage resources 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.

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. If you purchased a license from NetApp (BYOL), you also need to subscribe to the marketplace offering. Your license is always charged first, but you'll be charged at the hourly rate if you exceed your licensed capacity or if the license's term expires.

A marketplace subscription enables charging for the following BlueXP services with restricted mode:

- Backup and recovery
- Classification
- Cloud Volumes ONTAP

Before you begin

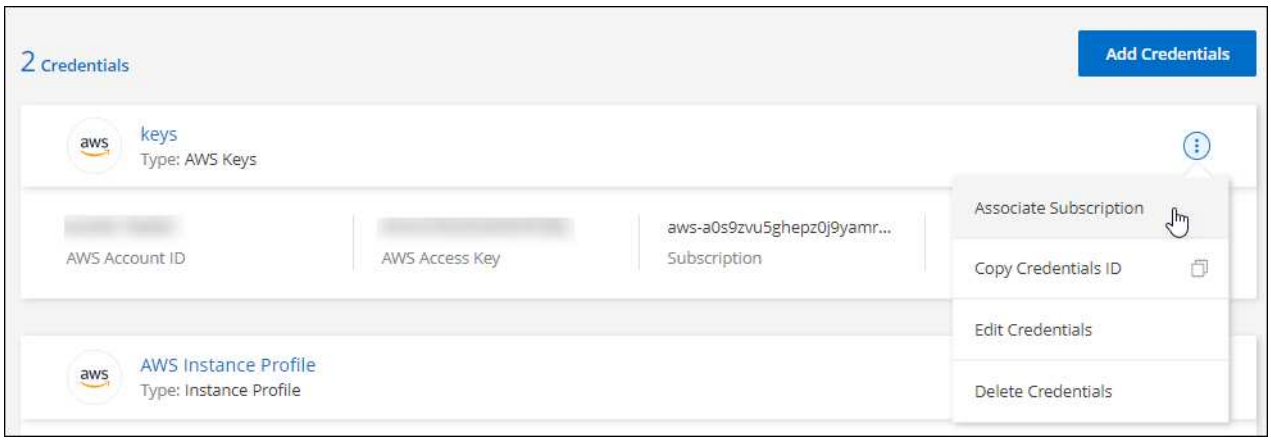
Subscribing to BlueXP involves associating a marketplace subscription with the cloud credentials that are associated with a Connector. If you followed the "Get started with restricted mode" workflow, then you should already have a Connector. To learn more, view the Quick start for BlueXP in restricted mode.

AWS

Steps

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

   You must select credentials that are associated with a Connector. You can't associate a marketplace subscription with credentials that are associated with BlueXP.



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

      - Select **Save**.

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

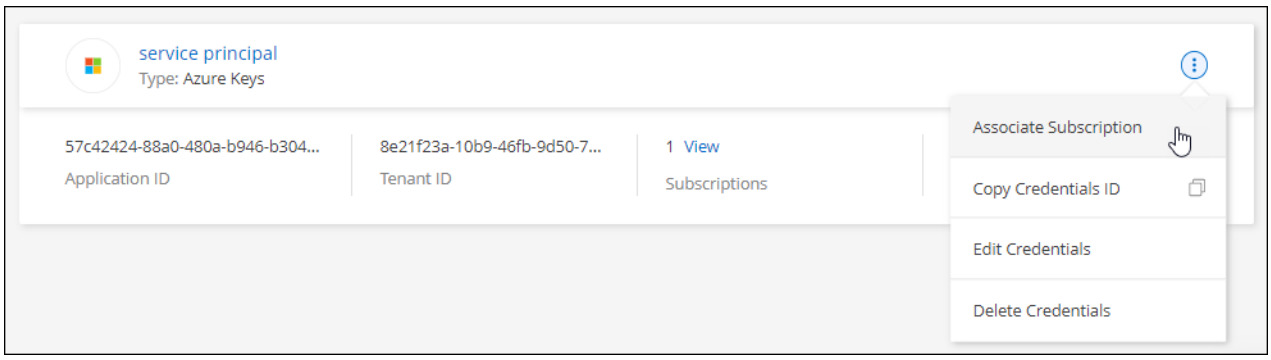
        Subscribe to BlueXP from the AWS Marketplace

Azure

Steps

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

   You must select credentials that are associated with a Connector. You can't associate a marketplace subscription with credentials that are associated with BlueXP.



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

      - Select **Save**.

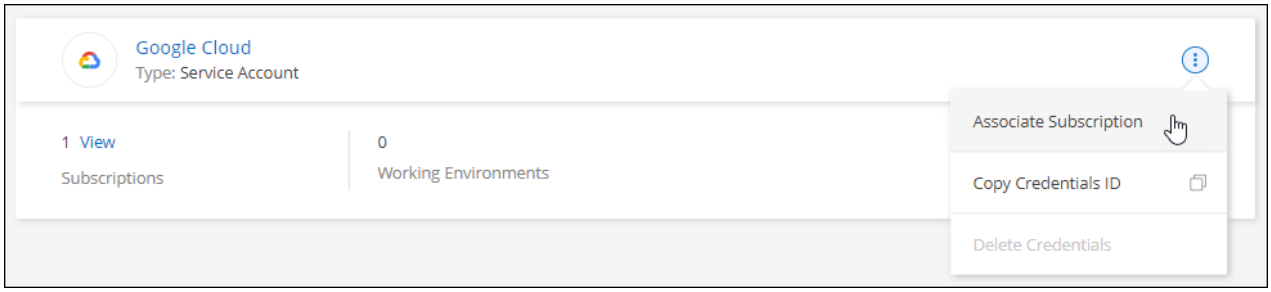
        The following video shows the steps to subscribe from the Azure Marketplace:

        Subscribe to BlueXP from the Azure Marketplace

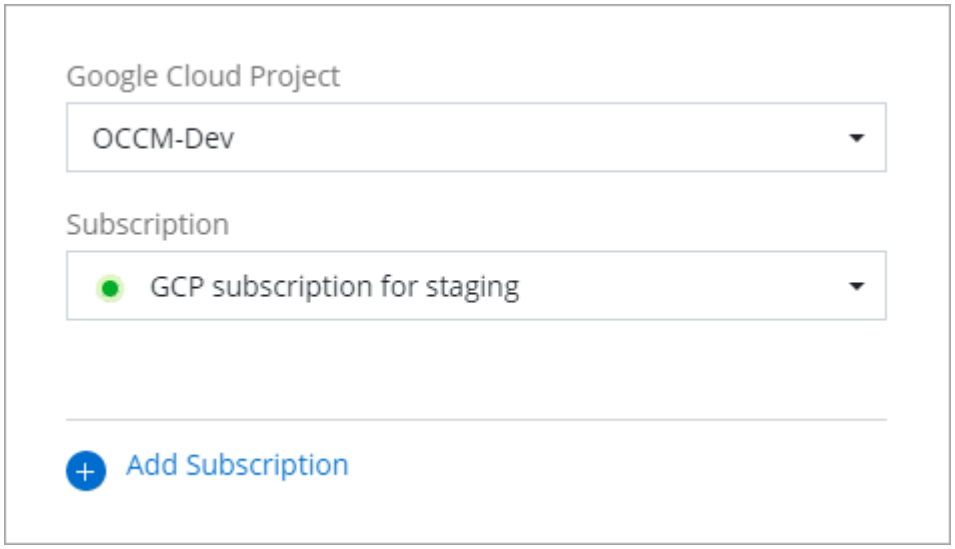
Google Cloud

Steps

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



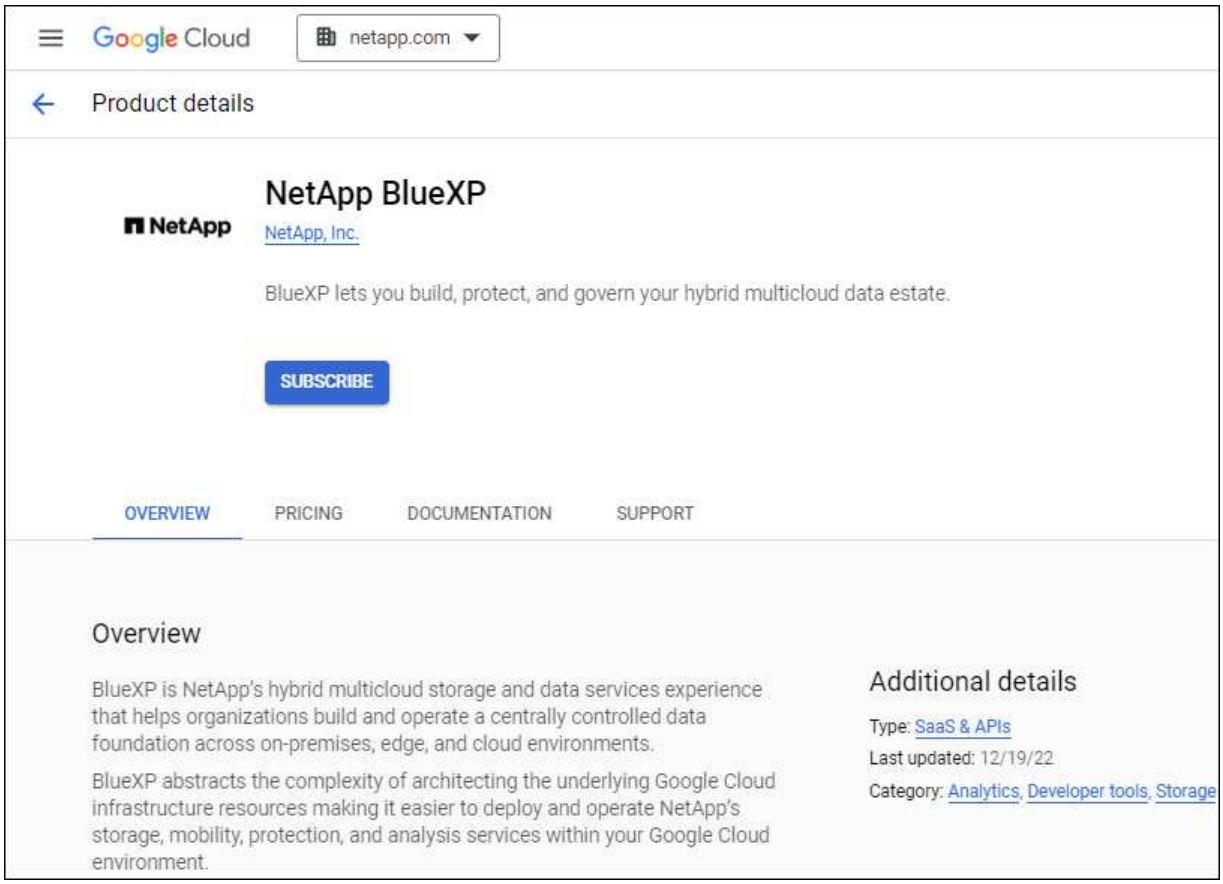
3. To associate the credentials with an existing subscription, select a Google Cloud project and subscription from the down-down list, and then select **Associate**.



4. If you don't already have a subscription, select **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.



b. Select **Subscribe**.

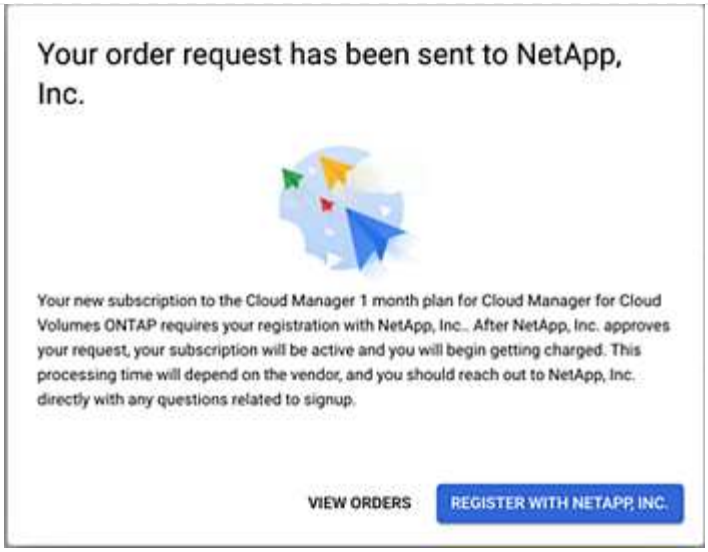
c. Select the appropriate billing account and agree to the terms and conditions.

d. Select **Subscribe**.

   This step sends your transfer request to NetApp.

e. On the pop-up dialog box, select **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.



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.

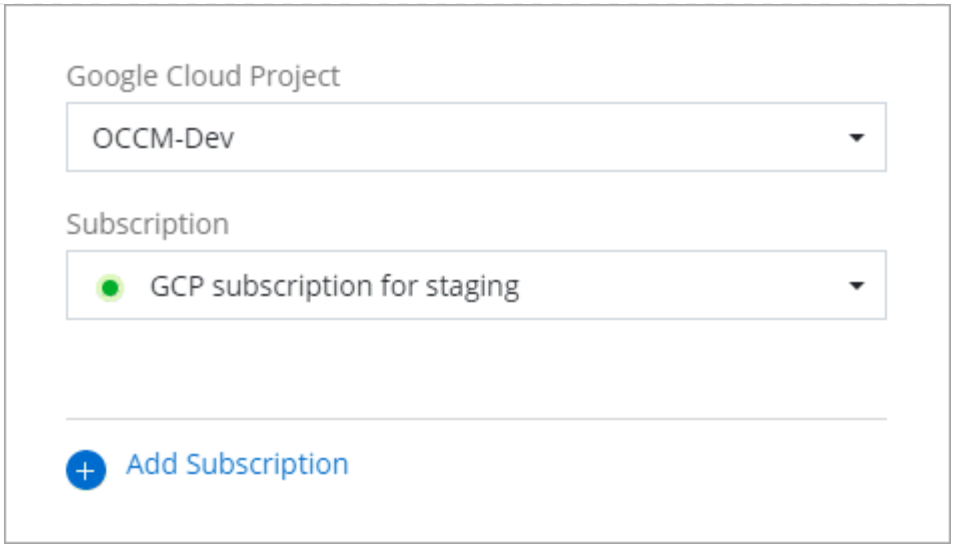
  For all other accounts, you'll need to manually associate the subscription by repeating these steps.

- Select **Save**.

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

  Subscribe to BlueXP from the Google Cloud Marketplace

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



Related links

- Manage BYOL capacity-based licenses for Cloud Volumes ONTAP
- Manage BYOL licenses for BlueXP data services
- Manage AWS credentials and subscriptions for BlueXP
- Manage Azure credentials and subscriptions for BlueXP
- Manage Google Cloud credentials and subscriptions for BlueXP

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
- Backup and recovery docs
- Classification docs
- Cloud Volumes ONTAP docs
- On-premises ONTAP cluster docs
- Replication docs

Related link

BlueXP deployment modes

Get started with private mode

Getting started workflow (private mode)

Get started with BlueXP in private mode by preparing your environment and deploying the Connector.

Before you get started, you should have an understanding of BlueXP accounts, Connectors, and deployment modes.

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.

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.

Prepare for deployment in private mode

Prepare your environment before you deploy BlueXP in private mode. For example, you need to review host requirements, prepare networking, set up permissions, and more.

If you want to use BlueXP in the AWS Secret Cloud or the AWS Top Secret Cloud, then you should follow separate instructions to get started in those environments. Learn how to get started with Cloud Volumes ONTAP in the AWS Secret Cloud or Top Secret Cloud

Step 1: 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.

Step 2: 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.

Step 3: Review host requirements

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

Dedicated host

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

Supported operating systems

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

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

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

Hypervisor

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

Red Hat Solution: Which hypervisors are certified to run Red Hat Enterprise Linux?

CPU

4 cores or 4 vCPUs

RAM

14 GB

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

Step 4: 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

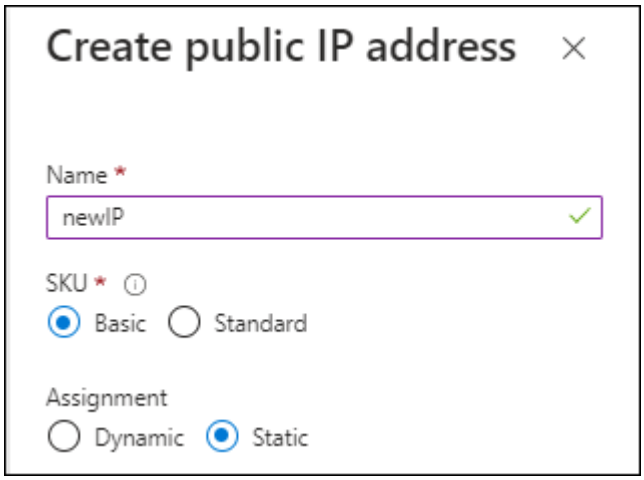
The Connector contacts the following endpoints to manage resources and processes within your public cloud environment.

Endpoints	Purpose
AWS services (amazonaws.com): • CloudFormation • Elastic Compute Cloud (EC2) • Identity and Access Management (IAM) • Key Management Service (KMS) • Security Token Service (STS) • Simple Storage Service (S3)	To manage resources in AWS. The exact endpoint depends on the AWS region that you're using. Refer to AWS documentation for details
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.

Endpoints	Purpose
https://www.googleapis.com/compute/v1/ https://compute.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.

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.



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

Proxy server

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

- IP address
- Credentials
- HTTPS certificate

  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.

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.

Step 5: 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. Select **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. Select **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. Log in to the AWS console and navigate to the IAM service.
2. Create a policy:
   a. Select **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.
3. Attach the policies to an IAM user.
   - AWS Documentation: Creating IAM Roles
   - AWS Documentation: Adding and Removing IAM Policies
4. Ensure that the user has an access key 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.

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

Steps

1. 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 that you want to use with BlueXP.

   Example

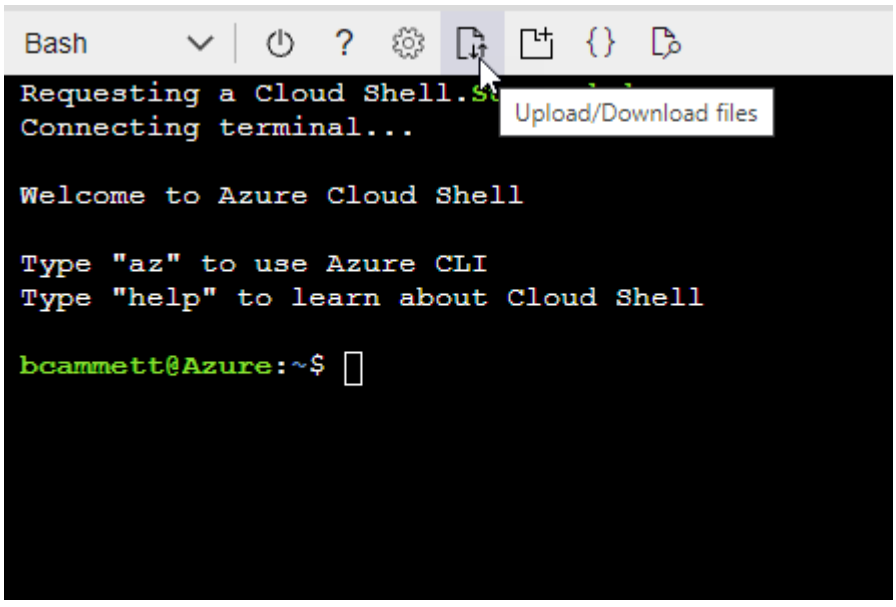
   ```
   "AssignableScopes": [
   "/subscriptions/d333af45-0d07-4154-943d-c25fbzzzzzzz",
   "/subscriptions/54b91999-b3e6-4599-908e-416e0zzzzzzz",
   "/subscriptions/398e471c-3b42-4ae7-9b59-ce5bbzzzzzzz"
   ```

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

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

   a. Start Azure Cloud Shell and choose the Bash environment.

   b. Upload the JSON file.



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

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

Result

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

Azure service principal

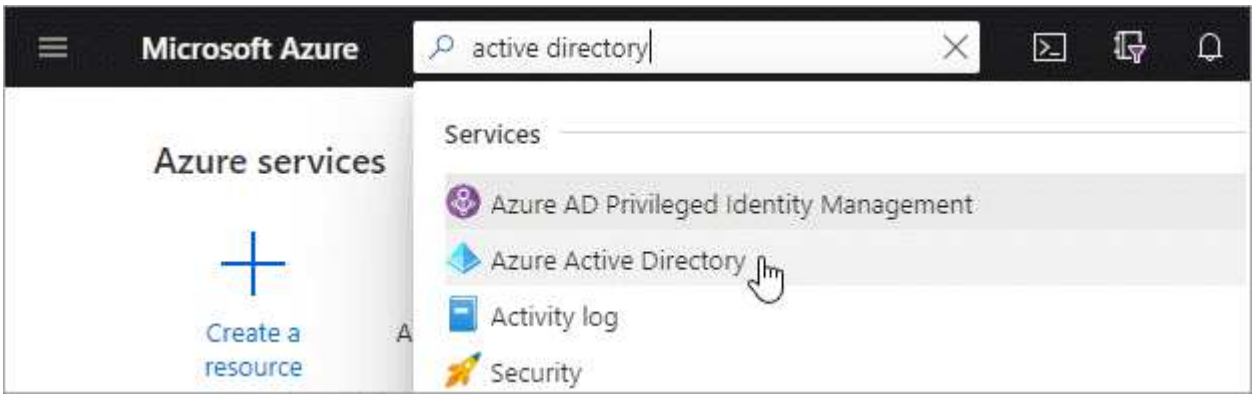
Create and set up a service principal in Azure Active Directory and obtain the Azure credentials that BlueXP needs. You'll need to provide BlueXP with these credentials after you install the Connector and set up BlueXP.

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

   You've created the AD application and service principal.

Assign the application to a role

1. Create a custom role:

   Note that you can create an Azure custom role using the Azure portal, Azure PowerShell, Azure CLI, or REST API. The following steps show how to create the role using the Azure CLI. If you would

prefer to use a different method, refer to Azure documentation

a. Copy the contents of the custom role permissions for the Connector and save them in a JSON file.

b. Modify the JSON file by adding Azure subscription IDs to the assignable scope.

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

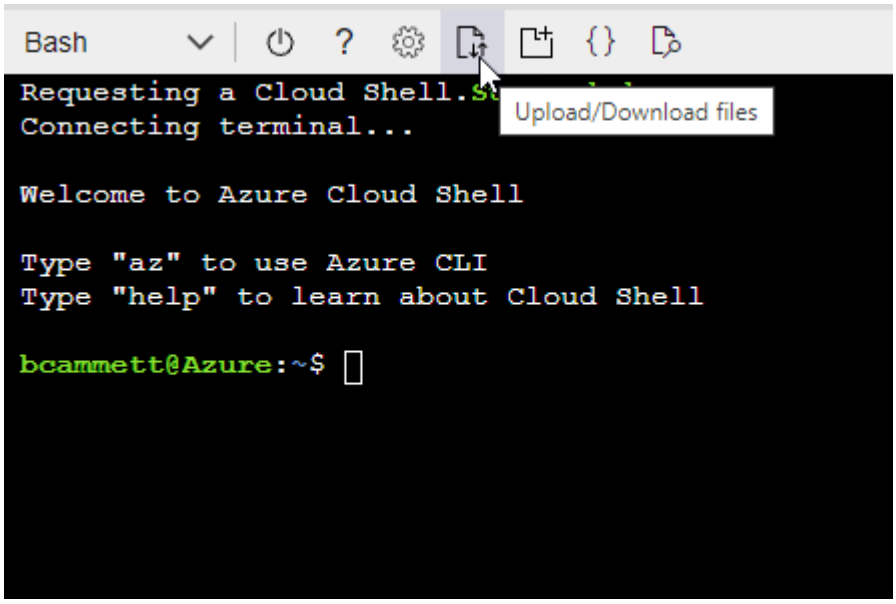
Example

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

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

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

- Start Azure Cloud Shell and choose the Bash environment.
- Upload the JSON file.



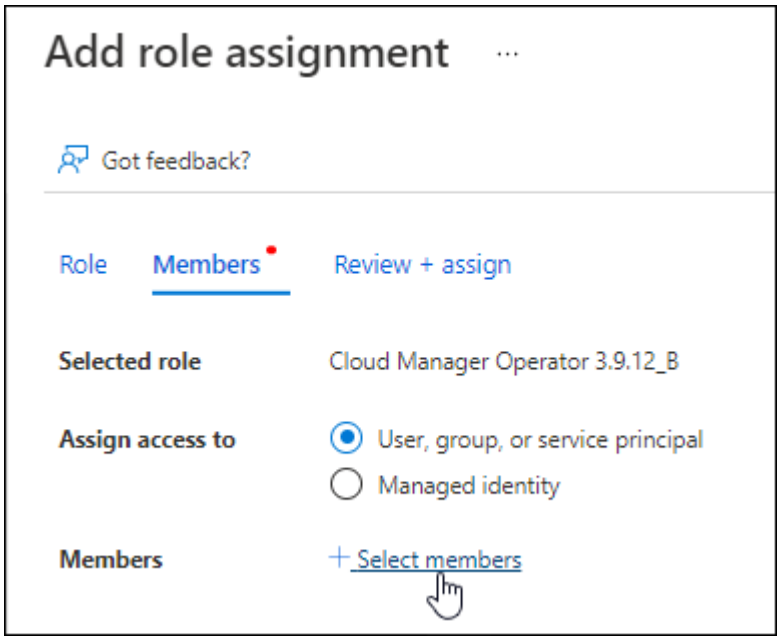
- Use the Azure CLI to create the custom role:

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

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

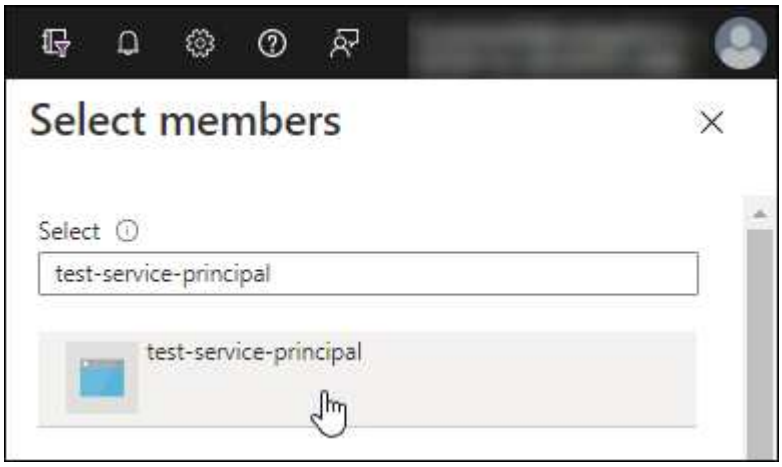
2. Assign the application to the role:

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



   - Search for the name of the application.

     Here's an example:



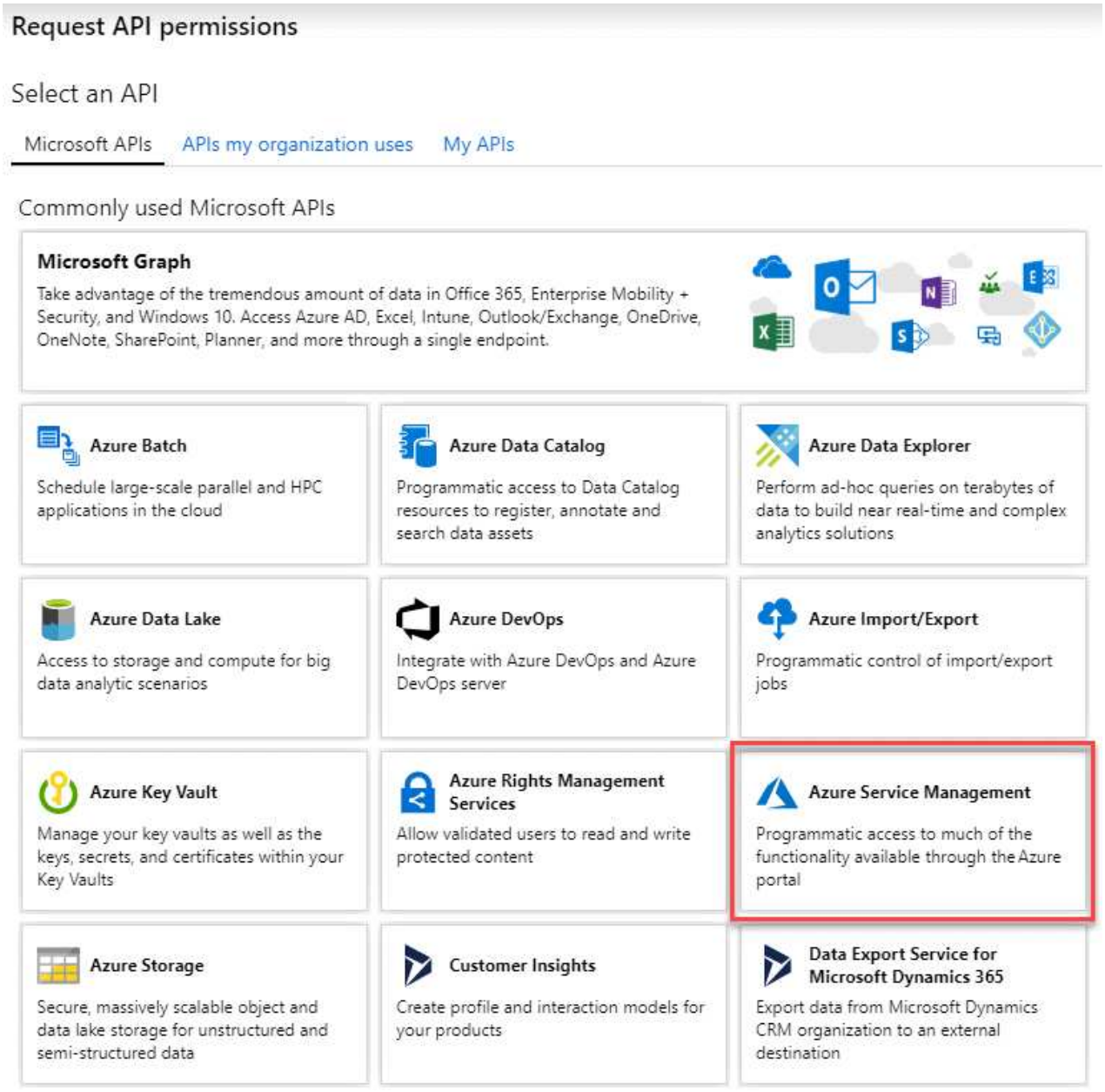
   - Select the application and select **Select**.
   - Select **Next**.
f. Select **Review + assign**.

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

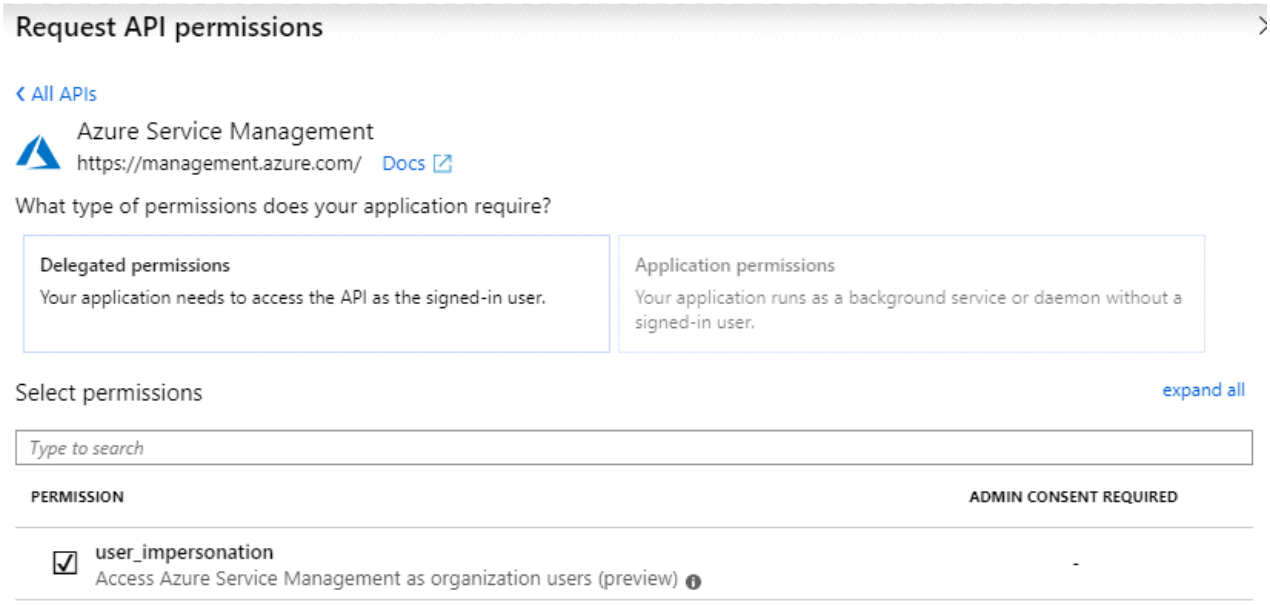
If you want to deploy Cloud Volumes ONTAP from multiple Azure subscriptions, then you must bind the service principal to each of those subscriptions. BlueXP enables you to select the subscription that you want to use when deploying Cloud Volumes ONTAP.

Add Windows Azure Service Management API permissions

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

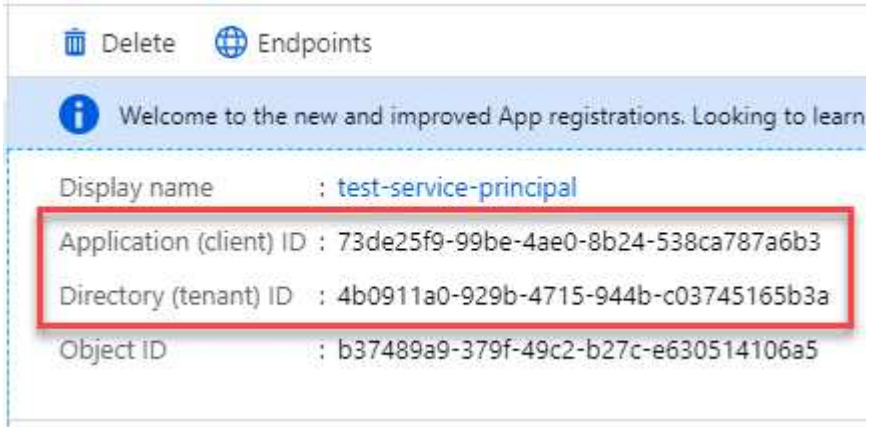


4. Select **Access Azure Service Management as organization users** and then select **Add permissions**.



Get the application ID and directory ID for the application

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



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

Create a client secret

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

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, select **Service Accounts > Create Service Account**.
   b. Enter service account details and select **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.

Step 6: 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
   - Cloud Key Management Service (KMS) API

     (Required only if you are planning to use BlueXP backup and recovery with customer-managed encryption keys (CMEK))

Deploy the Connector in private mode

Deploy the Connector in private mode so that you can use BlueXP with no outbound connectivity to the BlueXP SaaS layer. To get started, install the Connector, set up BlueXP by accessing the user interface that's running on the Connector, and then provide the cloud permissions that you previously set up.

Step 1: 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 Secret Cloud or the AWS Top Secret Cloud, then you should follow separate instructions to get started in those environments. Learn how to get started with Cloud Volumes ONTAP in the AWS Secret Cloud or Top Secret Cloud

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.

Step 2: Set up BlueXP

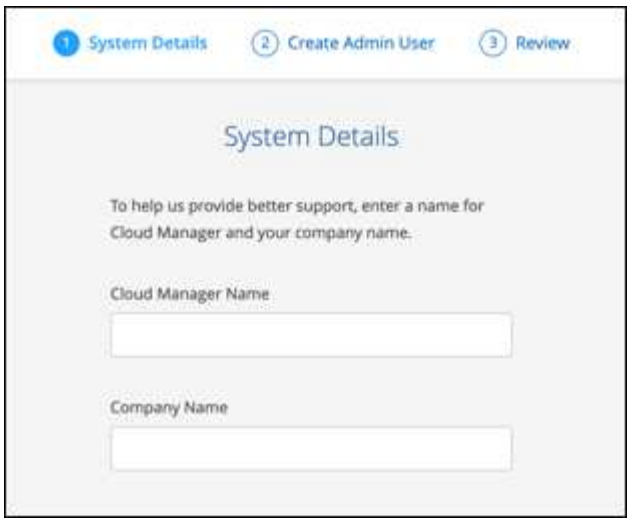
When you access the BlueXP console for the first time, you'll be prompted to set up BlueXP.

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. Select **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 select **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.

Step 3: 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 select **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, select the Settings icon, and select **Credentials**.

2. Select **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 select **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. Select **Access control (IAM)** > **Add** > **Add role assignment**.
3. In the **Role** tab, select the **BlueXP Operator** role and select **Next**.

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

4. In the **Members** tab, complete the following steps:

a. Assign access to a **Managed identity**.

b. Select **Select members**, select the subscription in which the Connector virtual machine was created, choose **Virtual machine**, and then select the Connector virtual machine.

c. Select **Select**.

d. Select **Next**.

e. Select **Review + assign**.

f. If you want to manage resources in additional Azure subscriptions, switch to that subscription and then repeat these steps.

Result

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

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, select the Settings icon, and select **Credentials**.

2. Select **Add Credentials** and follow the steps in the wizard.

a. **Credentials Location**: Select **Microsoft Azure > Connector**.

b. **Define Credentials**: Enter information about the Azure Active Directory service principal that grants the required permissions:

- Application (client) ID
- Directory (tenant) ID
- Client Secret

c. **Marketplace Subscription**: Associate a Marketplace subscription with these credentials by subscribing now or by selecting an existing subscription.

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

Result

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

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 manage resources 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.

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 BlueXP classification
- Back up on-prem ONTAP volume data to StorageGRID using BlueXP backup and recovery

Related link

BlueXP deployment modes

Log in to BlueXP

How you log in to BlueXP depends on the BlueXP deployment mode that you're using for your account.

Standard mode

After you sign up to BlueXP, you can log in from the web-based console to start managing your data and storage infrastructure.

About this task

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.

Restricted mode

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

About this task

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.

Private mode

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

About this task

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.

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