Console agents

NetApp Console setup and administration

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Console agents

Learn about NetApp Console agents

You use a Console agent to connect NetApp Console to your infrastructure and securely orchestrate storage solutions across AWS, Azure, Google Cloud, or on-premises environments, as well as use data protection services.

A Console agent enables you to:

- Orchestrate storage management tasks from the NetApp Console such as provisioning Cloud Volumes ONTAP, setting up storage volumes, using data classification, and more.
- Authenticate using your cloud provider’s IAM roles for subscription billing integration
- Use advanced data services (NetApp Backup and Recovery, NetApp Disaster Recovery, NetApp Ransomware Resilience, and NetApp Cloud Tiering)
- Use the Console in restricted mode.

If you don’t need advanced orchestration or data protection, you can centrally manage on-premises ONTAP clusters and cloud-native storage services without deploying an agent. Monitoring and data mobility tools are also available.

The following table shows which features and services you can use with and without a Console agent.

	Available with agent	Available without agent
Supported Storage systems:		
Amazon FSx for ONTAP	Yes (discovery and management features)	Yes (discovery only)
Amazon S3 storage	Yes	No
Azure Blob storage	Yes	Yes
Azure NetApp Files	Yes	Yes
Cloud Volumes ONTAP	Yes	No
E-Series systems	Yes	No
Google Cloud NetApp Volumes	Yes	Yes
Google Cloud storage buckets	Yes	No
StorageGRID systems	Yes	No

	Available with agent	**Available without agent**
On-premises ONTAP cluster (advanced management and discovery)	Yes (advanced management and discovery)	No (basic discovery only)
Available storage management services:		
Alerts	Yes	No
Automation hub	Yes	Yes
Digital Advisor (Active IQ)	Yes	No
License and subscription management	Yes	No
Economic efficiency	Yes	No
Home page dashboard metrics	Yes[2]	No
Lifecycle planning	Yes	No[1]
Sustainability	Yes	No
Software updates	Yes	Yes
NetApp Workloads	Yes	Yes
Available data services:		
NetApp Backup and Recovery	Yes	No
Data Classification	Yes	No
NetApp Cloud Tiering	Yes	No
NetApp Copy and Sync	Yes	No
NetApp Disaster Recovery	Yes	No
NetApp Ransomware Resilience	Yes	No
NetApp Volume Caching	Yes	No

[1] You can view Lifecycle planning without a Console agent, but a Console agent is required to initiate actions.

[2] Accurate metrics on the Home page require appropriately sized and configured Console agents.

Console agents must be operational at all times

Console agents are a fundamental part of the NetApp Console. It’s your responsibility (the customer) to ensure that relevant agents are up, operational, and accessible at all times. The Console can handle short agent outages, but you must fix infrastructure failures quickly.

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Supported locations

You can install agents in the following locations:

- Amazon Web Services
- Microsoft Azure

  Deploy a Console agent in Azure in the same region as the Cloud Volumes ONTAP systems it manages. Alternatively, deploy it in the Azure region pair. This 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

  To use the Console and data services with Google Cloud, deploy your agent in Google Cloud.

- On your premises

Communication with cloud providers

The agent uses TLS 1.3 for all communication to AWS, Azure, and Google Cloud.

Restricted mode

To use the Console in restricted mode, you install a Console agent and access the Console interface that’s running locally on the Console agent.

Learn about NetApp Console deployment modes.

How to install a Console agent

You can install a Console agent directly from the Console, from your cloud provider’s marketplace, or by manually installing the software on your own Linux host or in your VCenter environment.

- Learn about NetApp Console deployment modes
- Get started with NetApp Console in standard mode
- Get started with NetApp Console in restricted mode

Cloud provider permissions

You need specific permissions to create the Console agent directly from the NetApp Console and another set of permissions for the Console agent itself. If you create the Console agent in AWS or Azure directly from the Console, then the Console creates the Console agent with the permissions that it needs.

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

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

- Standard mode
  - Agent installation options in AWS
  - Agent installation options in Azure
  - Agent installation options in Google Cloud
  - Set up cloud permissions for on-premises deployments
- Set up permissions for restricted mode

To view the exact permissions that the Console agent needs for day-to-day operations, refer to the following pages:

- Learn how the Console agent uses AWS permissions
- Learn how the Console agent uses Azure permissions
- Learn how the Console agent uses Google Cloud permissions

It’s your responsibility to update the Console agent policies as new permissions are added in subsequent releases. The release notes list new permissions.

Agent upgrades

NetApp updates agent software monthly to add features and improve stability. Some Console features, like Cloud Volumes ONTAP and on-premises ONTAP cluster management, rely on the Console agent version and settings.

When you install your agent in the cloud, the Console agent updates automatically if it has internet access.

Operating system and VM maintenance

Maintaining the operating system on the Console agent host is your (customer’s) responsibility. For example, you (customer) should apply security updates to the operating system on the Console agent host by following your company’s standard procedures for operating system distribution.

Note that you (customer) don’t need to stop any services on the Console gent host when applying minor security updates.

If you (customer) need to stop and then start the Console agent VM, you should do so from your cloud provider’s console or by using the standard procedures for on-premises management.

The Console agent must be operational at all times.

Multiple systems and agents

An agent can manage multiple systems and support data services in the Console. You can use a single agent to manage multiple systems based on deployment size and the data services you use.

For large-scale deployments, work with your NetApp representative to size your environment. Contact NetApp Support if you experience issues.

Here are a few examples of agent deployments:

- You have a multicloud environment (for example, AWS and Azure) and you prefer to have one agent in AWS and another in Azure. Each manages the Cloud Volumes ONTAP systems running in those environments.
- A service provider might use one Console organization to provide services for their customers, while using another organization to provide disaster recovery for one of their business units. Each organization needs its own agent.

Deploy a Console agent

AWS

Console agent installation options in AWS

There are a few different ways to create a Console agent in AWS. Directly from the NetApp Console is the most common way.

The following installation options are available:

- Create the Console agent directly from the Console (this is the standard option)

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

- Create a Console agent from the AWS Marketplace

  This action also launches an EC2 instance running Linux and the Console agent software, but the deployment is initiated directly from the AWS Marketplace, rather than from the Console.

- 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 the Console with the required permissions that it needs to authenticate and manage resources in AWS.

Create a Console agent in AWS from NetApp Console

You can create a Console agent in AWS directly from the NetApp Console. Before creating a Console agent in AWS from the Console, you need to set up your networking and prepare AWS permissions.

Before you begin

- You should have an understanding of Console agents.
- You should review Console agent limitations.

Step 1: Set up networking for deploying a Console agent in AWS

Ensure that the network location where you plan to install the Console agent supports the following requirements. These requirements enable the Console agent to manage resources and processes in your hybrid cloud.

VPC and subnet

When you create the Console agent, you need to specify the VPC and subnet where it should reside.

Connections to target networks

The Console agent requires a network connection to the location where you're planning to create and manage systems. 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 Console agent must have an outbound internet connection to contact specific endpoints.

Endpoints contacted from the Console agent

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

The endpoints listed below are all CNAME entries.

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 AWS resources. The endpoint depends on your AWS region. Refer to AWS documentation for details
Amazon FsX for NetApp ONTAP: • api.workloads.netapp.com	The web-based console contacts this endpoint to interact with the Workload Factory APIs to manage and operate FSx for ONTAP based workloads.
https://mysupport.netapp.com	To obtain licensing information and to send AutoSupport messages to NetApp support.
https://signin.b2c.netapp.com	To update NetApp Support Site (NSS) credentials or to add new NSS credentials to the NetApp Console.
https://support.netapp.com	To obtain licensing information and to send AutoSupport messages to NetApp support as well as to receive software updates for Cloud Volumes ONTAP.

Endpoints	Purpose
https://api.bluexp.netapp.com https://netapp-cloud-account.auth0.com https://netapp-cloud-account.us.auth0.com https://console.netapp.com https://components.console.bluexp.netapp.com https://cdn.auth0.com	To provide features and services within the NetApp Console.
https://bluexpinfraprod.eastus2.data.azurecr.io https://bluexpinfraprod.azurecr.io	To obtain images for Console agent upgrades. • When you deploy a new agent, the validation check tests connectivity to current endpoints. If you use previous endpoints, the validation check fails. To avoid this failure, skip the validation check. Although the previous endpoints are still supported, NetApp recommends updating your firewall rules to the current endpoints as soon as possible. Learn how to update your endpoint list. • When you update to the current endpoints in your firewall, your existing agents will continue to work.

Endpoints contacted from the NetApp console

As you use the web-based NetApp 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 Console agent from the the Console.

View the list of endpoints contacted from the NetApp console.

Proxy server

NetApp supports both explicit and transparent proxy configurations. If you are using a transparent proxy, you only need to provide the certificate for the proxy server. If you are using an explicit proxy, you'll also need the IP address and credentials.

- IP address
- Credentials
- HTTPS certificate

Ports

There's no incoming traffic to the Console agent, unless you initiate it or if it 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, the Console automatically configures those systems to use a proxy server that's included with the Console agent. The only requirement is to ensure that the Console agent's security group allows inbound connections over port 3128. You'll need to open this port after you deploy the Console agent.

Enable NTP

If you're planning to use NetApp Data Classification to scan your corporate data sources, you should enable a Network Time Protocol (NTP) service on both the Console agent and the NetApp Data Classification system so that the time is synchronized between the systems. Learn more about NetApp Data classification

You'll need to implement this networking requirement after you create the Console agent.

Step 2: Set up AWS permissions for the Console agent

The Console needs to authenticate with AWS before it can deploy the Console agent in your VPC. You can choose one of these authentication methods:

- Let the Console 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 Console agent in AWS from the Console.

If needed, you can restrict the IAM policy by using the IAM `Condition` element. AWS documentation: Condition element

Steps

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

   This policy contains only the permissions needed to launch the Console agent in AWS from the Console. When the Console creates the Console agent, it applies a new set of permissions to the Console agent that enables the Console agent to manage AWS resources. View permissions required for the Console agent 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",
        "iam:ListRoles",
        "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",
        "ec2:DescribeAvailabilityZones",
        "ec2:DescribeLaunchTemplates",
        "ec2:CreateLaunchTemplate",
        "cloudformation:CreateStack",
        "cloudformation:DeleteStack",
        "cloudformation:DescribeStacks",
        "cloudformation:DescribeStackEvents",
        "cloudformation:ValidateTemplate",
        "ec2:AssociateIamInstanceProfile",
        "ec2:DescribeIamInstanceProfileAssociations",
        "ec2:DisassociateIamInstanceProfile",
        "iam:GetRole",
        "iam:TagRole",
        "kms:ListAliases",
        "cloudformation:ListStacks"
      ],
      "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 the Console can assume or to an IAM user so that you can provide the Console with access keys:
   - (Option 1) Set up an IAM role that the Console 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 Console 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 the Console when you create the Console agent.
   - (Option 2) Set up permissions for an IAM user so that you can provide the Console 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 Console agent from the Console, you can provide information about the role or access keys.

Step 3: Create the Console agent

Create the Console agent directly from the the Console web-based console.

About this task

- Creating the Console agent from the Console deploys an EC2 instance in AWS using a default configuration. Do not switch to a smaller EC2 instance with fewer CPUs or less RAM after creating the Console agent. Learn about the default configuration for the Console agent.
- When the Console creates the Console agent, it creates an IAM role and a profile for the agent. This role includes permissions that enables the Console agent to manage AWS resources. Ensure the role is updated as new permissions are added in future releases.
  Learn more about the IAM policy for the Console agent.

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 Console agent.
- Set up networking requirements.
- Set up AWS permissions.

Steps

1. Select **Administration > Agents**.
2. On the **Overview** page, select **Deploy agent > AWS**
3. Follow the steps in the wizard to create the Console agent:
4. On the **Introduction** page provides an overview of the process
5. On the **AWS Credentials** page, specify your AWS region and then choose an authentication method, which is either an IAM role that the Console 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 Console agent 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.

6. On the **Details** page, provide details about the Console agent.
   - Enter a name.
   - Add custom tags (metadata).
   - Choose whether you want the Console 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 Console agent’s EBS disks. You have the option to use the default encryption key or to use a custom key.
7. On the **Network** page, Specify a VPC, subnet, and key pair for the agent, choose whether to enable a public IP address, and optionally specify a proxy configuration.

Ensure you have the correct key pair to access the Console agent virtual machine. Without a key pair, you cannot access it.

8. On the **Security Group** page, 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.

9. Review your selections to verify that your set up is correct.

   a. The **Validate agent configuration** check box is marked by default to have the Console validate the network connectivity requirements when you deploy. If the Console fails to deploy the agent, it provides a report to help you troubleshoot. If the deployment succeeds, no report is provided.

   > If you are still using the previous endpoints used for agent upgrades, the validation fails with an error. To avoid this, unmark the check box to skip the validation check.

10. Select **Add**.

    The Console deploys the agent in about 10 minutes. Stay on the page until the process completes.

Result

After the process is complete, the Console agent is available for use from the Console.

> ⓘ If the deployment fails, you can download a report and logs from the Console to help you fix the issues. Learn how to troubleshoot installation issues.

If you have Amazon S3 buckets in the same AWS account where you created the Console agent, you'll see an Amazon S3 working environment appear on the **Systems** page automatically. Learn how to manage S3 buckets from NetApp Console

Create a Console agent from the AWS Marketplace

You create a Console agent in AWS directly from the AWS Marketplace. To create a Console agent from the AWS Marketplace, you need to set up your networking, prepare AWS permissions, review instance requirements, and then create the Console agent.

Before you begin

- You should have an understanding of Console agents.
- You should review Console agent limitations.

Step 1: Set up networking

Ensure the network location for the Console agent meets the following requirements to manage hybrid cloud resources.

VPC and subnet

When you create the Console agent, you need to specify the VPC and subnet where it should reside.

Connections to target networks

The Console agent requires a network connection to the location where you’re planning to create and manage systems. 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 Console agent must have an outbound internet connection to contact specific endpoints.

Endpoints contacted from the Console agent

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

The endpoints listed below are all CNAME entries.

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 AWS resources. The endpoint depends on your AWS region. Refer to AWS documentation for details
Amazon FsX for NetApp ONTAP: • api.workloads.netapp.com	The web-based console contacts this endpoint to interact with the Workload Factory APIs to manage and operate FSx for ONTAP based workloads.
https://mysupport.netapp.com	To obtain licensing information and to send AutoSupport messages to NetApp support.
https://signin.b2c.netapp.com	To update NetApp Support Site (NSS) credentials or to add new NSS credentials to the NetApp Console.
https://support.netapp.com	To obtain licensing information and to send AutoSupport messages to NetApp support as well as to receive software updates for Cloud Volumes ONTAP.
https://api.bluexp.netapp.com https://netapp-cloud-account.auth0.com https://netapp-cloud-account.us.auth0.com https://console.netapp.com https://components.console.bluexp.netapp.com https://cdn.auth0.com	To provide features and services within the NetApp Console.

Endpoints	Purpose
https://bluexpinfraprod.eastus2.data.azurecr.io https://bluexpinfraprod.azurecr.io	To obtain images for Console agent upgrades. • When you deploy a new agent, the validation check tests connectivity to current endpoints. If you use previous endpoints, the validation check fails. To avoid this failure, skip the validation check. Although the previous endpoints are still supported, NetApp recommends updating your firewall rules to the current endpoints as soon as possible. Learn how to update your endpoint list. • When you update to the current endpoints in your firewall, your existing agents will continue to work.

Proxy server

NetApp supports both explicit and transparent proxy configurations. If you are using a transparent proxy, you only need to provide the certificate for the proxy server. If you are using an explicit proxy, you'll also need the IP address and credentials.

- IP address
- Credentials
- HTTPS certificate

Ports

There's no incoming traffic to the Console agent, unless you initiate it or if it 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, the Console automatically configures those systems to use a proxy server that's included with the Console agent. The only requirement is to ensure that the Console agent's security group allows inbound connections over port 3128. You'll need to open this port after you deploy the Console agent.

Enable NTP

If you're planning to use NetApp Data Classification to scan your corporate data sources, you should enable a Network Time Protocol (NTP) service on both the Console agent and the NetApp Data Classification system so that the time is synchronized between the systems. Learn more about NetApp Data classification

Implement this network access after you create the Console agent.

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 Console agent from the AWS Marketplace, you are 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 Console agent.
   c. Finish the remaining steps to create the policy.

      You may need to create a second policy based on the NetApp data services you plan to use. 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 Console agent.
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 Console agent, you need to choose an EC2 instance type that meets the following requirements.

CPU

8 cores or 8 vCPUs

RAM

32 GB

AWS EC2 instance type

An instance type that meets CPU and RAM requirements. NetApp recommends t3.2xlarge.

Step 4: Create the Console agent

Create the Console agent directly from the AWS Marketplace.

About this task

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

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 Console agent.
- 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 NetApp Console agent listing on the AWS Marketplace
2. On the Marketplace page, select **Continue to Subscribe**.
3. To subscribe to the software, select **Accept Terms**.

   The subscription process can take a few minutes.

4. After the subscription process is complete, select **Continue to Configuration**.
5. On the **Configure this software** page, ensure that you've selected the correct region and then select **Continue to Launch**.
6. On the **Launch this software** page, under **Choose Action**, select **Launch through EC2** and then select **Launch**.

   Use the EC2 Console to launch the instance and attach an IAM role. This is not possible with the **Launch from Website** action.

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

   - **Name and tags**: Enter a name and tags for the instance.
   - **Application and OS Images**: Skip this section. The Console agent AMI is already selected.
   - **Instance type**: Depending on region availability, choose an instance type that meets RAM and CPU requirements (t3.2xlarge is preselected and 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 security group settings that enable the required connection methods for the Console agent instance: SSH, HTTP, and HTTPS.

       View security group rules for AWS.

   - **Configure storage**: Keep the default size and disk type for the root volume.

     If you want to enable Amazon EBS encryption on the root volume, select **Advanced**, expand **Volume 1**, select **Encrypted**, and then choose a KMS key.

   - **Advanced details**: Under **IAM instance profile**, choose the IAM role that includes the required permissions for the Console agent.
   - **Summary**: Review the summary and select **Launch instance**.

AWS launches the Console agent with the specified settings, and the Console agent runs in about ten minutes.

> ⓘ If the installation fails, you can view logs and a report to help you troubleshoot. Learn how to troubleshoot installation issues.

8. Open a web browser from a host that has a connection to the Console agent virtual machine and URL of the Console agent.
9. After you log in, set up the Console agent:
   a. Specify the Console organization to associate with the Console agent.
   b. Enter a name for the system.
   c. Under **Are you running in a secured environment?** keep restricted mode disabled.

      Keep restricted mode disabled to use the Console in standard mode. You should enable restricted mode only if you have a secure environment and want to disconnect this account from the Console backend services. If that’s the case, follow steps to get started with NetApp Console in restricted mode.

   d. Select **Let’s start**.

Result

The Console agent is now installed and set up with your Console organization.

Open a web browser and go to the NetApp Console to start using the Console agent with the Console.

If you have Amazon S3 buckets in the same AWS account where you created the Console agent, you’ll see an Amazon S3 working environment appear on the **Systems** page automatically. Learn how to manage S3 buckets from NetApp Console

Manually install the Console agent in AWS

You can manually install a Console agent on a Linux host running in AWS. To manually install the Console agent on your own Linux host, you need to review host requirements, set up your networking, prepare AWS permissions, install the Console agent, and then provide the permissions that you prepared.

Before you begin

- You should have an understanding of Console agents.
- You should review Console agent limitations.

Step 1: Review host requirements

Ensure the host running the Console agent software meets operating system, RAM, and port requirements.

> ⓘ The Console agent reserves the UID and GID range of 19000 to 19200. This range is fixed and cannot be modified. If any third-party software on your host is using UIDs or GIDs within this range, the agent installation will fail. NetApp recommends using a host that is free of third-party software to avoid conflicts.

Dedicated host

The Console agent requires a dedicated host. Any architecture is supported if it meets these size requirements:

- CPU: 8 cores or 8 vCPUs
- RAM: 32 GB
- Disk space: 165 GB is recommended for the host, with the following partition requirements:
    - `/opt`: 120 GiB of space must be available

      The agent uses `/opt` to install the `/opt/application/netapp` directory and its contents.
    - `/var`: 40 GiB of space must be available

      The Console agent requires this space in `/var` because Podman or Docker are architected to create the containers within this directory. Specifically, they will create containers in the `/var/lib/containers/storage` directory and `/var/lib/docker` for Docker. External mounts or symlinks do not work for this space.

AWS EC2 instance type

An instance type that meets CPU and RAM requirements. NetApp recommends t3.2xlarge.

Hypervisor

A bare metal or hosted hypervisor that is certified to run a supported operating system is required.

Operating system and container requirements

The Console agent is supported with the following operating systems when using the Console in standard mode or restricted mode. A container orchestration tool is required before you install the agent.

Operating system	Supported OS versions	Supported agent versions	Required container tool	SELinux
Red Hat Enterprise Linux				

Operating system	Supported OS versions	Supported agent versions	Required container tool	SELinux
	9.6 - English language versions only. - 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 agent installation.	4.0.0 or later with the Console in standard mode or restricted mode	Podman version 5.4.0 with podman-compose 1.5.0. View Podman configuration requirements.	Supported in enforcing mode or permissive mode
	9.1 to 9.4 - English language versions only. - 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 agent installation.	3.9.50 or later with the Console in standard mode or restricted mode	Podman version 4.9.4 with podman-compose 1.5.0. View Podman configuration requirements.	Supported in enforcing mode or permissive mode

Operating system	Supported OS versions	Supported agent versions	Required container tool	SELinux
	8.6 to 8.10 - English language versions only. - 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 agent installation.	3.9.50 or later with the Console in standard mode or restricted mode	Podman version 4.6.1 or 4.9.4 with podman-compose 1.0.6. View Podman configuration requirements.	Supported in enforcing mode or permissive mode
Ubuntu				
	24.04 LTS	3.9.45 or later with the NetApp Console in standard mode or restricted mode	Docker Engine 23.06 to 28.0.0.	Not supported
	22.04 LTS	3.9.50 or later	Docker Engine 23.0.6 to 28.0.0.	Not supported

Key pair

When you create the Console agent, you'll need to select an EC2 key pair to use with the instance.

PUT response hop limit when using IMDSv2

If IMDSv2 is enabled (the default for new EC2 instances), set the PUT response hop limit to 3. If you do not, the system displays a UI initialization error during agent setup.

- Require the use of IMDSv2 on Amazon EC2 instances
- AWS documentation: Change the PUT response hop limit

Step 2: Install Podman or Docker Engine

Depending on your operating system, either Podman or Docker Engine is required before installing the agent.

- Podman is required for Red Hat Enterprise Linux 8 and 9.

  View the supported Podman versions.

- Docker Engine is required for Ubuntu.

  View the supported Docker Engine versions.

Example 1. Steps

Podman

Follow these steps to install and configure Podman:

- Enable and start the podman.socket service
- Install python3
- Install the podman-compose package version 1.0.6
- Add podman-compose to the PATH environment variable
- If using Red Hat Enterprise Linux, verify that your Podman version is using Netavark Aardvark DNS instead of CNI

> Adjust the aardvark-dns port (default: 53) after installing the agent to avoid DNS port conflicts. Follow the instructions to configure the port.

Steps

1. Remove the podman-docker package if it's installed on the host.

   ```
   dnf remove podman-docker
   rm /var/run/docker.sock
   ```

2. Install Podman.

   You can obtain Podman from official Red Hat Enterprise Linux repositories.

   a. For Red Hat Enterprise Linux 9.6:

      ```
      sudo dnf install podman-5:<version>
      ```

      Where <version> is the supported version of Podman that you're installing. View the supported Podman versions.

   b. For Red Hat Enterprise Linux 9.1 to 9.4:

      ```
      sudo dnf install podman-4:<version>
      ```

      Where <version> is the supported version of Podman that you're installing. View the supported Podman versions.

   c. For Red Hat Enterprise Linux 8:

      ```
      sudo dnf install podman-4:<version>
      ```

      Where <version> is the supported version of Podman that you're installing. View the supported Podman versions.

3. Enable and start the podman.socket service.

```
sudo systemctl enable --now podman.socket
```

4. Install python3.

```
sudo dnf install python3
```

5. Install the EPEL repository package if it’s not already available on your system.

This step is required because podman-compose is available from the Extra Packages for Enterprise Linux (EPEL) repository.

6. If using Red Hat Enterprise 9:

a. Install the EPEL repository package.

```
sudo dnf install https://dl.fedoraproject.org/pub/epel/epel-release-latest-9.noarch.rpm
```

a. Install podman-compose package 1.5.0.

```
sudo dnf install podman-compose-1.5.0
```

7. If using Red Hat Enterprise Linux 8:

a. Install the EPEL repository package.

```
sudo dnf install https://dl.fedoraproject.org/pub/epel/epel-release-latest-8.noarch.rpm
```

b. Install podman-compose package 1.0.6.

```
sudo dnf install podman-compose-1.0.6
```

> Using the `dnf install` command meets the requirement for adding podman-compose to the PATH environment variable. The installation command adds podman-compose to /usr/bin, which is already included in the `secure_path` option on the host.

c. If using Red Hat Enterprise Linux 8, verify that your Podman version is using NetAvark with Aardvark DNS instead of CNI.

i. Check to see if your networkBackend is set to CNI by running the following command:

```
podman info | grep networkBackend
```

ii. If the networkBackend is set to `CNI`, you'll need to change it to `netavark`.

iii. Install `netavark` and `aardvark-dns` using the following command:

```
dnf install aardvark-dns netavark
```

iv. Open the `/etc/containers/containers.conf` file and modify the network_backend option to use "netavark" instead of "cni".

If `/etc/containers/containers.conf` doesn't exist, make the configuration changes to `/usr/share/containers/containers.conf`.

v. Restart podman.

```
systemctl restart podman
```

vi. Confirm networkBackend is now changed to "netavark" using the following command:

```
podman info | grep networkBackend
```

Docker Engine

Follow the documentation from Docker to install Docker Engine.

Steps

1. View installation instructions from Docker

   Follow the steps to install a supported Docker Engine version. Do not install the latest version, as it is unsupported by the Console.

2. Verify that Docker is enabled and running.

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

Step 3: Set up networking

Ensure the network location supports the following requirements so the Console agent can manage resources in your hybrid cloud.

Connections to target networks

The Console agent requires a network connection to the location where you're planning to create and manage systems. 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 Console agent must have an outbound internet connection to contact specific endpoints.

Endpoints contacted from computers when using the web-based NetApp Console

Computers that access the Console from a web browser must have the ability to contact several endpoints. You'll need to use the Console to set up the Console agent and for day-to-day use of the Console.

Prepare networking for the NetApp console.

Endpoints contacted from the Console agent

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

The endpoints listed below are all CNAME entries.

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 AWS resources. The endpoint depends on your AWS region. Refer to AWS documentation for details
Amazon FsX for NetApp ONTAP: • api.workloads.netapp.com	The web-based console contacts this endpoint to interact with the Workload Factory APIs to manage and operate FSx for ONTAP based workloads.
https://mysupport.netapp.com	To obtain licensing information and to send AutoSupport messages to NetApp support.
https://signin.b2c.netapp.com	To update NetApp Support Site (NSS) credentials or to add new NSS credentials to the NetApp Console.
https://support.netapp.com	To obtain licensing information and to send AutoSupport messages to NetApp support as well as to receive software updates for Cloud Volumes ONTAP.

Endpoints	Purpose
https://api.bluexp.netapp.com https://netapp-cloud-account.auth0.com https://netapp-cloud-account.us.auth0.com https://console.netapp.com https://components.console.bluexp.netapp.com https://cdn.auth0.com	To provide features and services within the NetApp Console.
https://bluexpinfraprod.eastus2.data.azurecr.io https://bluexpinfraprod.azurecr.io	To obtain images for Console agent upgrades. • When you deploy a new agent, the validation check tests connectivity to current endpoints. If you use previous endpoints, the validation check fails. To avoid this failure, skip the validation check. Although the previous endpoints are still supported, NetApp recommends updating your firewall rules to the current endpoints as soon as possible. Learn how to update your endpoint list. • When you update to the current endpoints in your firewall, your existing agents will continue to work.

Proxy server

NetApp supports both explicit and transparent proxy configurations. If you are using a transparent proxy, you only need to provide the certificate for the proxy server. If you are using an explicit proxy, you'll also need the IP address and credentials.

- IP address
- Credentials
- HTTPS certificate

Ports

There's no incoming traffic to the Console agent, unless you initiate it or if it 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, the Console automatically configures those systems to use a proxy server that's included with the Console agent. The only requirement is to ensure that the Console agent's security group allows inbound connections over port 3128. You'll need to open this port after you deploy the Console agent.

Enable NTP

If you’re planning to use NetApp Data Classification to scan your corporate data sources, you should enable a Network Time Protocol (NTP) service on both the Console agent and the NetApp Data Classification system so that the time is synchronized between the systems. Learn more about NetApp Data classification

Step 4: Set up AWS permissions for the Console

Provide AWS permissions to the NetApp Console using one of these 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 the Console with the AWS access key for an IAM user who has the required permissions.

Follow the steps to prepare permissions for the Console.

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 Console agent.
   c. Finish the remaining steps to create the policy.

      Depending on the NetApp data services you plann 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 Console agent.
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 Console agent.

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 Console agent.
   c. Finish the remaining steps to create the policy.

      Depending on the NetApp data services that you plan 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 Console agent.
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 the NetApp Console after you install the Console agent.

Result

You now have an IAM user that has the required permissions and an access key that you can provide to the Console.

Step 5: Install the Console agent

After you complete the prerequisites, manually install the software on your Linux host.

Before you begin

You should have the following:

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

  You have the option to configure a proxy server after installation but doing so requires restarting the Console agent.
- A CA-signed certificate, if the proxy server uses HTTPS or if the proxy is an intercepting proxy.

> ⓘ You cannot set a certificate for a transparent proxy server when manually installing the Console agent. If you need to set a certificate for a transparent proxy server, you must use the Maintenance Console after installation. Learn more about the Agent Maintenance Console.

About this task

After installation, the Console agent automatically updates itself if a new version is available.

Steps

1. 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 fails.

2. Download the Console agent software and then copy it to the Linux host. You can download it either from the NetApp Console or the NetApp Support site.
   - NetApp Console: Go to **Agents > Management> Deploy agent > On-prem > Manual install**.

     Choose download the agent installer files or a URL to the files.
   - NetApp Support Site (needed if you don't already have access to the Console) NetApp Support Site,
3. Assign permissions to run the script.

   ```
   chmod +x NetApp_Console_Agent_Cloud_<version>
   ```

   Where <version> is the version of the Console agent that you downloaded.

4. If installing in a Government Cloud environment, disable the configuration checks. Learn how to disable configuration checks for manual installations.

5. Run the installation script.

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

You'll need to add proxy information if your network requires a proxy for internet access. You can add an explicit proxy during installation. The `--proxy` and `--cacert` parameters are optional and you won't be prompted to add them. If you have an explicit proxy server, you will need to enter the parameters as shown.

> If you want to configure a transparent proxy, you can do so after you've installed. Learn about the agent maintenance console

+

Here is an example configuring an explicit proxy server with a CA-signed certificate:

+

```
./NetApp_Console_Agent_Cloud_v4.0.0--proxy
https://user:password@10.0.0.30:8080/ --cacert /tmp/cacert/certificate.cer
```

+
`--proxy` configures the Console agent to use an HTTP or HTTPS proxy server using one of the following formats:

+
* http://address:port
* http://user-name:password@address:port
* http://domain-name%92user-name:password@address:port
* https://address:port
* https://user-name:password@address:port
* https://domain-name%92user-name:password@address:port

+
Note the following:

+
The user can be a local user or domain user.
For a domain user, you must use the ASCII code for a \ as shown above.
The Console agent doesn't support user names or passwords that include the @ character.
If the password includes any of the following special characters, you must escape that special character by prepending it with a backslash: & or !

+
For example:

+
http://bxpproxyuser:netapp1\!@address:3128

1. If you used Podman, you'll need to adjust the aardvark-dns port.
   a. SSH to the Console agent virtual machine.
   b. Open podman */usr/share/containers/containers.conf* file and modify the chosen port for Aardvark DNS service. For example, change it to 54.

      ```
      vi /usr/share/containers/containers.conf
      ```

      For example:

      ```
      # Port to use for dns forwarding daemon with netavark in rootful
      bridge
      # mode and dns enabled.
      # Using an alternate port might be useful if other DNS services
      should
      # run on the machine.
      #
      dns_bind_port = 54
      ```

   c. Reboot the Console agent virtual machine.
2. Wait for the installation to complete.

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

ⓘ If the installation fails, you can view the installation report and logs to help you fix the issues. Learn how to troubleshoot installation issues.

1. Open a web browser from a host that has a connection to the Console agent virtual machine and enter the following URL:

   https://*ipaddress*

2. After you log in, set up the Console agent:
   a. Specify the organization to associate with the Console agent.
   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 the Console in standard mode. You should enable restricted mode only if you have a secure environment and want to disconnect this account from backend services. If that's the case, follow steps to get started with the NetApp Console in restricted mode.

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

If you have Amazon S3 buckets in the same AWS account where you created the Console agent, you'll see an Amazon S3 storage system appear on the **Systems** page automatically. Learn how to manage S3 buckets from NetApp ConsoleP

Step 6: Provide permissions to NetApp Console

After you install the Console agent, provide the AWS permissions you set up so the Console agent can manage your data and storage infrastructure in AWS.

IAM role

Attach the IAM role you create to the Console agent EC2 instance.

Steps

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

Go to the NetApp Console to start using the Console agent.

AWS access key

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

Steps

1. Ensure that the correct Console agent is currently selected in the Console.
2. Select **Administration > Credentials**.
3. Select **Organization credentials**.
4. Select **Add Credentials** and follow the steps in the wizard.
   a. **Credentials Location**: Select *Amazon Web Services > Agent.
   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**.

Go to the NetApp Console to start using the Console agent.

Azure

Console agent installation options in Azure

There are a few different ways to create a Console agent in Azure. Directly from the NetApp Console is the most common way.

The following installation options are available:

- Create a Console agent directly from the NetApp Console (this is the standard option)

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

- Create a Console agent from the Azure Marketplace

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

- 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 the Console agent with the required permissions that it needs to authenticate and manage resources in Azure.

Create a Console agent in Azure from NetApp Console

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

Before you begin

- You should have an understanding of Console agents.
- You should review Console agent limitations.

Step 1: Set up networking

Ensure that the network location where you plan to install the Console agent supports the following requirements. These requirements allow the Console agent to manage hybrid cloud resources.

Azure region

If you use Cloud Volumes ONTAP, the Console agent 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 Console agent, you need to specify the VNet and subnet where it should reside.

Connections to target networks

The Console agent requires a network connection to the location where you’re planning to create and manage systems. 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 Console agent must have an outbound internet connection to contact specific endpoints.

Endpoints contacted from the Console agent

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

The endpoints listed below are all CNAME entries.

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://mysupport.netapp.com	To obtain licensing information and to send AutoSupport messages to NetApp support.
https://signin.b2c.netapp.com	To update NetApp Support Site (NSS) credentials or to add new NSS credentials to the NetApp Console.
https://support.netapp.com	To obtain licensing information and to send AutoSupport messages to NetApp support as well as to receive software updates for Cloud Volumes ONTAP.
https://api.bluexp.netapp.com https://netapp-cloud-account.auth0.com https://netapp-cloud-account.us.auth0.com https://console.netapp.com https://components.console.bluexp.netapp.com https://cdn.auth0.com	To provide features and services within the NetApp Console.
https://bluexpinfraprod.eastus2.data.azurecr.io https://bluexpinfraprod.azurecr.io	To obtain images for Console agent upgrades. • When you deploy a new agent, the validation check tests connectivity to current endpoints. If you use previous endpoints, the validation check fails. To avoid this failure, skip the validation check. Although the previous endpoints are still supported, NetApp recommends updating your firewall rules to the current endpoints as soon as possible. Learn how to update your endpoint list. • When you update to the current endpoints in your firewall, your existing agents will continue to work.

Endpoints contacted from the NetApp console

As you use the web-based NetApp 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 Console agent from the the Console.

View the list of endpoints contacted from the NetApp console.

Proxy server

NetApp supports both explicit and transparent proxy configurations. If you are using a transparent proxy, you only need to provide the certificate for the proxy server. If you are using an explicit proxy, you'll also need the IP address and credentials.

- IP address
- Credentials
- HTTPS certificate

Ports

There's no incoming traffic to the Console agent, unless you initiate it or if it 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, the Console automatically configures those systems to use a proxy server that's included with the Console agent. The only requirement is to ensure that the Console agent's security group allows inbound connections over port 3128. You'll need to open this port after you deploy the Console agent.

Enable NTP

If you're planning to use NetApp Data Classification to scan your corporate data sources, you should enable a Network Time Protocol (NTP) service on both the Console agent and the NetApp Data Classification system so that the time is synchronized between the systems. Learn more about NetApp Data classification

You need to implement this networking requirement after you create the Console agent.

Step 2: Create a Console agent deployment policy (custom role)

You need to create a custom role that has permissions to deploy the Console agent in Azure.

Create an Azure custom role that you can assign to your Azure account or to a Microsoft Entra service principal. The Console authenticates with Azure and uses these permissions to create the Console agent on your behalf.

The Console deploys the Console agent VM in Azure, enables a system-assigned managed identity, creates the required role, and assigns it to the VM. Review how the Console uses the permissions.

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 Console agent VM in Azure from the Console. Don’t use this policy for other situations. When the Console creates the Console agent, it applies a new set of permissions to the Console agent VM that enables the Console agent to manage Azure resources.

```
{
  "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/agreements/read",

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

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

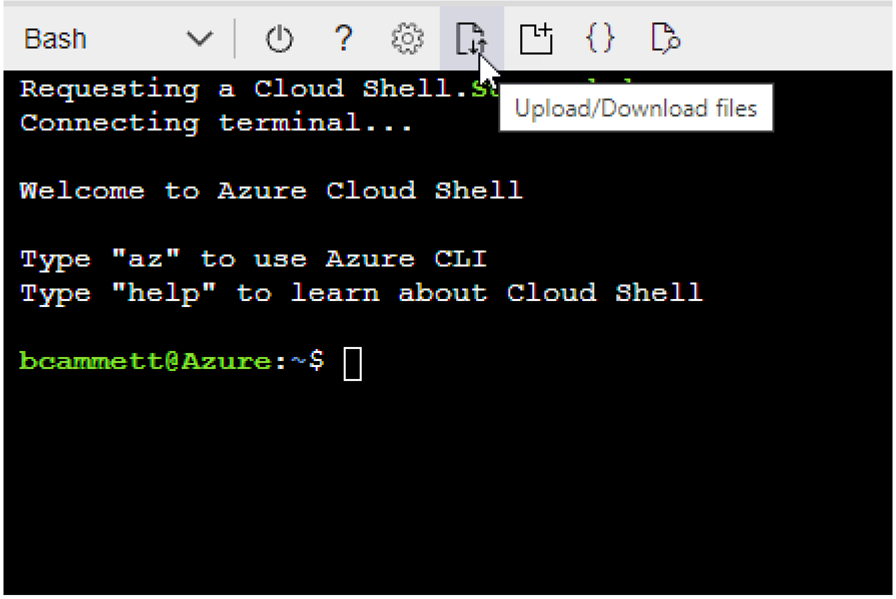
   Example

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

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

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

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



```
Requesting a Cloud Shell.Su
Connecting terminal...

Welcome to Azure Cloud Shell

Type "az" to use Azure CLI
Type "help" to learn about Cloud Shell

bcammett@Azure:~$ 
```

c. Enter the following Azure CLI command:

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

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

Step 3: Set up authentication

When creating the Console agent from the Console, you need to provide a login that enables the Console 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 a Microsoft Entra service principal. This service principal also requires specific permissions.

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

Azure account

Assign the custom role to the user who will deploy the Console agent from the Console.

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 Console agent 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**.

Service principal

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

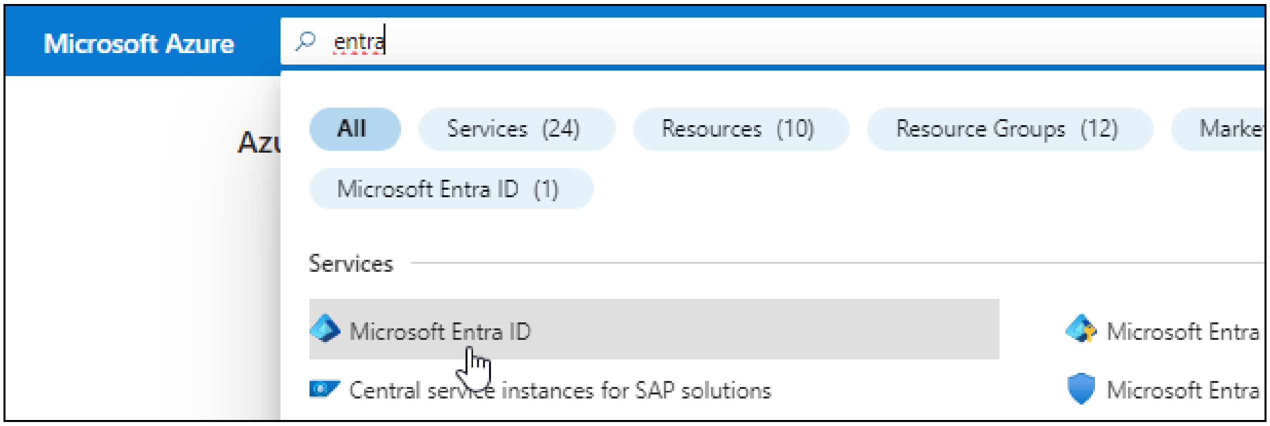
Create and set up a service principal in Microsoft Entra ID and obtain the Azure credentials that the Console needs.

Create a Microsoft Entra 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 **Microsoft Entra ID** service.



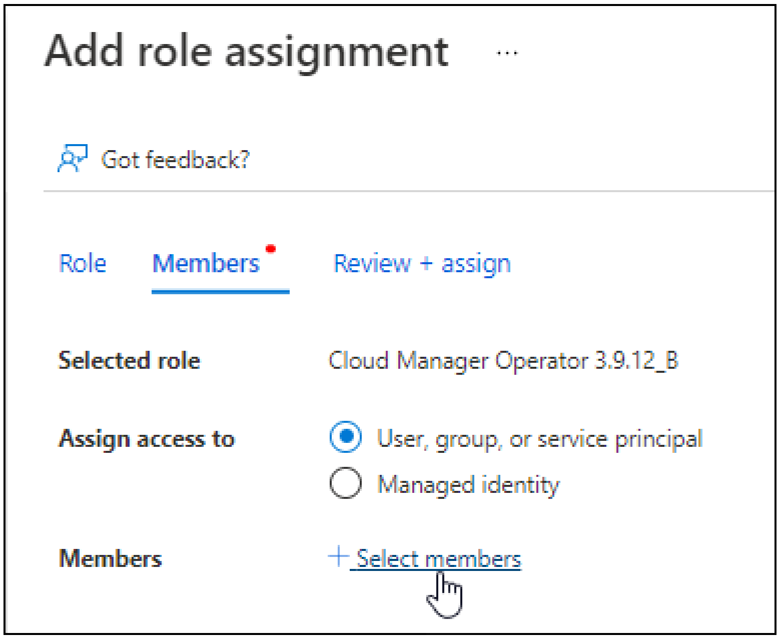
3. In the menu, select **App registrations**.
4. Select **New registration**.

5. Specify details about the application:
   - **Name**: Enter a name for the application.
   - **Account type**: Select an account type (any will work with the NetApp Console).
   - **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 **Console 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**.



Add role assignment ···

Got feedback?

Role | Members | Review + assign

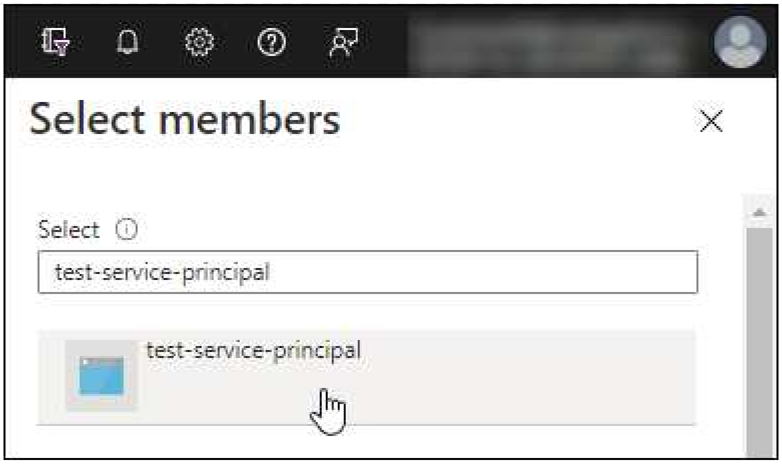
Selected role: Cloud Manager Operator 3.9.12_B

Assign access to: ● User, group, or service principal ○ Managed identity

Members: + Select members

   c. Search for the name of the application.

   Here's an example:



Select members

Select

test-service-principal

test-service-principal

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

   e. Click **Next**.

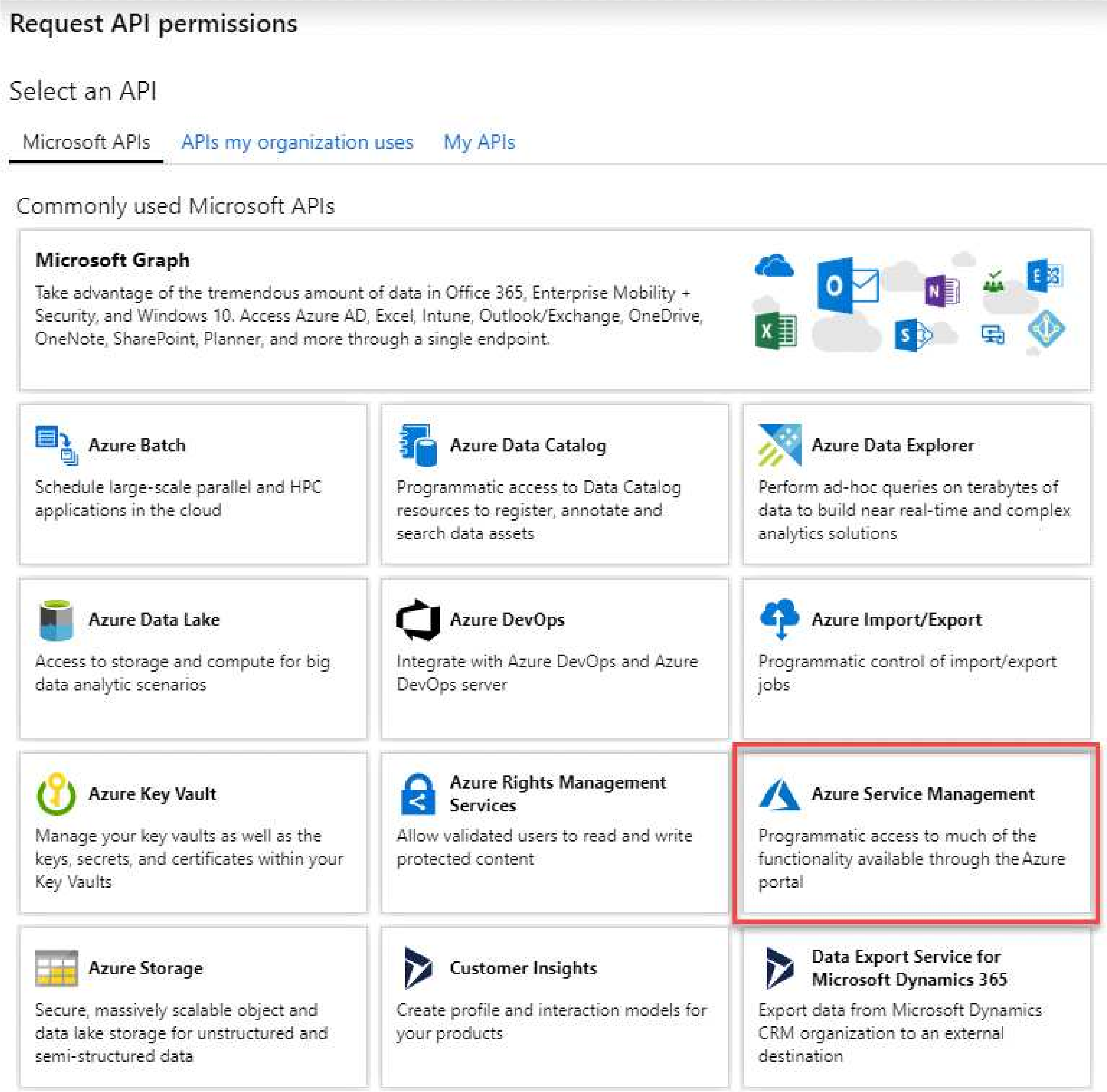
6. Click **Review + assign**.

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

   If you want to manage resources in multiple Azure subscriptions, then you must bind the service principal to each of those subscriptions. For example, the Console 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 **Microsoft Entra ID** service, select **App registrations** and select the application.
2. Select **API permissions > Add a permission**.
3. Under **Microsoft APIs**, select **Azure Service Management**.



Request API permissions

Select an API

Microsoft APIs | APIs my organization uses | My APIs

Commonly used Microsoft APIs

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

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

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

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

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

Azure DevOps
Integrate with Azure DevOps and Azure DevOps server

Azure Import/Export
Programmatic control of import/export jobs

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

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

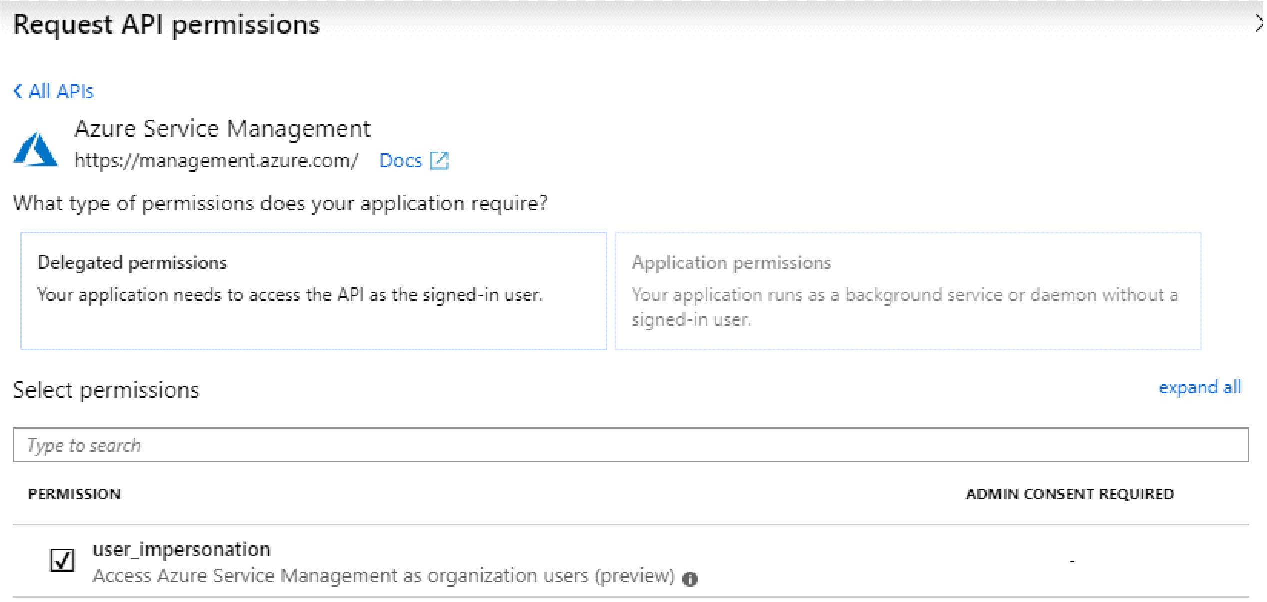
Azure Service Management
Programmatic access to much of the functionality available through the Azure portal

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

Customer Insights
Create profile and interaction models for your products

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

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



Request API permissions

< All APIs

Azure Service Management
https://management.azure.com/ Docs

What type of permissions does your application require?

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

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

Select permissions

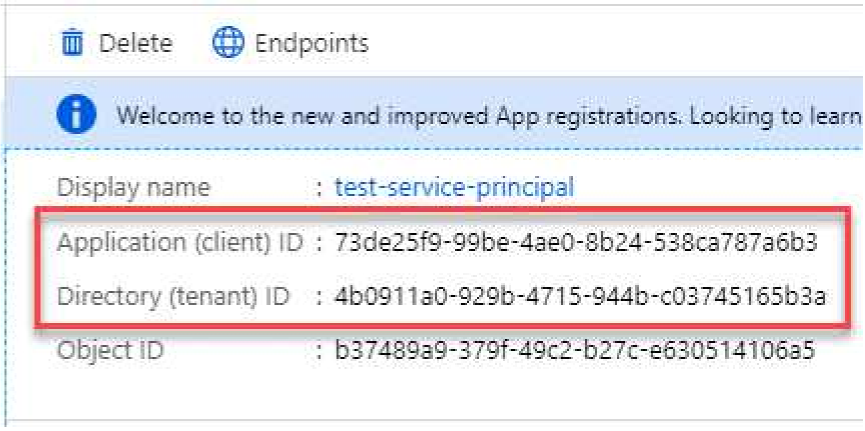
expand all

Type to search

PERMISSION	ADMIN CONSENT REQUIRED
☑ user_impersonation Access Azure Service Management as organization users (preview)	-

Get the application ID and directory ID for the application

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



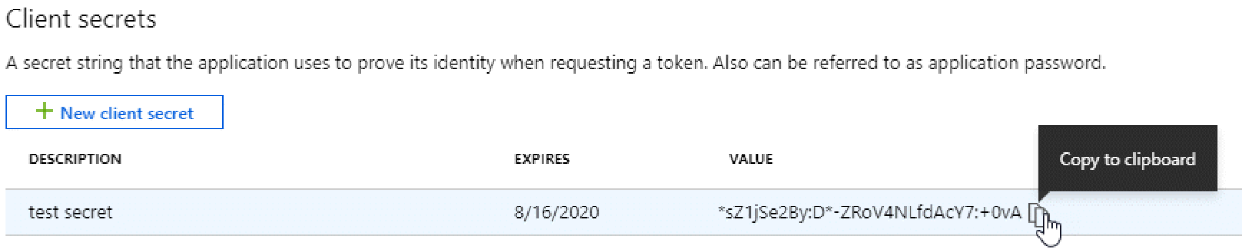
Welcome to the new and improved App registrations. Looking to learn

Display name : test-service-principal
Application (client) ID : 73de25f9-99be-4ae0-8b24-538ca787a6b3
Directory (tenant) ID : 4b0911a0-929b-4715-944b-c03745165b3a
Object ID : b37489a9-379f-49c2-b27c-e630514106a5

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

Create a client secret

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



Client secrets

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

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

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 the Console when you create the Console agent.

Step 4: Create the Console agent

Create the Console agent directly from the NetApp Console.

About this task

- Creating the Console agent from the Console deploys a virtual machine in Azure using a default configuration. Do not switch to a smaller VM instance with fewer CPUs or less RAM after creating the Console agent. Learn about the default configuration for the Console agent.
- When the Console deploys the Console agent, it creates a custom role and assigns it to the Console agent VM. This role includes permissions that enables the Console agent to manage Azure resources. You need to ensure that the role is kept up to date as new permissions are added in subsequent releases. Learn more about the custom role for the Console agent.

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 Console agent 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 the Console to automatically create an Azure role for the Console agent, then you'll need to create your own using the policy on this page.

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

Steps

1. Select **Administration > Agents**.
2. On the **Overview** page, select **Deploy agent > Azure**
3. On the **Review** page, review the requirements for deploying an agent. Those requirements are also detailed above on this page.
4. On the **Virtual Machine Authentication** page, select the authentication option that matches how you set up Azure permissions:
   - Select **Log in** 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 the Console automatically uses 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 Microsoft Entra 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.

5. On the **Virtual Machine Authentication** page, choose an Azure subscription, a location, a new resource group or an existing resource group, and then choose an authentication method for the Console agent 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

6. On the **Details** page, enter a name for the agent, specify tags, and choose whether you want the Console 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 Console agent permissions to manage resources in that subscription (for example, Cloud Volumes ONTAP).

7. On the **Network** page, choose a VNet and subnet, whether to enable a public IP address, and optionally specify a proxy configuration.
   - On the **Security Group** page, 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.

8. Review your selections to verify that your set up is correct.

   a. The **Validate agent configuration** check box is marked by default to have the Console validate the network connectivity requirements when you deploy. If the Console fails to deploy the agent, it provides a report to help you troubleshoot. If the deployment succeeds, no report is provided.

> If you are still using the previous endpoints used for agent upgrades, the validation fails with an error. To avoid this, unmark the check box to skip the validation check.

9. Select **Add**.

   The Console prepares the agent in about 10 minutes. Stay on the page until the process completes.

Result

After the process is complete, the Console agent is available for use from the Console.

> ⓘ If the deployment fails, you can download a report and logs from the Console to help you fix the issues. Learn how to troubleshoot installation issues.

If you have Azure Blob storage in the same Azure account where you created the Console agent, you'll see Azure Blob storage appear on the **Systems** page automatically. Learn how to manage Azure Blob storage from NetApp Console

Create a Console agent from the Azure Marketplace

You can create a Console agent in Azure directly from the Azure Marketplace. To create a Console agent from the Azure Marketplace, you need to set up your networking, prepare Azure permissions, review instance requirements, and then create the Console agent.

Before you begin

- You should have an understanding of Console agents.
- Review Console agent limitations.

Step 1: Set up networking

Ensure that the network location where you plan to install the Console agent supports the following requirements.These requirements enable the Console agent to manage resources in your hybrid cloud.

Azure region

If you use Cloud Volumes ONTAP, the Console agent 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 Console agent, you need to specify the VNet and subnet where it should reside.

Connections to target networks

The Console agent requires a network connection to the location where you're planning to create and manage systems. 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 Console agent must have an outbound internet connection to contact specific endpoints.

Endpoints contacted from the Console agent

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

The endpoints listed below are all CNAME entries.

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://mysupport.netapp.com	To obtain licensing information and to send AutoSupport messages to NetApp support.
https://signin.b2c.netapp.com	To update NetApp Support Site (NSS) credentials or to add new NSS credentials to the NetApp Console.
https://support.netapp.com	To obtain licensing information and to send AutoSupport messages to NetApp support as well as to receive software updates for Cloud Volumes ONTAP.
https://api.bluexp.netapp.com https://netapp-cloud-account.auth0.com https://netapp-cloud-account.us.auth0.com https://console.netapp.com https://components.console.bluexp.netapp.com https://cdn.auth0.com	To provide features and services within the NetApp Console.

Endpoints	Purpose
https://bluexpinfraprod.eastus2.data.azurecr.io https://bluexpinfraprod.azurecr.io	To obtain images for Console agent upgrades. • When you deploy a new agent, the validation check tests connectivity to current endpoints. If you use previous endpoints, the validation check fails. To avoid this failure, skip the validation check. Although the previous endpoints are still supported, NetApp recommends updating your firewall rules to the current endpoints as soon as possible. Learn how to update your endpoint list. • When you update to the current endpoints in your firewall, your existing agents will continue to work.

Proxy server

NetApp supports both explicit and transparent proxy configurations. If you are using a transparent proxy, you only need to provide the certificate for the proxy server. If you are using an explicit proxy, you'll also need the IP address and credentials.

- IP address
- Credentials
- HTTPS certificate

Ports

There's no incoming traffic to the Console agent, unless you initiate it or if it 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, the Console automatically configures those systems to use a proxy server that's included with the Console agent. The only requirement is to ensure that the Console agent's security group allows inbound connections over port 3128. You'll need to open this port after you deploy the Console agent.

Enable NTP

If you're planning to use NetApp Data Classification to scan your corporate data sources, you should enable a Network Time Protocol (NTP) service on both the Console agent and the NetApp Data Classification system so that the time is synchronized between the systems. Learn more about NetApp Data classification

Implement the networking requirements after creating the Console agent.

Step 2: Review VM requirements

When you create the Console agent, choose a virtual machine type that meets the following requirements.

CPU
8 cores or 8 vCPUs

RAM
32 GB

Azure VM size
An instance type that meets CPU and RAM requirements. NetApp recommends Standard_D8s_v3.

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 the Console with the credentials for an Azure service principal that has the required permissions.

Follow these steps to set up permissions for the Console.

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 the NetApp Console.

   Example

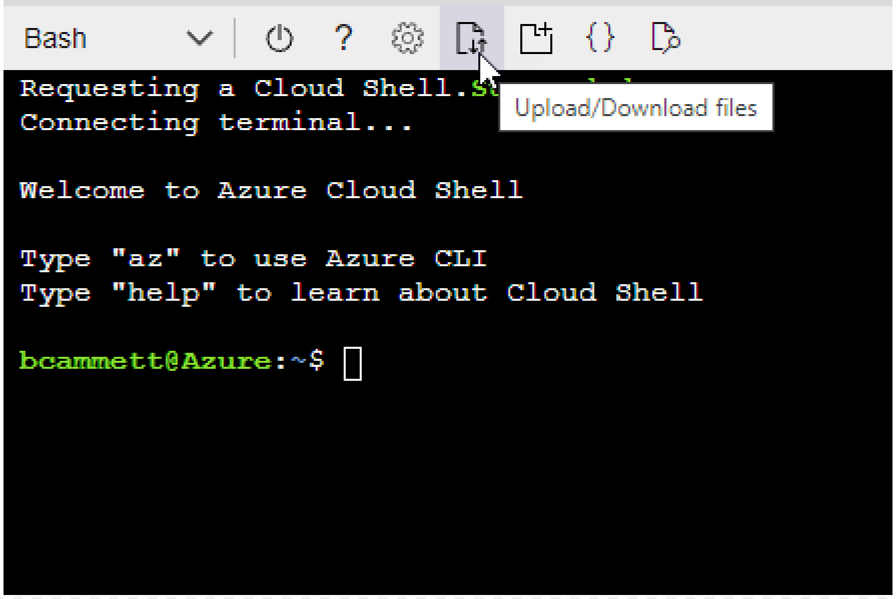
   ```
   "AssignableScopes": [
   "/subscriptions/d333af45-0d07-4154-943d-c25fbzzzzzzz",
   "/subscriptions/54b91999-b3e6-4599-908e-416e0zzzzzzz",
   "/subscriptions/398e471c-3b42-4ae7-9b59-ce5bbzzzzzzz"
   ]
   ```

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.



```
Requesting a Cloud Shell.Su
Connecting terminal...

Welcome to Azure Cloud Shell

Type "az" to use Azure CLI
Type "help" to learn about Cloud Shell

bcammett@Azure:~$
```

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

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

Service principal

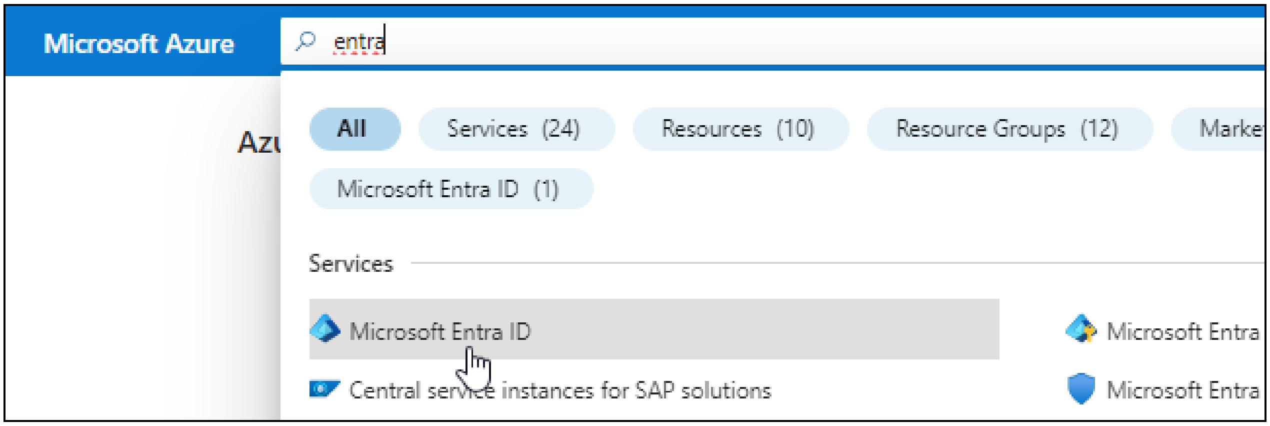
Create and set up a service principal in Microsoft Entra ID and obtain the Azure credentials that the Console needs.

Create a Microsoft Entra 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 **Microsoft Entra ID** 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 the NetApp Console).
   - **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 Console agent 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.

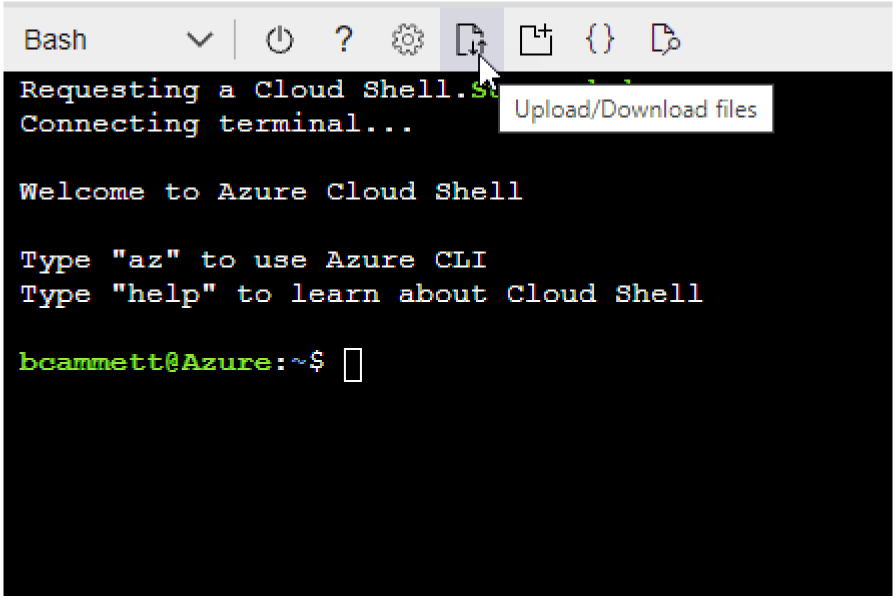
   Example

```
"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.



```
Requesting a Cloud Shell.Su
Connecting terminal...

Welcome to Azure Cloud Shell

Type "az" to use Azure CLI
Type "help" to learn about Cloud Shell

bcammett@Azure:~$
```

   - Use the Azure CLI to create the custom role:

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

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

2. Assign the application to the role:

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

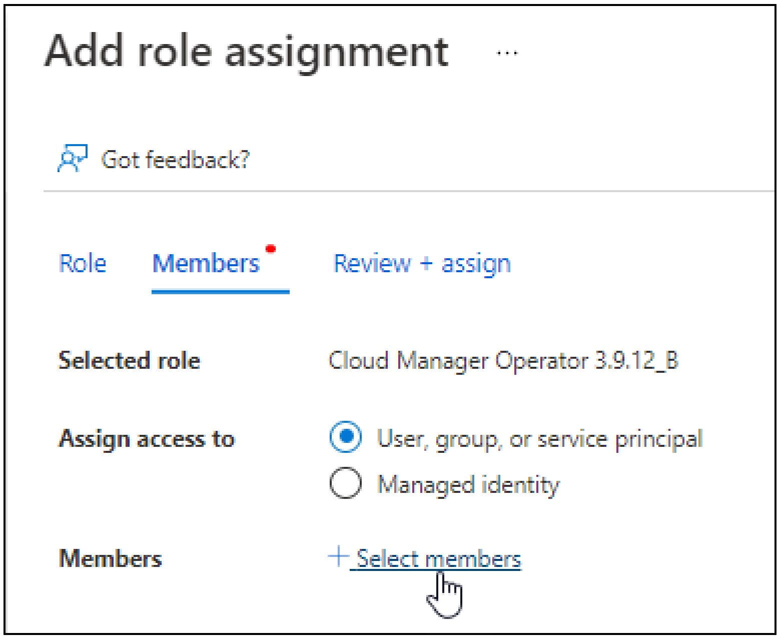
   b. Select the subscription.

c. Select **Access control (IAM) > Add > Add role assignment**.

d. In the **Role** tab, select the **Console Operator** role and select **Next**.

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

- Keep **User, group, or service principal** selected.
- Select **Select members**.



Add role assignment ···

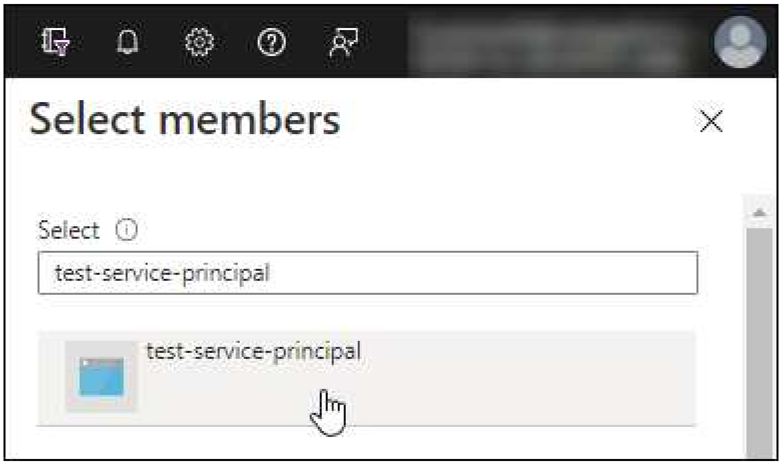
Selected role: Cloud Manager Operator 3.9.12_B

Assign access to: ● User, group, or service principal ○ Managed identity

Members: + Select members

- Search for the name of the application.

  Here’s an example:



Select members

Select ⓘ: test-service-principal

test-service-principal

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

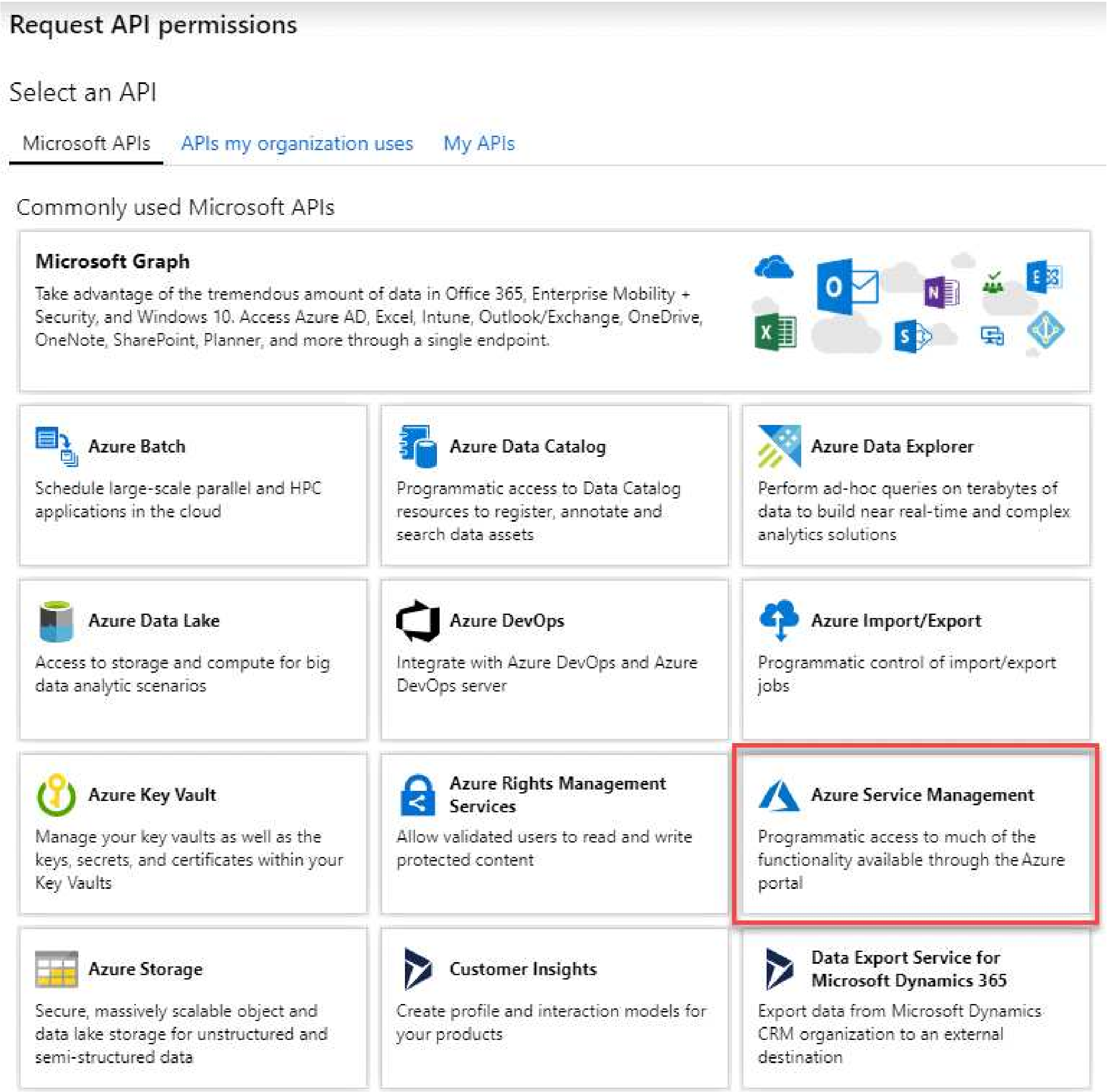
f. Select **Review + assign**.

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

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

Add Windows Azure Service Management API permissions

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



Request API permissions

Select an API

Microsoft APIs | APIs my organization uses | My APIs

Commonly used Microsoft APIs

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

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

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

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

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

Azure DevOps
Integrate with Azure DevOps and Azure DevOps server

Azure Import/Export
Programmatic control of import/export jobs

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

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

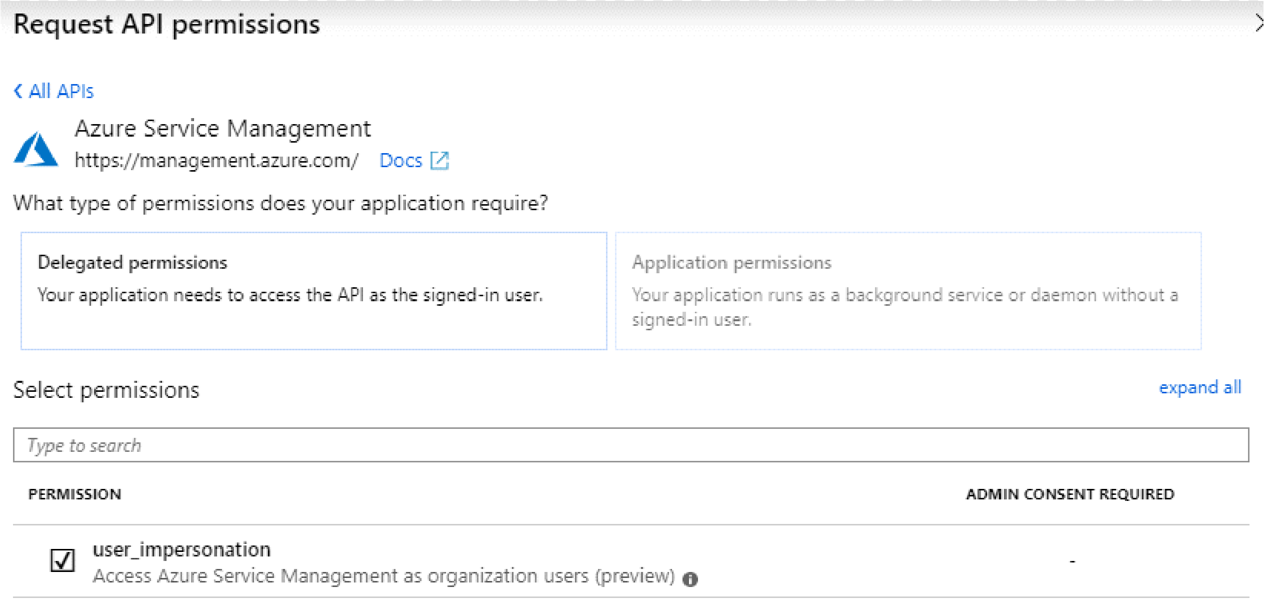
Azure Service Management
Programmatic access to much of the functionality available through the Azure portal

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

Customer Insights
Create profile and interaction models for your products

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

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



Request API permissions

‹ All APIs

Azure Service Management
https://management.azure.com/ Docs

What type of permissions does your application require?

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

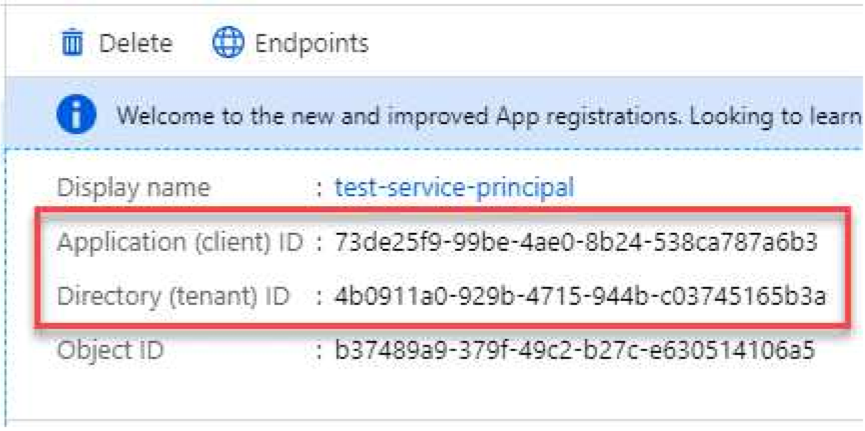
Application permissions
Your application runs as a background service or daemon without a signed-in user.

Select permissions

PERMISSION	ADMIN CONSENT REQUIRED
☑ user_impersonation Access Azure Service Management as organization users (preview)	-

Get the application ID and directory ID for the application

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



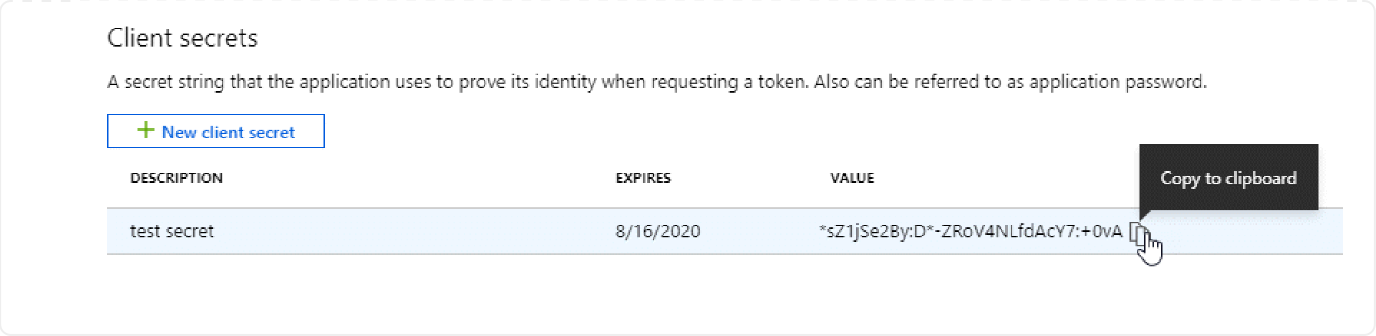
Welcome to the new and improved App registrations. Looking to learn

Display name : test-service-principal
Application (client) ID : 73de25f9-99be-4ae0-8b24-538ca787a6b3
Directory (tenant) ID : 4b0911a0-929b-4715-944b-c03745165b3a
Object ID : b37489a9-379f-49c2-b27c-e630514106a5

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

Create a client secret

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



Client secrets

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

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

Step 4: Create the Console agent

Launch the Console agent directly from the Azure Marketplace.

About this task

Creating the Console agent from the Azure Marketplace sets up a virtual machine with a default configuration. Learn about the default configuration for the Console agent.

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 Console agent 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 the Console to automatically create an Azure role for the Console agent, then you'll need to create your own using the policy on this page.

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

Steps

1. Go to the NetApp Console agent 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 Standard_D8s_v3.

- **Disks**: The Console agent can perform optimally with either HDD or SSD disks.
- **Network security group**: The Console agent 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 Console agent virtual machine to identify itself to Microsoft Entra ID 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. You should see the virtual machine and Console agent software running in about ten minutes.

   ⓘ If the installation fails, you can view logs and a report to help you troubleshoot. Learn how to troubleshoot installation issues.

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

   https://*ipaddress*

6. After you log in, set up the Console agent:

   a. Specify the the Console organization to associate with the Console agent.

   b. Enter a name for the system.

   c. Under **Are you running in a secured environment?** keep restricted mode disabled.

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

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

Result

You have now installed the Console agent and set it up with your the Console organization.

If you have Azure Blob storage in the same Azure subscription where you created the Console agent, you'll see an Azure Blob storage system appear on the **Systems** page automatically. Learn how to manage Azure Blob storage from the Console

Step 5: Provide permissions to the Console agent

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

Custom role

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

Steps

1. From the Azure Portal, open the **Subscriptions** service and select your subscription.

   It's important to assign the role from the **Subscriptions** service because this specifies the scope of the role assignment at the subscription level. The *scope* defines the set of resources that the access applies to. If you specify a scope at a different level (for example, at the virtual machine level), your ability to complete actions from within the NetApp Console will be affected.

   Microsoft Azure documentation: Understand scope for Azure RBAC

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

   > ⓘ Console Operator is the default name provided in the 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 Console agent virtual machine was created, under **Managed identity**, choose **Virtual machine**, and then select the Console agent 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.

What's next?

Go to the NetApp Console to start using the Console agent.

Service principal

Steps

1. Select **Administration > Credentials**.
2. Select **Add Credentials** and follow the steps in the wizard.
   a. **Credentials Location**: Select **Microsoft Azure > Agent**.
   b. **Define Credentials**: Enter information about the Microsoft Entra 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

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

Manually install the Console agent in Azure

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

Before you begin

- You should have an understanding of Console agents.
- You should review Console agent limitations.

Step 1: Review host requirements

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

> ⓘ The Console agent reserves the UID and GID range of 19000 to 19200. This range is fixed and cannot be modified. If any third-party software on your host is using UIDs or GIDs within this range, the agent installation will fail. NetApp recommends using a host that is free of third-party software to avoid conflicts.

Dedicated host

The Console agent requires a dedicated host. Any architecture is supported if it meets these size requirements:

- CPU: 8 cores or 8 vCPUs
- RAM: 32 GB
- Disk space: 165 GB is recommended for the host, with the following partition requirements:
  - `/opt`: 120 GiB of space must be available

    The agent uses `/opt` to install the `/opt/application/netapp` directory and its contents.
  - `/var`: 40 GiB of space must be available

    The Console agent requires this space in `/var` because Podman or Docker are architected to create the containers within this directory. Specifically, they will create containers in the `/var/lib/containers/storage` directory and `/var/lib/docker` for Docker. External mounts or symlinks do not work for this space.

Azure VM size

An instance type that meets CPU and RAM requirements. NetApp recommends Standard_D8s_v3.

Hypervisor

A bare metal or hosted hypervisor that is certified to run a supported operating system is required.

Operating system and container requirements

The Console agent is supported with the following operating systems when using the Console in standard mode or restricted mode. A container orchestration tool is required before you install the agent.

Operating system	Supported OS versions	Supported agent versions	Required container tool	SELinux
Red Hat Enterprise Linux				
	9.6 • English language versions only. • 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 agent installation.	4.0.0 or later with the Console in standard mode or restricted mode	Podman version 5.4.0 with podman-compose 1.5.0. View Podman configuration requirements.	Supported in enforcing mode or permissive mode
	9.1 to 9.4 • English language versions only. • 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 agent installation.	3.9.50 or later with the Console in standard mode or restricted mode	Podman version 4.9.4 with podman-compose 1.5.0. View Podman configuration requirements.	Supported in enforcing mode or permissive mode

Operating system	Supported OS versions	Supported agent versions	Required container tool	SELinux
	8.6 to 8.10 • English language versions only. • 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 agent installation.	3.9.50 or later with the Console in standard mode or restricted mode	Podman version 4.6.1 or 4.9.4 with podman-compose 1.0.6. View Podman configuration requirements.	Supported in enforcing mode or permissive mode
Ubuntu				
	24.04 LTS	3.9.45 or later with the NetApp Console in standard mode or restricted mode	Docker Engine 23.06 to 28.0.0.	Not supported
	22.04 LTS	3.9.50 or later	Docker Engine 23.0.6 to 28.0.0.	Not supported

Step 2: Install Podman or Docker Engine

Depending on your operating system, either Podman or Docker Engine is required before installing the agent.

- Podman is required for Red Hat Enterprise Linux 8 and 9.

  View the supported Podman versions.

- Docker Engine is required for Ubuntu.

  View the supported Docker Engine versions.

Example 2. Steps

Podman

Follow these steps to install and configure Podman:

- Enable and start the podman.socket service
- Install python3
- Install the podman-compose package version 1.0.6
- Add podman-compose to the PATH environment variable
- If using Red Hat Enterprise Linux, verify that your Podman version is using Netavark Aardvark DNS instead of CNI

> ⓘ Adjust the aardvark-dns port (default: 53) after installing the agent to avoid DNS port conflicts. Follow the instructions to configure the port.

Steps

1. Remove the podman-docker package if it’s installed on the host.

   ```
   dnf remove podman-docker
   rm /var/run/docker.sock
   ```

2. Install Podman.

   You can obtain Podman from official Red Hat Enterprise Linux repositories.

   a. For Red Hat Enterprise Linux 9.6:

      ```
      sudo dnf install podman-5:<version>
      ```

      Where <version> is the supported version of Podman that you’re installing. View the supported Podman versions.

   b. For Red Hat Enterprise Linux 9.1 to 9.4:

      ```
      sudo dnf install podman-4:<version>
      ```

      Where <version> is the supported version of Podman that you’re installing. View the supported Podman versions.

   c. For Red Hat Enterprise Linux 8:

      ```
      sudo dnf install podman-4:<version>
      ```

      Where <version> is the supported version of Podman that you’re installing. View the supported Podman versions.

3. Enable and start the podman.socket service.

   ```
   sudo systemctl enable --now podman.socket
   ```

4. Install python3.

   ```
   sudo dnf install python3
   ```

5. Install the EPEL repository package if it’s not already available on your system.

   This step is required because podman-compose is available from the Extra Packages for Enterprise Linux (EPEL) repository.

6. If using Red Hat Enterprise 9:

   a. Install the EPEL repository package.

   ```
   sudo dnf install https://dl.fedoraproject.org/pub/epel/epel-release-latest-9.noarch.rpm
   ```

   a. Install podman-compose package 1.5.0.

   ```
   sudo dnf install podman-compose-1.5.0
   ```

7. If using Red Hat Enterprise Linux 8:

   a. Install the EPEL repository package.

   ```
   sudo dnf install https://dl.fedoraproject.org/pub/epel/epel-release-latest-8.noarch.rpm
   ```

   b. Install podman-compose package 1.0.6.

   ```
   sudo dnf install podman-compose-1.0.6
   ```

   > ⓘ Using the `dnf install` command meets the requirement for adding podman-compose to the PATH environment variable. The installation command adds podman-compose to /usr/bin, which is already included in the `secure_path` option on the host.

   c. If using Red Hat Enterprise Linux 8, verify that your Podman version is using NetAvark with Aardvark DNS instead of CNI.

      i. Check to see if your networkBackend is set to CNI by running the following command:

```
podman info | grep networkBackend
```

ii. If the networkBackend is set to `CNI`, you'll need to change it to `netavark`.

iii. Install `netavark` and `aardvark-dns` using the following command:

```
dnf install aardvark-dns netavark
```

iv. Open the `/etc/containers/containers.conf` file and modify the network_backend option to use "netavark" instead of "cni".

If `/etc/containers/containers.conf` doesn't exist, make the configuration changes to `/usr/share/containers/containers.conf`.

v. Restart podman.

```
systemctl restart podman
```

vi. Confirm networkBackend is now changed to "netavark" using the following command:

```
podman info | grep networkBackend
```

Docker Engine

Follow the documentation from Docker to install Docker Engine.

Steps

1. View installation instructions from Docker

   Follow the steps to install a supported Docker Engine version. Do not install the latest version, as it is unsupported by the Console.

2. Verify that Docker is enabled and running.

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

Step 3: Set up networking

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

Azure region

If you use Cloud Volumes ONTAP, the Console agent 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

The Console agent requires a network connection to the location where you're planning to create and manage systems. 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 Console agent must have an outbound internet connection to contact specific endpoints.

Endpoints contacted from computers when using the web-based NetApp Console

Computers that access the Console from a web browser must have the ability to contact several endpoints. You'll need to use the Console to set up the Console agent and for day-to-day use of the Console.

Prepare networking for the NetApp console.

Endpoints contacted from the Console agent

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

The endpoints listed below are all CNAME entries.

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://mysupport.netapp.com	To obtain licensing information and to send AutoSupport messages to NetApp support.
https://signin.b2c.netapp.com	To update NetApp Support Site (NSS) credentials or to add new NSS credentials to the NetApp Console.
https://support.netapp.com	To obtain licensing information and to send AutoSupport messages to NetApp support as well as to receive software updates for Cloud Volumes ONTAP.

Endpoints	Purpose
https://api.bluexp.netapp.com https://netapp-cloud-account.auth0.com https://netapp-cloud-account.us.auth0.com https://console.netapp.com https://components.console.bluexp.netapp.com https://cdn.auth0.com	To provide features and services within the NetApp Console.
https://bluexpinfraprod.eastus2.data.azurecr.io https://bluexpinfraprod.azurecr.io	To obtain images for Console agent upgrades. • When you deploy a new agent, the validation check tests connectivity to current endpoints. If you use previous endpoints, the validation check fails. To avoid this failure, skip the validation check. Although the previous endpoints are still supported, NetApp recommends updating your firewall rules to the current endpoints as soon as possible. Learn how to update your endpoint list. • When you update to the current endpoints in your firewall, your existing agents will continue to work.

Proxy server

NetApp supports both explicit and transparent proxy configurations. If you are using a transparent proxy, you only need to provide the certificate for the proxy server. If you are using an explicit proxy, you'll also need the IP address and credentials.

- IP address
- Credentials
- HTTPS certificate

Ports

There's no incoming traffic to the Console agent, unless you initiate it or if it 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, the Console automatically configures those systems to use a proxy server that's included with the Console agent. The only requirement is to ensure that the Console agent's security group allows inbound connections over port 3128. You'll need to open this port after you deploy the Console agent.

Enable NTP

If you’re planning to use NetApp Data Classification to scan your corporate data sources, you should enable a Network Time Protocol (NTP) service on both the Console agent and the NetApp Data Classification system so that the time is synchronized between the systems. Learn more about NetApp Data classification

Step 4: Set up Console agent deployment permissions

You need to provide Azure permissions to the Console agent 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 the Console agent with the credentials for an Azure service principal that has the required permissions.

Follow the steps to prepare permissions for the Console agent.

Create a custom role for Console agent deployment

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 the NetApp Console.

   Example

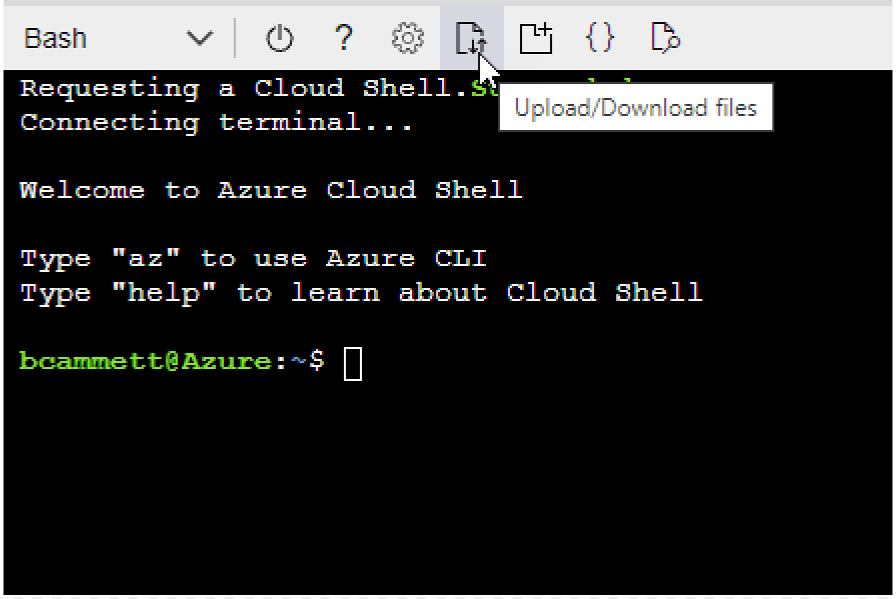
   ```
   "AssignableScopes": [
   "/subscriptions/d333af45-0d07-4154-943d-c25fbzzzzzzz",
   "/subscriptions/54b91999-b3e6-4599-908e-416e0zzzzzzz",
   "/subscriptions/398e471c-3b42-4ae7-9b59-ce5bbzzzzzzz"
   ]
   ```

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.



```
Requesting a Cloud Shell.Su
Connecting terminal...

Welcome to Azure Cloud Shell

Type "az" to use Azure CLI
Type "help" to learn about Cloud Shell

bcammett@Azure:~$
```

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

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

Service principal

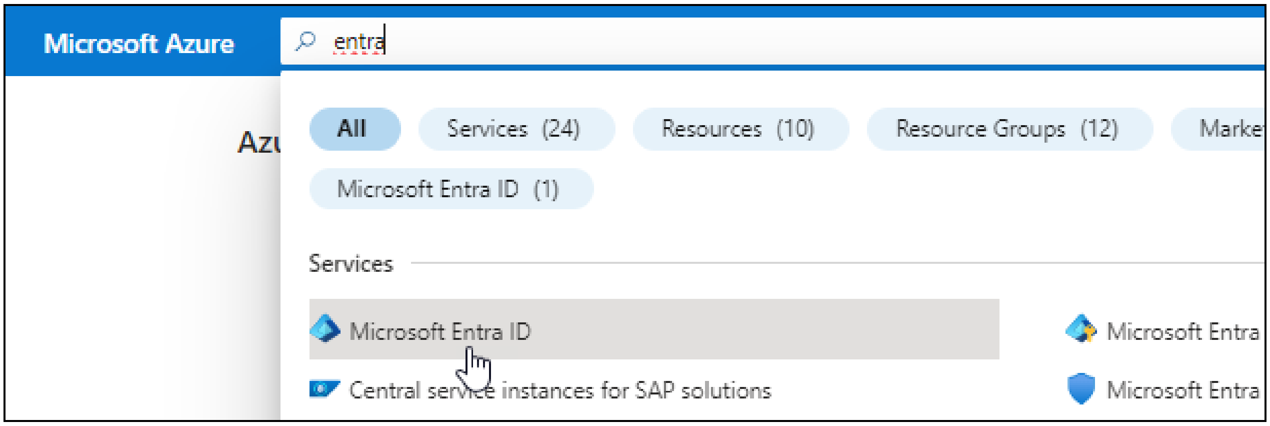
Create and set up a service principal in Microsoft Entra ID and obtain the Azure credentials that the Console agent needs.

Create a Microsoft Entra 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 **Microsoft Entra ID** 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 the NetApp Console).
   - **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 Console agent 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.

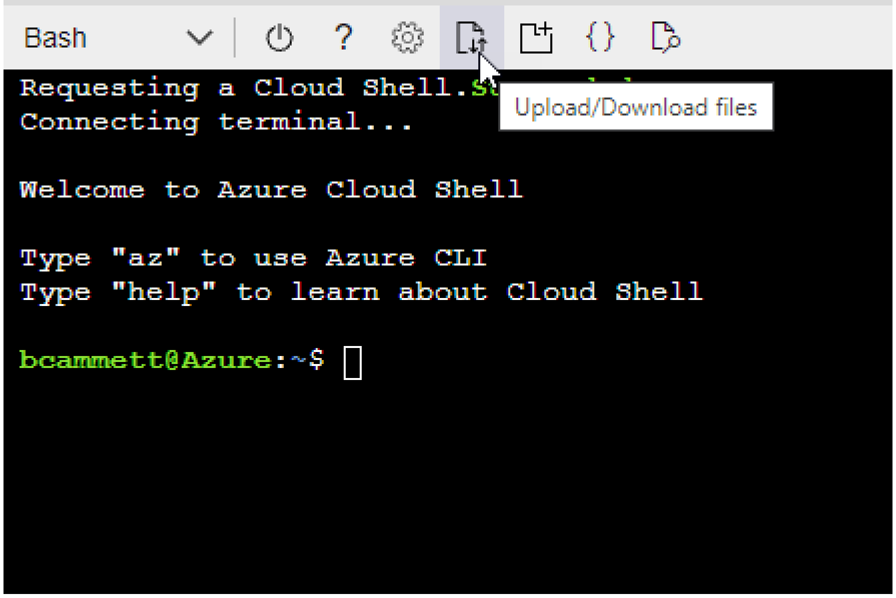
Example

```
"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.



```
Requesting a Cloud Shell.Su
Connecting terminal...

Welcome to Azure Cloud Shell

Type "az" to use Azure CLI
Type "help" to learn about Cloud Shell

bcammett@Azure:~$
```

- Use the Azure CLI to create the custom role:

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

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

2. Assign the application to the role:

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

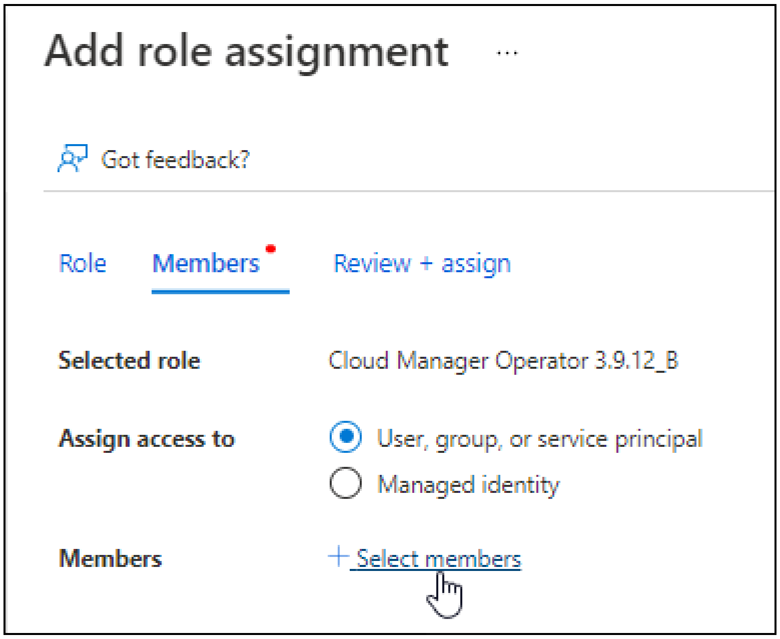
b. Select the subscription.

c. Select **Access control (IAM) > Add > Add role assignment**.

d. In the **Role** tab, select the **Console Operator** role and select **Next**.

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

   - Keep **User, group, or service principal** selected.
   - Select **Select members**.



Add role assignment ···

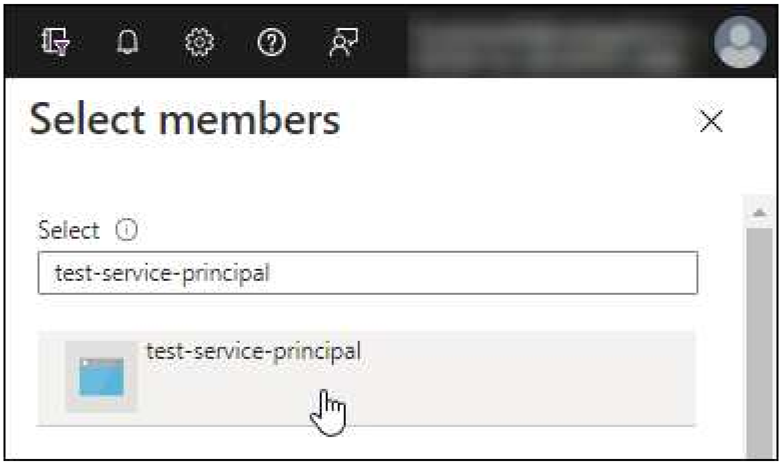
Selected role: Cloud Manager Operator 3.9.12_B

Assign access to: ● User, group, or service principal ○ Managed identity

Members: + Select members

   - Search for the name of the application.

     Here's an example:



Select members

Select ⓘ: test-service-principal

test-service-principal

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

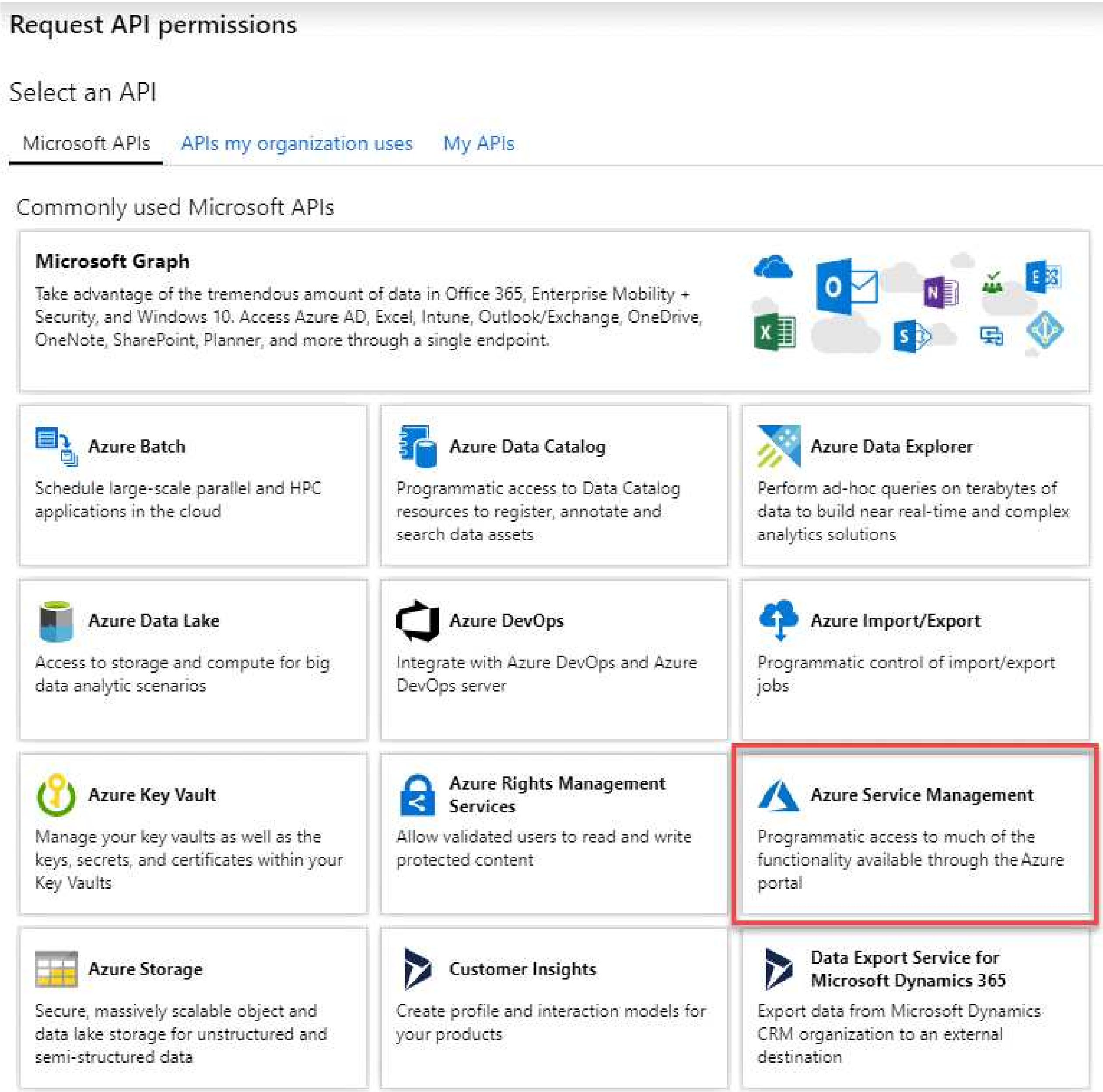
f. Select **Review + assign**.

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

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

Add Windows Azure Service Management API permissions

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



Request API permissions

Select an API

Microsoft APIs | APIs my organization uses | My APIs

Commonly used Microsoft APIs

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

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

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

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

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

Azure DevOps
Integrate with Azure DevOps and Azure DevOps server

Azure Import/Export
Programmatic control of import/export jobs

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

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

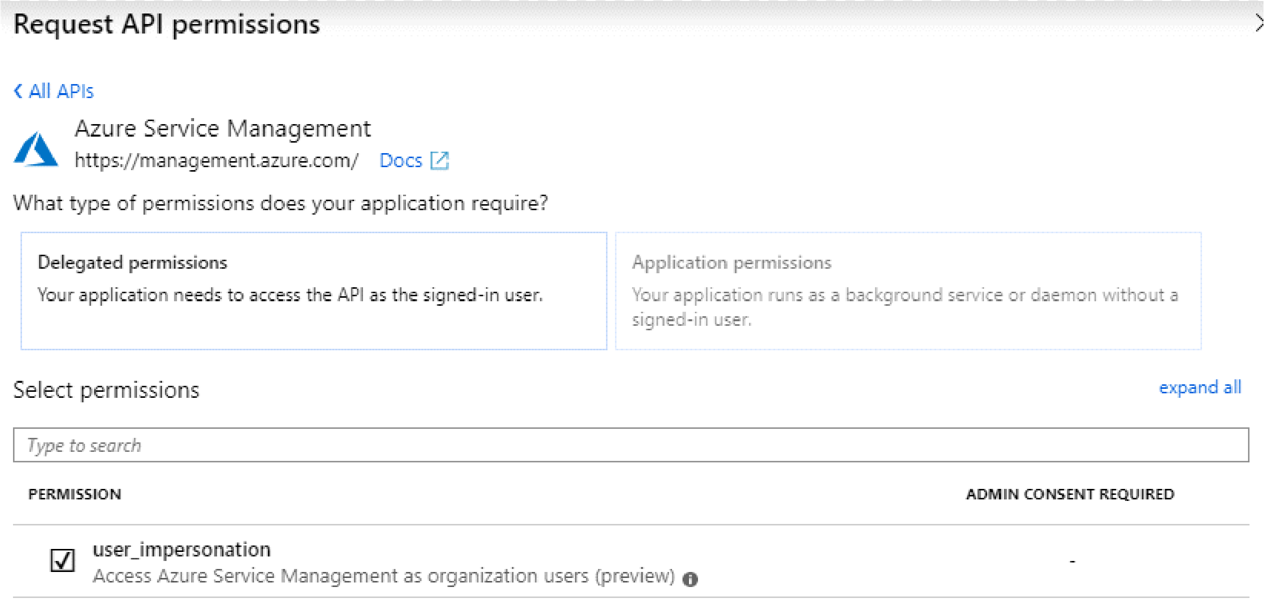
Azure Service Management
Programmatic access to much of the functionality available through the Azure portal

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

Customer Insights
Create profile and interaction models for your products

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

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



Request API permissions

‹ All APIs

Azure Service Management
https://management.azure.com/ Docs

What type of permissions does your application require?

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

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

Select permissions

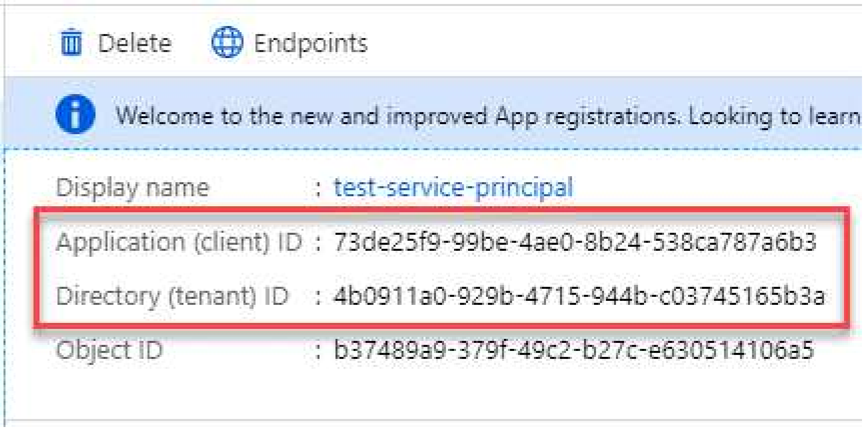
expand all

Type to search

PERMISSION	ADMIN CONSENT REQUIRED
☑ user_impersonation Access Azure Service Management as organization users (preview)	-

Get the application ID and directory ID for the application

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



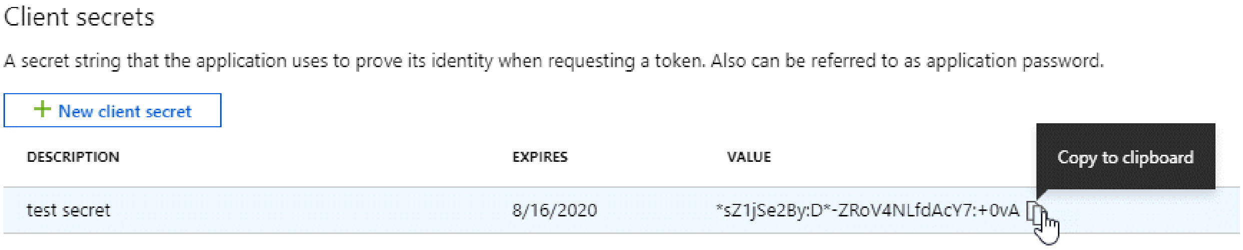
Welcome to the new and improved App registrations. Looking to learn

Display name : test-service-principal
Application (client) ID : 73de25f9-99be-4ae0-8b24-538ca787a6b3
Directory (tenant) ID : 4b0911a0-929b-4715-944b-c03745165b3a
Object ID : b37489a9-379f-49c2-b27c-e630514106a5

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

Create a client secret

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



Client secrets

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

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

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 the Console when you add an Azure account.

Step 5: Install the Console agent

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

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

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

  ⓘ You cannot set a certificate for a transparent proxy server when manually installing the Console agent. If you need to set a certificate for a transparent proxy server, you must use the Maintenance Console after installation. Learn more about the Agent Maintenance Console.

- 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

After installation, the Console agent automatically updates itself if a new version is available.

Steps

1. 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 fails.

2. Download the Console agent software and then copy it to the Linux host. You can download it either from the NetApp Console or the NetApp Support site.
   - NetApp Console: Go to **Agents > Management> Deploy agent > On-prem > Manual install**.

     Choose download the agent installer files or a URL to the files.

   - NetApp Support Site (needed if you don't already have access to the Console) NetApp Support Site,
3. Assign permissions to run the script.

   ```
   chmod +x NetApp_Console_Agent_Cloud_<version>
   ```

   Where <version> is the version of the Console agent that you downloaded.

4. If installing in a Government Cloud environment, disable the configuration checks. Learn how to disable configuration checks for manual installations.
5. Run the installation script.

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

   You'll need to add proxy information if your network requires a proxy for internet access. You can add an explicit proxy during installation. The `--proxy` and `--cacert` parameters are optional and you won't be prompted to add them. If you have an explicit proxy server, you will need to enter the parameters as shown.

> If you want to configure a transparent proxy, you can do so after you've installed. Learn about the agent maintenance console

+

Here is an example configuring an explicit proxy server with a CA-signed certificate:

+

```
./NetApp_Console_Agent_Cloud_v4.0.0--proxy
https://user:password@10.0.0.30:8080/ --cacert /tmp/cacert/certificate.cer
```

+
`--proxy` configures the Console agent to use an HTTP or HTTPS proxy server using one of the following formats:

+
* http://address:port
* http://user-name:password@address:port
* http://domain-name%92user-name:password@address:port
* https://address:port
* https://user-name:password@address:port

* https://domain-name%92user-name:password@address:port

+
Note the following:

+
The user can be a local user or domain user.
For a domain user, you must use the ASCII code for a \ as shown above.
The Console agent doesn’t support user names or passwords that include the @ character.
If the password includes any of the following special characters, you must escape that special character by prepending it with a backslash: & or !

+
For example:

+
http://bxpproxyuser:netapp1\!@address:3128

1. If you used Podman, you’ll need to adjust the aardvark-dns port.
    a. SSH to the Console agent virtual machine.
    b. Open podman */usr/share/containers/containers.conf* file and modify the chosen port for Aardvark DNS service. For example, change it to 54.

    ```
    vi /usr/share/containers/containers.conf
    ```

    For example:

    ```
    # Port to use for dns forwarding daemon with netavark in rootful
    bridge
    # mode and dns enabled.
    # Using an alternate port might be useful if other DNS services
    should
    # run on the machine.
    #
    dns_bind_port = 54
    ```

    c. Reboot the Console agent virtual machine.
2. Wait for the installation to complete.

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

ⓘ If the installation fails, you can view the installation report and logs to help you fix the issues. Learn how to troubleshoot installation issues.

1. Open a web browser from a host that has a connection to the Console agent virtual machine and enter the following URL:

https://*ipaddress*

2. After you log in, set up the Console agent:
    a. Specify the organization to associate with the Console agent.
    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 the Console in standard mode. You should enable restricted mode only if you have a secure environment and want to disconnect this account from backend services. If that’s the case, follow steps to get started with the NetApp Console in restricted mode.

    d. Select **Let’s start**.

If you have Azure Blob storage in the same Azure subscription where you created the Console agent, you’ll see an Azure Blob storage system appear on the **Systems** page automatically. Learn how to manage Azure Blob storage from NetApp Console

Step 6: Provide permissions to NetApp Console

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

Custom role

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

Steps

1. From the Azure Portal, open the **Subscriptions** service and select your subscription.

   It's important to assign the role from the **Subscriptions** service because this specifies the scope of the role assignment at the subscription level. The *scope* defines the set of resources that the access applies to. If you specify a scope at a different level (for example, at the virtual machine level), your ability to complete actions from within the NetApp Console will be affected.

   Microsoft Azure documentation: Understand scope for Azure RBAC

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

   > ⓘ Console Operator is the default name provided in the 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 Console agent virtual machine was created, under **Managed identity**, choose **Virtual machine**, and then select the Console agent 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.

What's next?

Go to the NetApp Console to start using the Console agent.

Service principal

Steps

1. Select **Administration > Credentials**.
2. Select **Add Credentials** and follow the steps in the wizard.
   a. **Credentials Location**: Select **Microsoft Azure > Agent**.
   b. **Define Credentials**: Enter information about the Microsoft Entra 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

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

Google Cloud

Console agent installation options in Google Cloud

There are a few different ways to create a Console agent in Google Cloud. Directly from the NetApp Console is the most common way.

The following installation options are available:

- Create the Console agent directly from the Console (this is the standard option)

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

- Create the Console agent using Google Platform

  This action also launches a VM instance running Linux and the Console agent software, but the deployment is initiated directly from Google Cloud, rather than from the Console.

- 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 the Console with the required permissions that it needs to authenticate and manage resources in Google Cloud.

Create a Console agent in Google Cloud from NetApp Console

You can create a Console agent in Google Cloud from the Console. You need to set up your networking, prepare Google Cloud permissions, enable Google Cloud APIs, and then create the Console agent.

Before you begin

- You should have an understanding of Console agents.
- You should review Console agent limitations.

Step 1: Set up networking

Set up networking to ensure the Console agent can manage resources, with connections to target networks and outbound internet access.

VPC and subnet

When you create the Console agent, you need to specify the VPC and subnet where it should reside.

Connections to target networks

The Console agent requires a network connection to the location where you're planning to create and manage systems. 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 Console agent must have an outbound internet connection to contact specific endpoints.

Endpoints contacted from the Console agent

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

The endpoints listed below are all CNAME entries.

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://config.googleapis.com/v1/projects	To manage resources in Google Cloud.
https://mysupport.netapp.com	To obtain licensing information and to send AutoSupport messages to NetApp support.
https://signin.b2c.netapp.com	To update NetApp Support Site (NSS) credentials or to add new NSS credentials to the NetApp Console.
https://support.netapp.com	To obtain licensing information and to send AutoSupport messages to NetApp support as well as to receive software updates for Cloud Volumes ONTAP.
https://api.bluexp.netapp.com https://netapp-cloud-account.auth0.com https://netapp-cloud-account.us.auth0.com https://console.netapp.com https://components.console.bluexp.netapp.com https://cdn.auth0.com	To provide features and services within the NetApp Console.

Endpoints	Purpose
https://bluexpinfraprod.eastus2.data.azurecr.io https://bluexpinfraprod.azurecr.io	To obtain images for Console agent upgrades. • When you deploy a new agent, the validation check tests connectivity to current endpoints. If you use previous endpoints, the validation check fails. To avoid this failure, skip the validation check. Although the previous endpoints are still supported, NetApp recommends updating your firewall rules to the current endpoints as soon as possible. Learn how to update your endpoint list. • When you update to the current endpoints in your firewall, your existing agents will continue to work.

Endpoints contacted from the NetApp console

As you use the web-based NetApp 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 Console agent from the the Console.

View the list of endpoints contacted from the NetApp console.

Proxy server

NetApp supports both explicit and transparent proxy configurations. If you are using a transparent proxy, you only need to provide the certificate for the proxy server. If you are using an explicit proxy, you'll also need the IP address and credentials.

- IP address
- Credentials
- HTTPS certificate

Ports

There's no incoming traffic to the Console agent, unless you initiate it or if it 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, the Console automatically configures those systems to use a proxy server that's included with the Console agent. The only requirement is to ensure that the Console agent's security group allows inbound connections over port 3128. You'll need to open this port after you deploy the Console agent.

Enable NTP

If you're planning to use NetApp Data Classification to scan your corporate data sources, you should enable a Network Time Protocol (NTP) service on both the Console agent and the NetApp Data Classification system so that the time is synchronized between the systems. Learn more about NetApp Data classification

Implement this networking requirement after creating the Console agent.

Step 2: Set up permissions to create the Console agent

Before you can deploy a Console agent from the Console, you need to set up permissions for the Google Platform user who deploys the Console agent VM.

Steps

1. Create a custom role in Google Platform:

   a. Create a YAML file that includes the following permissions:

```
title: Console agent deployment policy
description: Permissions for the user who deploys the Console agent
stage: GA
includedPermissions:

- cloudbuild.builds.get
- 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
- config.deployments.create
- config.operations.get
- config.deployments.delete
- config.deployments.deleteState
- config.deployments.get
- config.deployments.getState
- config.deployments.list
- config.deployments.update
- config.deployments.updateState
- config.previews.get
- config.previews.list
- config.revisions.get
- config.resources.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.actAs
- iam.serviceAccounts.create
- iam.serviceAccounts.list
- iam.serviceAccountKeys.create
- storage.buckets.create
- storage.buckets.get
- storage.objects.create
- storage.folders.create
- storage.objects.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 "agentDeployment" at the project level:

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

      Google Cloud docs: Creating and managing custom roles

2. Assign this custom role to the user who will deploy the Console agent from the Console or by using gcloud.

   Google Cloud docs: Grant a single role

Step 3: Create a Google Cloud service account to use with the agent

A Google Cloud service account is required to provide the Console agent with the permissions that the Console needs to manage resources in Google Cloud. When you create the Console agent, you'll need to associate this service account with the Console agent VM.

It's your responsibility to update the custom role as new permissions are added in subsequent releases. If new permissions are required, they will be listed in the release notes.

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 Console agent.

   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 "agent" at the project level:

      ```
      gcloud iam roles create connector --project=myproject --file=agent.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 Console agent resides, then you'll need to provide the Console agent's service account with access to those projects.

   For example, let's say the Console agent 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 Console agent's service account.
      - Select the Console agent's custom role.
      - Select **Save**.

   For more details, refer to Google Cloud documentation

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 agent	Custom	Service Project	Agent deployment policy	compute.networkUser	Deploying the agent in the service project
agent service account	Custom	Service project	Agent 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: NetApp Console service account as serviceAccount.user	N/A	(Optional) For NetApp Cloud Tiering and NetApp 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 the Console 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 the Console 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 the Console create them for you. The NetApp Console creates 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 the Console create them for you. These permissions reside in the Console 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 Cloud 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

You must enable several Google Cloud APIs before deploying the Console agent and Cloud Volumes ONTAP.

Step

1. Enable the following Google Cloud APIs in your project:
   - Cloud Infrastructure Manager API
   - 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 NetApp Backup and Recovery with customer-managed encryption keys (CMEK))

Google Cloud documentation: Enabling APIs

Step 6: Create the Console agent

Create a Console agent directly from the Console.

Creating the Console agent deploys a virtual machine instance in Google Cloud using a default configuration. Do not switch to a smaller VM instance with fewer CPUs or less RAM after creating the Console agent. Learn about the default configuration for the Console agent.

> ⓘ When you deploy an agent in Google Cloud, the agent creates a bucket to store deployment files.

Before you begin

You should have the following:

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

Steps

1. Select **Administration > Agents**.
2. On the **Overview** page, select **Deploy agent > Google Cloud**
3. On the **Deploying an agent** 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 Console agent:
   - 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.
- **Network tags**: Add a network tag to the Console agent instance if using a transparent proxy. Network tags must start with a lowercase letter and can contain lowercase letters, numbers, and hyphens. Tags must end with a lowercase letter or number. For example, you might use the tag "console-agent-proxy".
- **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

5. Review your selections to verify that your set up is correct.

   a. The **Validate agent configuration** check box is marked by default to have the Console validate the network connectivity requirements when you deploy. If the Console fails to deploy the agent, it provides a report to help you troubleshoot. If the deployment succeeds, no report is provided.

   > If you are still using the previous endpoints used for agent upgrades, the validation fails with an error. To avoid this, unmark the check box to skip the validation check.

6. Select **Add**.

   The agent is ready in approximately 10 minutes; stay on the page until the process completes.

Result

After the process completes, the Console agent is available for use.

> ⓘ If the deployment fails, you can download a report and logs from the Console to help you fix the issues. Learn how to troubleshoot installation issues.

If you have Google Cloud Storage buckets in the same Google Cloud account where you created the Console agent, you'll see a Google Cloud Storage system appear on the **Systems** page automatically. Learn how to manage Google Cloud Storage from the Console

Create a Console agent from Google Cloud

To create a Console agent in Google Cloud by using Google Cloud, you need to set up your networking, prepare Google Cloud permissions, enable Google Cloud APIs, and then create the Console agent.

Before you begin

- You should have a understanding of Console agents.
- You should review Console agent limitations.

Step 1: Set up networking

Set up networking to enable the Console agent to manage resources and connect to target networks and the internet.

VPC and subnet

When you create the Console agent, you need to specify the VPC and subnet where it should reside.

Connections to target networks

The Console agent requires a network connection to the location where you're planning to create and manage systems. 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 Console agent must have an outbound internet connection to contact specific endpoints.

Endpoints contacted from the Console agent

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

The endpoints listed below are all CNAME entries.

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://config.googleapis.com/v1/projects	To manage resources in Google Cloud.
https://mysupport.netapp.com	To obtain licensing information and to send AutoSupport messages to NetApp support.
https://signin.b2c.netapp.com	To update NetApp Support Site (NSS) credentials or to add new NSS credentials to the NetApp Console.
https://support.netapp.com	To obtain licensing information and to send AutoSupport messages to NetApp support as well as to receive software updates for Cloud Volumes ONTAP.
https://api.bluexp.netapp.com https://netapp-cloud-account.auth0.com https://netapp-cloud-account.us.auth0.com https://console.netapp.com https://components.console.bluexp.netapp.com https://cdn.auth0.com	To provide features and services within the NetApp Console.

Endpoints	Purpose
https://bluexpinfraprod.eastus2.data.azurecr.io https://bluexpinfraprod.azurecr.io	To obtain images for Console agent upgrades. • When you deploy a new agent, the validation check tests connectivity to current endpoints. If you use previous endpoints, the validation check fails. To avoid this failure, skip the validation check. Although the previous endpoints are still supported, NetApp recommends updating your firewall rules to the current endpoints as soon as possible. Learn how to update your endpoint list. • When you update to the current endpoints in your firewall, your existing agents will continue to work.

Endpoints contacted from the NetApp console

As you use the web-based NetApp 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 Console agent from the the Console.

View the list of endpoints contacted from the NetApp console.

Proxy server

NetApp supports both explicit and transparent proxy configurations. If you are using a transparent proxy, you only need to provide the certificate for the proxy server. If you are using an explicit proxy, you'll also need the IP address and credentials.

- IP address
- Credentials
- HTTPS certificate

Ports

There's no incoming traffic to the Console agent, unless you initiate it or if it 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, the Console automatically configures those systems to use a proxy server that's included with the Console agent. The only requirement is to ensure that the Console agent's security group allows inbound connections over port 3128. You'll need to open this port after you deploy the Console agent.

Enable NTP

If you’re planning to use NetApp Data Classification to scan your corporate data sources, you should enable a Network Time Protocol (NTP) service on both the Console agent and the NetApp Data Classification system so that the time is synchronized between the systems. Learn more about NetApp Data classification

Implement this networking requirement after creating the Console agent.

Step 2: Set up permissions to create the Console agent

Set up permissions for the Google Cloud user to deploy the Console agent VM from Google Cloud.

Steps

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

```
title: Console agent deployment policy
description: Permissions for the user who deploys the Console
agent
stage: GA
includedPermissions:

- cloudbuild.builds.get
- 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
- config.deployments.create
- config.operations.get
- config.deployments.delete
- config.deployments.deleteState
- config.deployments.get
- config.deployments.getState
- config.deployments.list
- config.deployments.update
- config.deployments.updateState
- config.previews.get
- config.previews.list
- config.revisions.get
- config.resources.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.actAs
- iam.serviceAccounts.create
- iam.serviceAccounts.list
- iam.serviceAccountKeys.create
- storage.buckets.create
- storage.buckets.get
- storage.objects.create
- storage.folders.create
- storage.objects.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 deploys the Console agent from Google Cloud.

   Google Cloud docs: Grant a single role

Step 3: Set up permissions for the Console agent operations

A Google Cloud service account is required to provide the Console agent with the permissions that the Console needs to manage resources in Google Cloud. When you create the Console agent, you'll need to associate this service account with the Console agent VM.

It's your responsibility to update the custom role as new permissions are added in subsequent releases. If new permissions are required, they will be listed in the release notes.

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 Console agent.
   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 "agent" at the project level:

      ```
      gcloud iam roles create connector --project=myproject --file=agent.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 Console agent resides, then you'll need to provide the Console agent's service account with access to those projects.

   For example, let's say the Console agent 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 Console agent's service account.

- Select the Console agent’s custom role.
- Select **Save**.

For more details, refer to Google Cloud documentation

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 agent	Custom	Service Project	Agent deployment policy	compute.network User	Deploying the agent in the service project
agent service account	Custom	Service project	Agent service account policy	compute.network User 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: NetApp Console service account as serviceAccount.user	N/A	(Optional) For NetApp Cloud Tiering and NetApp Backup and Recovery
Google APIs service agent	Google Cloud	Service project	(Default) Editor	compute.network User	Interacts with Google Cloud APIs on behalf of deployment. Allows the Console to use the shared network.
Google Compute Engine default service account	Google Cloud	Service project	(Default) Editor	compute.network User	Deploys Google Cloud instances and compute infrastructure on behalf of deployment. Allows the Console 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 the Console create them for you. The NetApp Console creates 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 the Console create them for you. These permissions reside in the Console 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 Cloud 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

Enable several Google Cloud APIs before deploying the Console agent and Cloud Volumes ONTAP.

Step

1. Enable the following Google Cloud APIs in your project:
   - Cloud Infrastructure Manager API
   - 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 NetApp Backup and Recovery with customer-managed encryption keys (CMEK))

Google Cloud documentation: Enabling APIs

Step 6: Create the Console agent

Create a Console agent by using Google Cloud.

Creating the Console agent deploys a VM instance in Google Cloud with the default configuration. Do not switch to a smaller VM instance with fewer CPUs or less RAM after you create the Console agent. Learn about the default configuration for the Console agent.

Before you begin

You should have the following:

- The required Google Cloud permissions to create the Console agent and a service account for the Console agent VM.
- A VPC and subnet that meets networking requirements.
- An understanding of VM instance requirements.
  - **CPU**: 8 cores or 8 vCPUs
  - **RAM**: 32 GB
  - **Machine type**: We recommend n2-standard-8.

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

Steps

1. Log in to the Google Cloud SDK using your preferred method.

   This example uses a local shell with the gcloud SDK installed, but you can also use the Google Cloud Shell.

   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-8
  --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 Console agent instance

network-path

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

subnet-path

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

kms-key-path

(Optional) Add a KMS key to encrypt the Console agent'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 Console agent. The Console agent instance and software should be running in approximately five minutes.

4. Open a web browser and enter the Console agent host URL:

   The Console host URL can be a localhost, a private IP address, or a public IP address, depending on the configuration of the host. For example, if the Console agent 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 Console agent host.

5. After you log in, set up the Console agent:
   1. Specify the Console organization to associate with the Console agent.

      Learn about identity and access management.

   2. Enter a name for the system.

Result

The Console agent is now installed and set up with your Console organization.

Open a web browser and go to the NetApp Console to start using the Console agent.

Manually install the Console agent in Google Cloud

To manually install the Console agent 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 Console, and then provide the permissions that you prepared.

Before you begin

- You should have an understanding of Console agents.
- You should review Console agent limitations.

Step 1: Review host requirements

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

> The Console agent reserves the UID and GID range of 19000 to 19200. This range is fixed and cannot be modified. If any third-party software on your host is using UIDs or GIDs within this range, the agent installation will fail. NetApp recommends using a host that is free of third-party software to avoid conflicts.

Dedicated host

The Console agent requires a dedicated host. Any architecture is supported if it meets these size requirements:

- CPU: 8 cores or 8 vCPUs
- RAM: 32 GB
- Disk space: 165 GB is recommended for the host, with the following partition requirements:
  - `/opt`: 120 GiB of space must be available

    The agent uses `/opt` to install the `/opt/application/netapp` directory and its contents.
  - `/var`: 40 GiB of space must be available

    The Console agent requires this space in `/var` because Podman or Docker are architected to create the containers within this directory. Specifically, they will create containers in the `/var/lib/containers/storage` directory and `/var/lib/docker` for Docker. External mounts or symlinks do not work for this space.

Google Cloud machine type

An instance type that meets CPU and RAM requirements. NetApp recommends n2-standard-8.

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

Hypervisor

A bare metal or hosted hypervisor that is certified to run a supported operating system is required.

Operating system and container requirements

The Console agent is supported with the following operating systems when using the Console in standard mode or restricted mode. A container orchestration tool is required before you install the agent.

Operating system	Supported OS versions	Supported agent versions	Required container tool	SELinux
Red Hat Enterprise Linux				

Operating system	Supported OS versions	Supported agent versions	Required container tool	SELinux
	9.6 • English language versions only. • 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 agent installation.	4.0.0 or later with the Console in standard mode or restricted mode	Podman version 5.4.0 with podman-compose 1.5.0. View Podman configuration requirements.	Supported in enforcing mode or permissive mode
	9.1 to 9.4 • English language versions only. • 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 agent installation.	3.9.50 or later with the Console in standard mode or restricted mode	Podman version 4.9.4 with podman-compose 1.5.0. View Podman configuration requirements.	Supported in enforcing mode or permissive mode

Operating system	Supported OS versions	Supported agent versions	Required container tool	SELinux
	8.6 to 8.10 • English language versions only. • 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 agent installation.	3.9.50 or later with the Console in standard mode or restricted mode	Podman version 4.6.1 or 4.9.4 with podman-compose 1.0.6. View Podman configuration requirements.	Supported in enforcing mode or permissive mode
Ubuntu				
	24.04 LTS	3.9.45 or later with the NetApp Console in standard mode or restricted mode	Docker Engine 23.06 to 28.0.0.	Not supported
	22.04 LTS	3.9.50 or later	Docker Engine 23.0.6 to 28.0.0.	Not supported

Google Cloud machine type

An instance type that meets CPU and RAM requirements. NetApp recommends n2-standard-8.

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

Step 2: Install Podman or Docker Engine

Depending on your operating system, either Podman or Docker Engine is required before installing the agent.

- Podman is required for Red Hat Enterprise Linux 8 and 9.

  View the supported Podman versions.

- Docker Engine is required for Ubuntu.

  View the supported Docker Engine versions.

Example 3. Steps

Podman

Follow these steps to install and configure Podman:

- Enable and start the podman.socket service
- Install python3
- Install the podman-compose package version 1.0.6
- Add podman-compose to the PATH environment variable
- If using Red Hat Enterprise Linux, verify that your Podman version is using Netavark Aardvark DNS instead of CNI

Adjust the aardvark-dns port (default: 53) after installing the agent to avoid DNS port conflicts. Follow the instructions to configure the port.

Steps

1. Remove the podman-docker package if it’s installed on the host.

   ```
   dnf remove podman-docker
   rm /var/run/docker.sock
   ```

2. Install Podman.

   You can obtain Podman from official Red Hat Enterprise Linux repositories.

   a. For Red Hat Enterprise Linux 9.6:

      ```
      sudo dnf install podman-5:<version>
      ```

      Where <version> is the supported version of Podman that you’re installing. View the supported Podman versions.

   b. For Red Hat Enterprise Linux 9.1 to 9.4:

      ```
      sudo dnf install podman-4:<version>
      ```

      Where <version> is the supported version of Podman that you’re installing. View the supported Podman versions.

   c. For Red Hat Enterprise Linux 8:

      ```
      sudo dnf install podman-4:<version>
      ```

      Where <version> is the supported version of Podman that you’re installing. View the supported Podman versions.

3. Enable and start the podman.socket service.

   ```
   sudo systemctl enable --now podman.socket
   ```

4. Install python3.

   ```
   sudo dnf install python3
   ```

5. Install the EPEL repository package if it’s not already available on your system.

   This step is required because podman-compose is available from the Extra Packages for Enterprise Linux (EPEL) repository.

6. If using Red Hat Enterprise 9:

   a. Install the EPEL repository package.

   ```
   sudo dnf install https://dl.fedoraproject.org/pub/epel/epel-release-latest-9.noarch.rpm
   ```

   a. Install podman-compose package 1.5.0.

   ```
   sudo dnf install podman-compose-1.5.0
   ```

7. If using Red Hat Enterprise Linux 8:

   a. Install the EPEL repository package.

   ```
   sudo dnf install https://dl.fedoraproject.org/pub/epel/epel-release-latest-8.noarch.rpm
   ```

   b. Install podman-compose package 1.0.6.

   ```
   sudo dnf install podman-compose-1.0.6
   ```

   > Using the `dnf install` command meets the requirement for adding podman-compose to the PATH environment variable. The installation command adds podman-compose to /usr/bin, which is already included in the `secure_path` option on the host.

   c. If using Red Hat Enterprise Linux 8, verify that your Podman version is using NetAvark with Aardvark DNS instead of CNI.

      i. Check to see if your networkBackend is set to CNI by running the following command:

```
podman info | grep networkBackend
```

ii. If the networkBackend is set to `CNI`, you'll need to change it to `netavark`.

iii. Install `netavark` and `aardvark-dns` using the following command:

```
dnf install aardvark-dns netavark
```

iv. Open the `/etc/containers/containers.conf` file and modify the network_backend option to use "netavark" instead of "cni".

If `/etc/containers/containers.conf` doesn't exist, make the configuration changes to `/usr/share/containers/containers.conf`.

v. Restart podman.

```
systemctl restart podman
```

vi. Confirm networkBackend is now changed to "netavark" using the following command:

```
podman info | grep networkBackend
```

Docker Engine

Follow the documentation from Docker to install Docker Engine.

Steps

1. View installation instructions from Docker

   Follow the steps to install a supported Docker Engine version. Do not install the latest version, as it is unsupported by the Console.

2. Verify that Docker is enabled and running.

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

Step 3: Set up networking

Set up your networking so the Console agent 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

The Console agent requires a network connection to the location where you're planning to create and manage systems. 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 Console agent must have an outbound internet connection to contact specific endpoints.

Endpoints contacted from computers when using the web-based NetApp Console

Computers that access the Console from a web browser must have the ability to contact several endpoints. You'll need to use the Console to set up the Console agent and for day-to-day use of the Console.

Prepare networking for the NetApp console.

Endpoints contacted from the Console agent

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

The endpoints listed below are all CNAME entries.

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://config.googleapis.com/v1/projects	To manage resources in Google Cloud.
https://mysupport.netapp.com	To obtain licensing information and to send AutoSupport messages to NetApp support.
https://signin.b2c.netapp.com	To update NetApp Support Site (NSS) credentials or to add new NSS credentials to the NetApp Console.
https://support.netapp.com	To obtain licensing information and to send AutoSupport messages to NetApp support as well as to receive software updates for Cloud Volumes ONTAP.
https://api.bluexp.netapp.com https://netapp-cloud-account.auth0.com https://netapp-cloud-account.us.auth0.com https://console.netapp.com https://components.console.bluexp.netapp.com https://cdn.auth0.com	To provide features and services within the NetApp Console.

Endpoints	Purpose
https://bluexpinfraprod.eastus2.data.azurecr.io https://bluexpinfraprod.azurecr.io	To obtain images for Console agent upgrades. • When you deploy a new agent, the validation check tests connectivity to current endpoints. If you use previous endpoints, the validation check fails. To avoid this failure, skip the validation check. Although the previous endpoints are still supported, NetApp recommends updating your firewall rules to the current endpoints as soon as possible. Learn how to update your endpoint list. • When you update to the current endpoints in your firewall, your existing agents will continue to work.

Proxy server

NetApp supports both explicit and transparent proxy configurations. If you are using a transparent proxy, you only need to provide the certificate for the proxy server. If you are using an explicit proxy, you'll also need the IP address and credentials.

- IP address
- Credentials
- HTTPS certificate

Ports

There's no incoming traffic to the Console agent, unless you initiate it or if it 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, the Console automatically configures those systems to use a proxy server that's included with the Console agent. The only requirement is to ensure that the Console agent's security group allows inbound connections over port 3128. You'll need to open this port after you deploy the Console agent.

Enable NTP

If you're planning to use NetApp Data Classification to scan your corporate data sources, you should enable a Network Time Protocol (NTP) service on both the Console agent and the NetApp Data Classification system so that the time is synchronized between the systems. Learn more about NetApp Data classification

Step 4: Set up permissions for the Console agent

A Google Cloud service account is required to provide the Console agent with the permissions that the

Console needs to manage resources in Google Cloud. When you create the Console agent, you'll need to associate this service account with the Console agent VM.

It's your responsibility to update the custom role as new permissions are added in subsequent releases. If new permissions are required, they will be listed in the release notes.

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 Console agent.
   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 "agent" at the project level:

      ```
      gcloud iam roles create connector --project=myproject --file=agent.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 Console agent resides, then you'll need to provide the Console agent's service account with access to those projects.

   For example, let's say the Console agent 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 Console agent's service account.
      - Select the Console agent's custom role.
      - Select **Save**.

   For more details, refer to Google Cloud documentation

Step 5: 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 agent	Custom	Service Project	Agent deployment policy	compute.network User	Deploying the agent in the service project
agent service account	Custom	Service project	Agent service account policy	compute.network User 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: NetApp Console service account as serviceAccount.user	N/A	(Optional) For NetApp Cloud Tiering and NetApp Backup and Recovery
Google APIs service agent	Google Cloud	Service project	(Default) Editor	compute.network User	Interacts with Google Cloud APIs on behalf of deployment. Allows the Console to use the shared network.
Google Compute Engine default service account	Google Cloud	Service project	(Default) Editor	compute.network User	Deploys Google Cloud instances and compute infrastructure on behalf of deployment. Allows the Console 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 the Console create them for you. The NetApp Console creates 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 the Console create them for you. These permissions reside in the Console 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 Cloud 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 6: Enable Google Cloud APIs

Several Google Cloud APIs must be enabled before you can deploy a Console agent in Google Cloud.

Step

1. Enable the following Google Cloud APIs in your project:
    - Cloud Infrastructure Manager API
    - 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 NetApp Backup and Recovery with customer-managed encryption keys (CMEK))

Google Cloud documentation: Enabling APIs

Step 7: Install the Console agent

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

When you deploy an agent, the system also creates a Google Cloud bucket to store deployment files.

Before you begin

You should have the following:

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

  You have the option to configure a proxy server after installation but doing so requires restarting the Console agent.
- A CA-signed certificate, if the proxy server uses HTTPS or if the proxy is an intercepting proxy.

> ⓘ You cannot set a certificate for a transparent proxy server when manually installing the Console agent. If you need to set a certificate for a transparent proxy server, you must use the Maintenance Console after installation. Learn more about the Agent Maintenance Console.

About this task

After installation, the Console agent automatically updates itself if a new version is available.

Steps

1. 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 fails.

2. Download the Console agent software and then copy it to the Linux host. You can download it either from the NetApp Console or the NetApp Support site.
   - NetApp Console: Go to **Agents > Management> Deploy agent > On-prem > Manual install**.

     Choose download the agent installer files or a URL to the files.
   - NetApp Support Site (needed if you don't already have access to the Console) NetApp Support Site,
3. Assign permissions to run the script.

   ```
   chmod +x NetApp_Console_Agent_Cloud_<version>
   ```

   Where <version> is the version of the Console agent that you downloaded.
4. If installing in a Government Cloud environment, disable the configuration checks. Learn how to disable configuration checks for manual installations.
5. Run the installation script.

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

   You'll need to add proxy information if your network requires a proxy for internet access. You can add an explicit proxy during installation. The `--proxy` and `--cacert` parameters are optional and you won't be prompted to add them. If you have an explicit proxy server, you will need to enter the parameters as shown.

> If you want to configure a transparent proxy, you can do so after you've installed. Learn about the agent maintenance console

+

Here is an example configuring an explicit proxy server with a CA-signed certificate:

+

```
./NetApp_Console_Agent_Cloud_v4.0.0--proxy
https://user:password@10.0.0.30:8080/ --cacert /tmp/cacert/certificate.cer
```

+
`--proxy` configures the Console agent to use an HTTP or HTTPS proxy server using one of the following formats:

+
* http://address:port
* http://user-name:password@address:port
* http://domain-name%92user-name:password@address:port

* https://address:port
* https://user-name:password@address:port
* https://domain-name%92user-name:password@address:port

+
Note the following:

+
The user can be a local user or domain user.
For a domain user, you must use the ASCII code for a \ as shown above.
The Console agent doesn’t support user names or passwords that include the @ character.
If the password includes any of the following special characters, you must escape that special character by prepending it with a backslash: & or !

+
For example:

+
http://bxpproxyuser:netapp1\!@address:3128

1. If you used Podman, you’ll need to adjust the aardvark-dns port.
   a. SSH to the Console agent virtual machine.
   b. Open podman */usr/share/containers/containers.conf* file and modify the chosen port for Aardvark DNS service. For example, change it to 54.

      ```
      vi /usr/share/containers/containers.conf
      ```

      For example:

      ```
      # Port to use for dns forwarding daemon with netavark in rootful
      bridge
      # mode and dns enabled.
      # Using an alternate port might be useful if other DNS services
      should
      # run on the machine.
      #
      dns_bind_port = 54
      ```

   c. Reboot the Console agent virtual machine.
2. Wait for the installation to complete.

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

ⓘ If the installation fails, you can view the installation report and logs to help you fix the issues. Learn how to troubleshoot installation issues.

1. Open a web browser from a host that has a connection to the Console agent virtual machine and enter the following URL:

   https://*ipaddress*

2. After you log in, set up the Console agent:

   a. Specify the organization to associate with the Console agent.

   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 the Console in standard mode. You should enable restricted mode only if you have a secure environment and want to disconnect this account from backend services. If that's the case, follow steps to get started with the NetApp Console in restricted mode.

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

   ⓘ If the installation fails, you can view logs and a report to help you troubleshoot. Learn how to troubleshoot installation issues.

If you have Google Cloud Storage buckets in the same Google Cloud account where you created the Console agent, you'll see a Google Cloud Storage system appear on the **Systems** page automatically. Learn how to manage Google Cloud Storage from the NetApp Console

Step 8: Provide permissions to Console agent

You need to provide the Console agent with the Google Cloud permissions that you previously set up. Providing the permissions enables the Console agent 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 Console agent 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 Console agent role to that project. You'll need to repeat this step for each project.

Install an agent on-premises

Manually install a Console agent on-premises

Install a Console agent on-premises and then log in and set it up to work with your Console organization.

ⓘ If you are a VMWare user, you can use an OVA to install a Console agent in your VCenter. Learn more about installing an agent in a VCenter.

Before you install, you'll need to ensure your host (VM or Linux host) meets requirements and ensure that the Console agent will have outbound access to the internet as well as targeted networks. If you plan to NetApp data services, or cloud storage options such as Cloud Volumes ONTAP, you'll need to create credentials in your cloud provider to add to the Console so that the Console agent can perform actions in the cloud on your behalf.

Prepare to install the Console agent

Before you install a Console agent, you should ensure you have a host machine that meets installation requirements. You'll also need to work with your network administrator to ensure that the Console agent has outbound access to required endpoints and connections to targeted networks.

Review Console agent host requirements

Run the Console agent on a x86 host that meets operating system, RAM, and port requirements. Ensure that your host meets these requirements before you install the Console agent.

> ⓘ The Console agent reserves the UID and GID range of 19000 to 19200. This range is fixed and cannot be modified. If any third-party software on your host is using UIDs or GIDs within this range, the agent installation will fail. NetApp recommends using a host that is free of third-party software to avoid conflicts.

Dedicated host

The Console agent requires a dedicated host. Any architecture is supported if it meets these size requirements:

- CPU: 8 cores or 8 vCPUs
- RAM: 32 GB
- Disk space: 165 GB is recommended for the host, with the following partition requirements:
  - `/opt`: 120 GiB of space must be available

    The agent uses `/opt` to install the `/opt/application/netapp` directory and its contents.
  - `/var`: 40 GiB of space must be available

    The Console agent requires this space in `/var` because Podman or Docker are architected to create the containers within this directory. Specifically, they will create containers in the `/var/lib/containers/storage` directory and `/var/lib/docker` for Docker. External mounts or symlinks do not work for this space.

Hypervisor

A bare metal or hosted hypervisor that is certified to run a supported operating system is required.

Operating system and container requirements

The Console agent is supported with the following operating systems when using the Console in standard mode or restricted mode. A container orchestration tool is required before you install the agent.

Operating system	Supported OS versions	Supported agent versions	Required container tool	SELinux
Red Hat Enterprise Linux				

Operating system	Supported OS versions	Supported agent versions	Required container tool	SELinux
	9.6 - English language versions only. - 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 agent installation.	4.0.0 or later with the Console in standard mode or restricted mode	Podman version 5.4.0 with podman-compose 1.5.0. View Podman configuration requirements.	Supported in enforcing mode or permissive mode
	9.1 to 9.4 - English language versions only. - 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 agent installation.	3.9.50 or later with the Console in standard mode or restricted mode	Podman version 4.9.4 with podman-compose 1.5.0. View Podman configuration requirements.	Supported in enforcing mode or permissive mode

Operating system	Supported OS versions	Supported agent versions	Required container tool	SELinux
	8.6 to 8.10 - English language versions only. - 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 agent installation.	3.9.50 or later with the Console in standard mode or restricted mode	Podman version 4.6.1 or 4.9.4 with podman-compose 1.0.6. View Podman configuration requirements.	Supported in enforcing mode or permissive mode
Ubuntu				
	24.04 LTS	3.9.45 or later with the NetApp Console in standard mode or restricted mode	Docker Engine 23.06 to 28.0.0.	Not supported
	22.04 LTS	3.9.50 or later	Docker Engine 23.0.6 to 28.0.0.	Not supported

Set up network access for the Console agent

Set up network access to ensure the Console agent can manage resources. It needs connections to target networks and outbound internet access to specific endpoints.

Connections to target networks

The Console agent requires a network connection to the location where you're planning to create and manage systems. 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 Console agent must have an outbound internet connection to contact specific endpoints.

Endpoints contacted from computers when using the web-based NetApp Console

Computers that access the Console from a web browser must have the ability to contact several endpoints. You'll need to use the Console to set up the Console agent and for day-to-day use of the Console.

Prepare networking for the NetApp console.

Endpoints contacted from the Console agent

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

The endpoints listed below are all CNAME entries.

> ⓘ A Console agent installed on your premises cannot manage resources in Google Cloud. If you want to manage Google Cloud resources, you need to install an agent in Google Cloud.

AWS

When the Console agent is installed on-premises, it needs network access to the following AWS endpoints in order to manage NetApp systems (such as Cloud Volumes ONTAP) deployed in AWS.

Endpoints contacted from the Console agent

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

The endpoints listed below are all CNAME entries.

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 AWS resources. The endpoint depends on your AWS region. Refer to AWS documentation for details
Amazon FsX for NetApp ONTAP: • api.workloads.netapp.com	The web-based console contacts this endpoint to interact with the Workload Factory APIs to manage and operate FSx for ONTAP based workloads.
https://mysupport.netapp.com	To obtain licensing information and to send AutoSupport messages to NetApp support.
https://signin.b2c.netapp.com	To update NetApp Support Site (NSS) credentials or to add new NSS credentials to the NetApp Console.
https://support.netapp.com	To obtain licensing information and to send AutoSupport messages to NetApp support as well as to receive software updates for Cloud Volumes ONTAP.
https://api.bluexp.netapp.com https://netapp-cloud-account.auth0.com https://netapp-cloud-account.us.auth0.com https://console.netapp.com https://components.console.bluexp.netapp.com https://cdn.auth0.com	To provide features and services within the NetApp Console.

Endpoints	Purpose
https://bluexpinfraprod.eastus2.data.azurecr.io https://bluexpinfraprod.azurecr.io	To obtain images for Console agent upgrades. • When you deploy a new agent, the validation check tests connectivity to current endpoints. If you use previous endpoints, the validation check fails. To avoid this failure, skip the validation check. Although the previous endpoints are still supported, NetApp recommends updating your firewall rules to the current endpoints as soon as possible. Learn how to update your endpoint list. • When you update to the current endpoints in your firewall, your existing agents will continue to work.

Azure

When the Console agent is installed on-premises, it needs network access to the following Azure endpoints in order to manage NetApp systems (such as Cloud Volumes ONTAP) deployed in Azure.

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://mysupport.netapp.com	To obtain licensing information and to send AutoSupport messages to NetApp support.
https://signin.b2c.netapp.com	To update NetApp Support Site (NSS) credentials or to add new NSS credentials to the NetApp Console.
https://support.netapp.com	To obtain licensing information and to send AutoSupport messages to NetApp support as well as to receive software updates for Cloud Volumes ONTAP.

Endpoints	Purpose
https://api.bluexp.netapp.com https://netapp-cloud-account.auth0.com https://netapp-cloud-account.us.auth0.com https://console.netapp.com https://components.console.bluexp.netapp.com https://cdn.auth0.com	To provide features and services within the NetApp Console.
https://bluexpinfraprod.eastus2.data.azurecr.io https://bluexpinfraprod.azurecr.io	To obtain images for Console agent upgrades. • When you deploy a new agent, the validation check tests connectivity to current endpoints. If you use previous endpoints, the validation check fails. To avoid this failure, skip the validation check. Although the previous endpoints are still supported, NetApp recommends updating your firewall rules to the current endpoints as soon as possible. Learn how to update your endpoint list. • When you update to the current endpoints in your firewall, your existing agents will continue to work.

Proxy server

NetApp supports both explicit and transparent proxy configurations. If you are using a transparent proxy, you only need to provide the certificate for the proxy server. If you are using an explicit proxy, you'll also need the IP address and credentials.

- IP address
- Credentials
- HTTPS certificate

Ports

There's no incoming traffic to the Console agent, unless you initiate it or if it 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, the Console automatically configures those systems to use a proxy server that's included with the Console agent. The only requirement is to ensure that the Console agent's security group allows inbound connections over port 3128. You'll need to open this port after you deploy the Console agent.

Enable NTP

If you’re planning to use NetApp Data Classification to scan your corporate data sources, you should enable a Network Time Protocol (NTP) service on both the Console agent and the NetApp Data Classification system so that the time is synchronized between the systems. Learn more about NetApp Data classification

Create Console agent cloud permissions for AWS or Azure

If you want to use NetApp data services in AWS or Azure with an on-premises Console agent, then you need to set up permissions in your cloud provider and then you add the credentials to the Console agent after you install it.

> You must install the Console agent in Google Cloud to manage any resources that reside there.

AWS

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

You must use this authentication method if the Console agent 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 Console agent.
   c. Finish the remaining steps to create the policy.

      Depending on the NetApp data 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 Console agent.
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 the NetApp Console after you install the Console agent.

Result

You should now have access keys for an IAM user who has the required permissions. After you install the Console agent, associate these credentials with the Console agent from the Console.

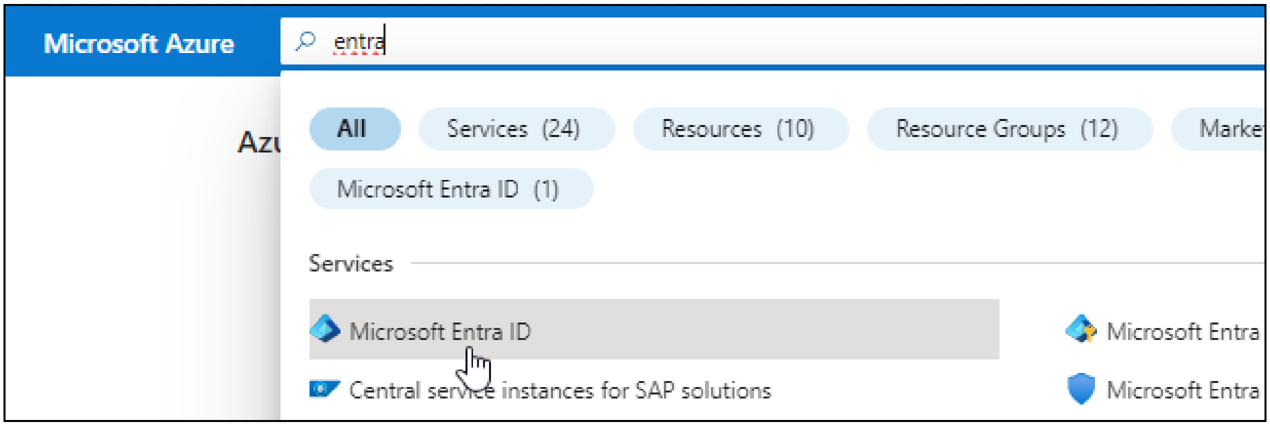
Azure

When the Console agent is installed on-premises, you need to provide the Console agent with Azure permissions by setting up a service principal in Microsoft Entra ID and obtaining the Azure credentials that the Console agent needs.

Create a Microsoft Entra 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 **Microsoft Entra ID** 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 the NetApp Console).
   - **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 Console agent 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.

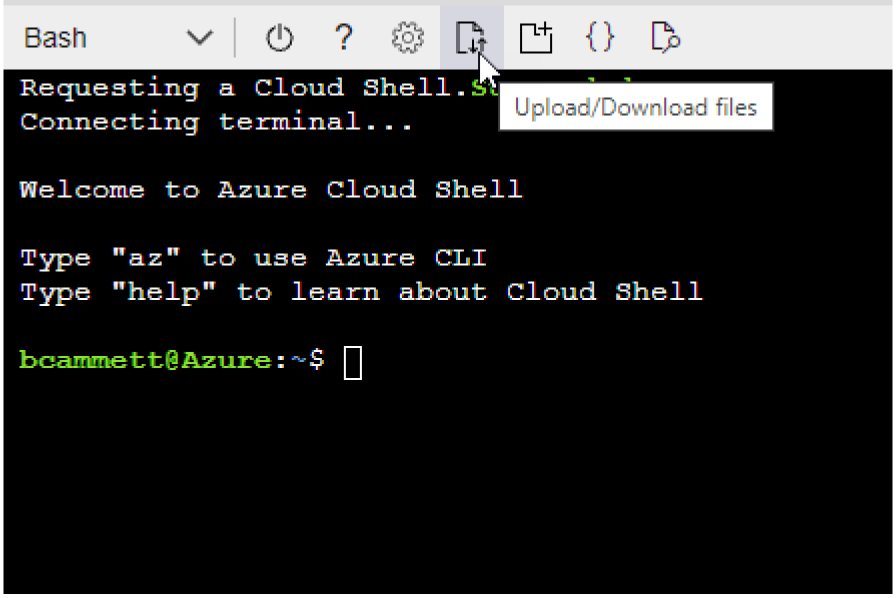
   Example

```
"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.



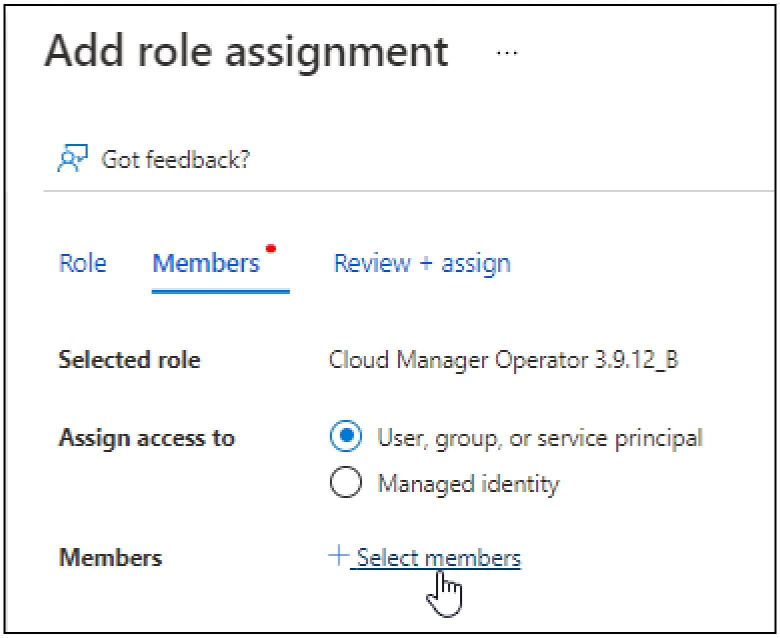
```
Requesting a Cloud Shell.Su
Connecting terminal...

Welcome to Azure Cloud Shell

Type "az" to use Azure CLI
Type "help" to learn about Cloud Shell

bcammett@Azure:~$ 
```

- Use the Azure CLI to create the custom role:

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

You should now have a custom role called Console Operator that you can assign to the Console agent 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 **Console Operator** role and select **Next**.
   e. In the **Members** tab, complete the following steps:
      - Keep **User, group, or service principal** selected.
      - Select **Select members**.



Add role assignment ...

Got feedback?

Role | Members | Review + assign

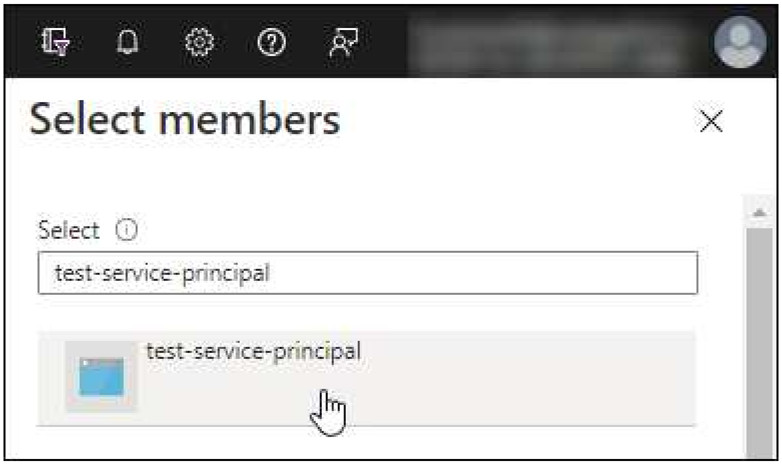
Selected role: Cloud Manager Operator 3.9.12_B

Assign access to:
● User, group, or service principal
○ Managed identity

Members: + Select members

- Search for the name of the application.

  Here's an example:



Select members

Select ⓘ

test-service-principal

test-service-principal

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

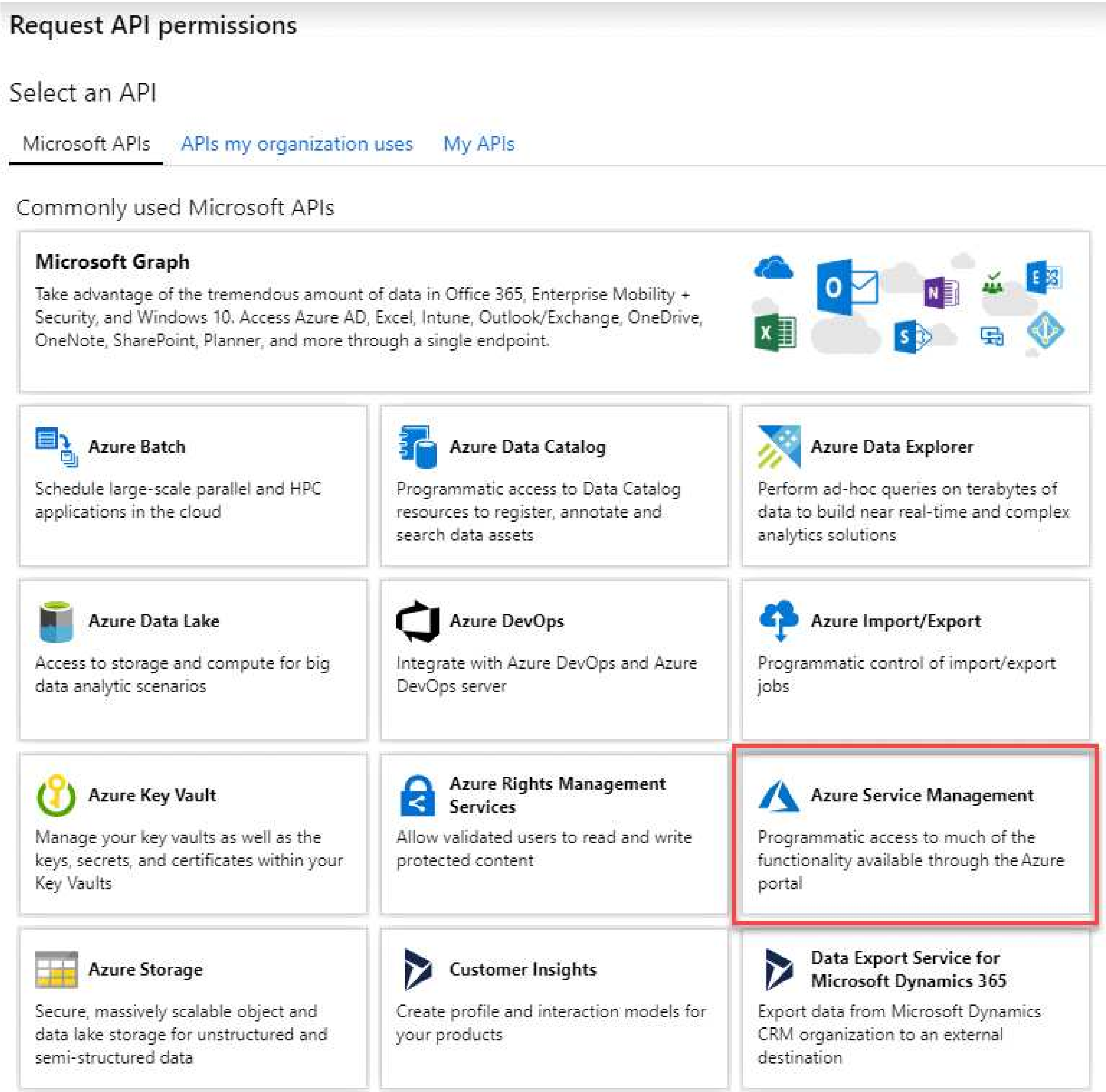
f. Select **Review + assign**.

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

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

Add Windows Azure Service Management API permissions

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



Request API permissions

Select an API

Microsoft APIs | APIs my organization uses | My APIs

Commonly used Microsoft APIs

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

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

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

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

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

Azure DevOps
Integrate with Azure DevOps and Azure DevOps server

Azure Import/Export
Programmatic control of import/export jobs

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

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

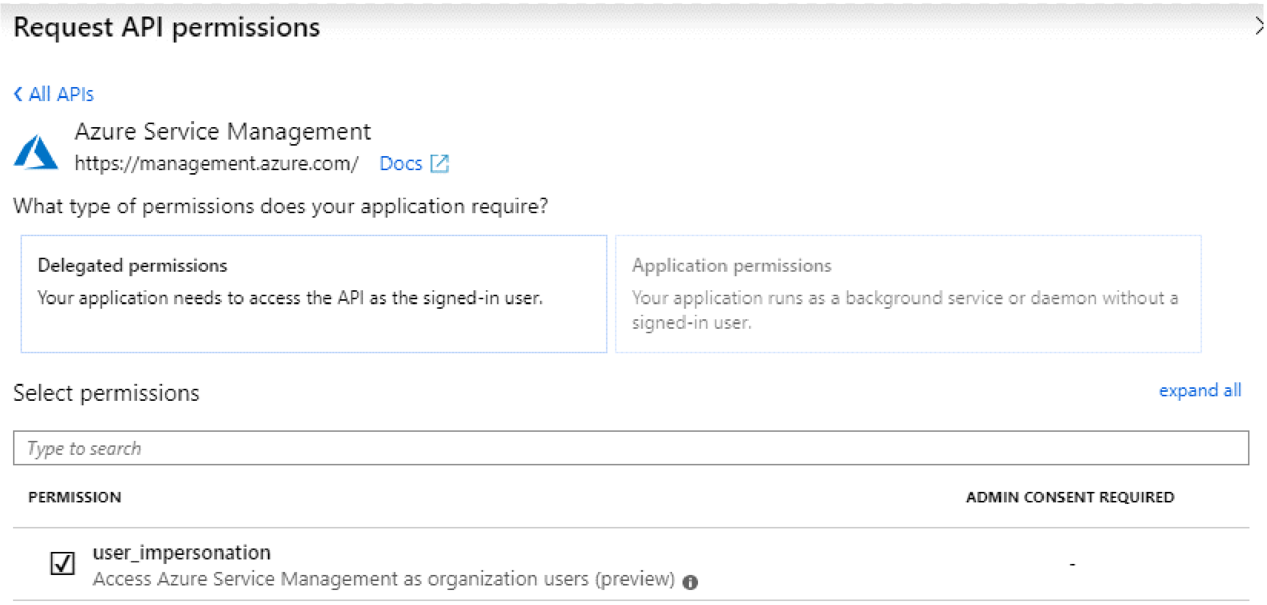
Azure Service Management
Programmatic access to much of the functionality available through the Azure portal

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

Customer Insights
Create profile and interaction models for your products

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

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



Request API permissions

‹ All APIs

Azure Service Management
https://management.azure.com/ Docs

What type of permissions does your application require?

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

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

Select permissions

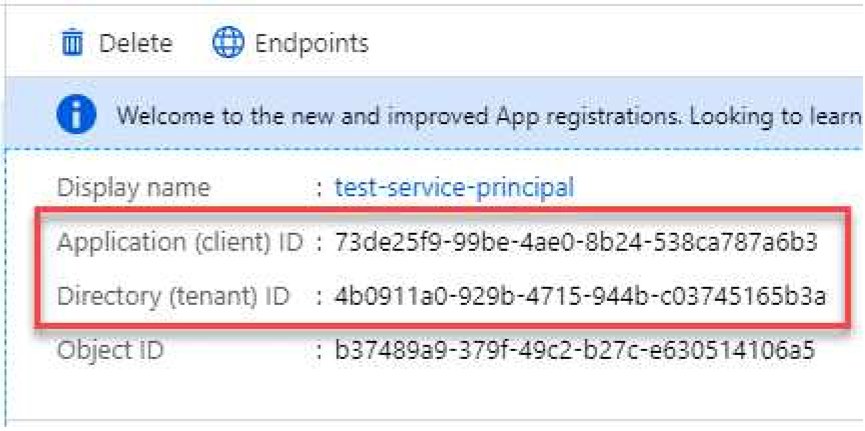
expand all

Type to search

PERMISSION	ADMIN CONSENT REQUIRED
☑ user_impersonation Access Azure Service Management as organization users (preview)	-

Get the application ID and directory ID for the application

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



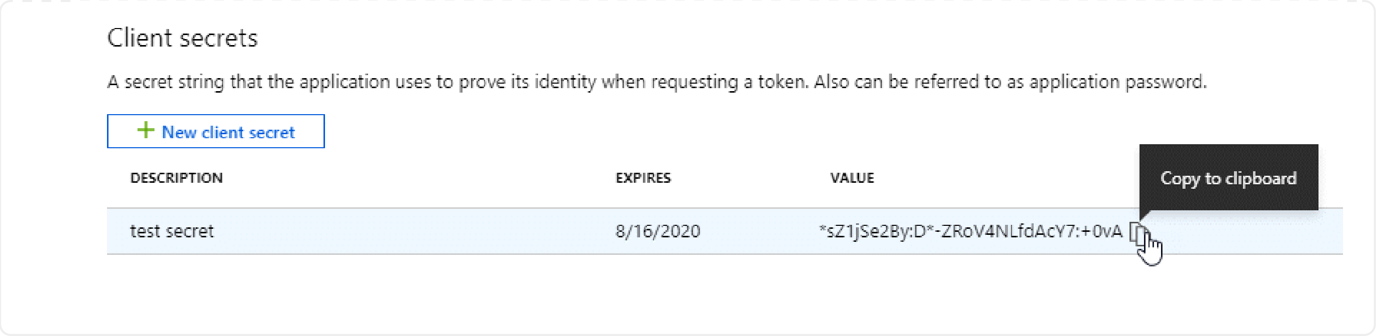
Welcome to the new and improved App registrations. Looking to learn

Display name : test-service-principal
Application (client) ID : 73de25f9-99be-4ae0-8b24-538ca787a6b3
Directory (tenant) ID : 4b0911a0-929b-4715-944b-c03745165b3a
Object ID : b37489a9-379f-49c2-b27c-e630514106a5

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

Create a client secret

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



Client secrets

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

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

Manually install a Console agent

When you manually install a Console agent, you need to prepare your machine environment so that it meets requirements. You'll need an Linux machine and you'll need to install Podman or Docker, depending on your Linux operating system.

Install Podman or Docker Engine

Depending on your operating system, either Podman or Docker Engine is required before installing the agent.

- Podman is required for Red Hat Enterprise Linux 8 and 9.

  View the supported Podman versions.

- Docker Engine is required for Ubuntu.

  View the supported Docker Engine versions.

Example 4. Steps

Podman

Follow these steps to install and configure Podman:

- Enable and start the podman.socket service
- Install python3
- Install the podman-compose package version 1.0.6
- Add podman-compose to the PATH environment variable
- If using Red Hat Enterprise Linux, verify that your Podman version is using Netavark Aardvark DNS instead of CNI

ⓘ Adjust the aardvark-dns port (default: 53) after installing the agent to avoid DNS port conflicts. Follow the instructions to configure the port.

Steps

1. Remove the podman-docker package if it’s installed on the host.

   ```
   dnf remove podman-docker
   rm /var/run/docker.sock
   ```

2. Install Podman.

   You can obtain Podman from official Red Hat Enterprise Linux repositories.

   a. For Red Hat Enterprise Linux 9.6:

      ```
      sudo dnf install podman-5:<version>
      ```

      Where <version> is the supported version of Podman that you’re installing. View the supported Podman versions.

   b. For Red Hat Enterprise Linux 9.1 to 9.4:

      ```
      sudo dnf install podman-4:<version>
      ```

      Where <version> is the supported version of Podman that you’re installing. View the supported Podman versions.

   c. For Red Hat Enterprise Linux 8:

      ```
      sudo dnf install podman-4:<version>
      ```

      Where <version> is the supported version of Podman that you’re installing. View the supported Podman versions.

3. Enable and start the podman.socket service.

   ```
   sudo systemctl enable --now podman.socket
   ```

4. Install python3.

   ```
   sudo dnf install python3
   ```

5. Install the EPEL repository package if it’s not already available on your system.

   This step is required because podman-compose is available from the Extra Packages for Enterprise Linux (EPEL) repository.

6. If using Red Hat Enterprise 9:

   a. Install the EPEL repository package.

   ```
   sudo dnf install https://dl.fedoraproject.org/pub/epel/epel-release-
   latest-9.noarch.rpm
   ```

   a. Install podman-compose package 1.5.0.

   ```
   sudo dnf install podman-compose-1.5.0
   ```

7. If using Red Hat Enterprise Linux 8:

   a. Install the EPEL repository package.

   ```
   sudo dnf install https://dl.fedoraproject.org/pub/epel/epel-
   release-latest-8.noarch.rpm
   ```

   b. Install podman-compose package 1.0.6.

   ```
   sudo dnf install podman-compose-1.0.6
   ```

   > ⓘ Using the `dnf install` command meets the requirement for adding podman-compose to the PATH environment variable. The installation command adds podman-compose to /usr/bin, which is already included in the `secure_path` option on the host.

   c. If using Red Hat Enterprise Linux 8, verify that your Podman version is using NetAvark with Aardvark DNS instead of CNI.

      i. Check to see if your networkBackend is set to CNI by running the following command:

```
podman info | grep networkBackend
```

ii. If the networkBackend is set to `CNI`, you'll need to change it to `netavark`.

iii. Install `netavark` and `aardvark-dns` using the following command:

```
dnf install aardvark-dns netavark
```

iv. Open the `/etc/containers/containers.conf` file and modify the network_backend option to use "netavark" instead of "cni".

If `/etc/containers/containers.conf` doesn't exist, make the configuration changes to `/usr/share/containers/containers.conf`.

v. Restart podman.

```
systemctl restart podman
```

vi. Confirm networkBackend is now changed to "netavark" using the following command:

```
podman info | grep networkBackend
```

Docker Engine

Follow the documentation from Docker to install Docker Engine.

Steps

1. View installation instructions from Docker

   Follow the steps to install a supported Docker Engine version. Do not install the latest version, as it is unsupported by the Console.

2. Verify that Docker is enabled and running.

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

Install the Console agent manually

Download and install the Console agent software on an existing Linux host on-premises.

Before you begin

You should have the following:

- Root privileges to install the Console agent.

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

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

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

> You cannot set a certificate for a transparent proxy server when manually installing the Console agent. If you need to set a certificate for a transparent proxy server, you must use the Maintenance Console after installation. Learn more about the Agent Maintenance Console.

About this task

After installation, the Console agent automatically updates itself if a new version is available.

Steps

1. 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 fails.

2. Download the Console agent software and then copy it to the Linux host. You can download it either from the NetApp Console or the NetApp Support site.
   - NetApp Console: Go to **Agents > Management> Deploy agent > On-prem > Manual install**.

     Choose download the agent installer files or a URL to the files.

   - NetApp Support Site (needed if you don’t already have access to the Console) NetApp Support Site,

3. Assign permissions to run the script.

   ```
   chmod +x NetApp_Console_Agent_Cloud_<version>
   ```

   Where <version> is the version of the Console agent that you downloaded.

4. If installing in a Government Cloud environment, disable the configuration checks. Learn how to disable configuration checks for manual installations.

5. Run the installation script.

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

   You’ll need to add proxy information if your network requires a proxy for internet access. You can add an explicit proxy during installation. The `--proxy` and `--cacert` parameters are optional and you won’t be prompted to add them. If you have an explicit proxy server, you will need to enter the parameters as shown.

If you want to configure a transparent proxy, you can do so after you’ve installed. Learn about the agent maintenance console

+

Here is an example configuring an explicit proxy server with a CA-signed certificate:

+

```
./NetApp_Console_Agent_Cloud_v4.0.0--proxy
https://user:password@10.0.0.30:8080/ --cacert /tmp/cacert/certificate.cer
```

+
`--proxy` configures the Console agent to use an HTTP or HTTPS proxy server using one of the following formats:

+
* http://address:port
* http://user-name:password@address:port
* http://domain-name%92user-name:password@address:port
* https://address:port
* https://user-name:password@address:port
* https://domain-name%92user-name:password@address:port

+
Note the following:

+
The user can be a local user or domain user.
For a domain user, you must use the ASCII code for a \ as shown above.
The Console agent doesn’t support user names or passwords that include the @ character.
If the password includes any of the following special characters, you must escape that special character by prepending it with a backslash: & or !

+
For example:

+
http://bxpproxyuser:netapp1\!@address:3128

1. If you used Podman, you’ll need to adjust the aardvark-dns port.

   a. SSH to the Console agent virtual machine.

   b. Open podman */usr/share/containers/containers.conf* file and modify the chosen port for Aardvark DNS service. For example, change it to 54.

   ```
   vi /usr/share/containers/containers.conf
   ```

   For example:

```
# Port to use for dns forwarding daemon with netavark in rootful
bridge
# mode and dns enabled.
# Using an alternate port might be useful if other DNS services
should
# run on the machine.
#
dns_bind_port = 54
```

c. Reboot the Console agent virtual machine.

What’s next?

You’ll need to register the Console agent within the NetApp Console.

Register the Console agent with NetApp Console

Log into the Console and associate the Console agent with your organization. How you log in depends on the mode in which you are using Console. If you are using the Console in standard mode, you log in through the SaaS website. If you are using the Console in restricted mode, you log in locally from the Console agent host.

Steps

1. Open a web browser and enter the Console agent host URL:

   The Console host URL can be a localhost, a private IP address, or a public IP address, depending on the configuration of the host. For example, if the Console agent 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 Console agent host.

2. Sign up or log in.
3. After you log in, set up the Console:
   a. Specify the Console organization to associate with the Console agent.
   b. Enter a name for the system.
   c. Under **Are you running in a secured environment?** keep restricted mode disabled.

      Restricted mode isn’t supported when the Console agent is installed on-premises.

   d. Select **Let’s start**.

Provide cloud provider credentials to NetApp Console

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

AWS

Before you begin

If you just created these AWS credentials, they may take a few minutes to become available. Wait a few minutes before you add the credentials to the Console.

Steps

1. Select **Administration > Credentials**.
2. Select **Organization credentials**.
3. Select **Add Credentials** and follow the steps in the wizard.
   a. **Credentials Location**: Select *Amazon Web Services > Agent.
   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**.

You can now go to the NetApp Console to start using the Console agent.

Azure

Before you begin

If you just created these Azure credentials, they may take a few minutes to become available. Wait a few minutes before you add the credentials the Console agent.

Steps

1. Select **Administration > Credentials**.
2. Select **Add Credentials** and follow the steps in the wizard.
   a. **Credentials Location**: Select **Microsoft Azure > Agent**.
   b. **Define Credentials**: Enter information about the Microsoft Entra 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

The Console agent now has the permissions that it needs to perform actions in Azure on your behalf. You can now go to the NetApp Console to start using the Console agent.

Install a Console agent on-premises using VCenter

If you are a VMWare user, you can use an OVA to install a Console agent in your VCenter. THe OVA download or URL is available through the NetApp Console.

ⓘ When you install a Console agent with your VCenter tools, you can use the VM web console to perform maintenance tasks. Learn more about the VM console for the agent.

Prepare to install the Console agent

Before installation, make sure your VM host meets the requirements and the Console agent can access the internet and targeted networks. To use NetApp data services or Cloud Volumes ONTAP, create cloud provider credentials for the Console agent to perform actions on your behalf.

Review Console agent host requirements

Make sure your host machine meets installation requirements before installing the Console agent.

- CPU: 8 cores or 8 vCPUs
- RAM: 32 GB
- Disk space: 165 GB (thick provisioned)
- vSphere 7.0 or higher
- ESXi host 7.03 or higher

ⓘ Install the agent in a vCenter environment rather than directly on an ESXi host.

Set up network access for the Console agent

Work with your network administrator to ensure the Console agent has outbound access to the required endpoints and connections to targeted networks.

Connections to target networks

The Console agent requires a network connection to the location where you're planning to create and manage systems. 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 Console agent must have an outbound internet connection to contact specific endpoints.

Endpoints contacted from computers when using the web-based NetApp Console

Computers that access the Console from a web browser must have the ability to contact several endpoints. You'll need to use the Console to set up the Console agent and for day-to-day use of the Console.

Prepare networking for the NetApp console.

Endpoints contacted from the Console agent

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

The endpoints listed below are all CNAME entries.

ⓘ You can't manage resources in Google Cloud with an Console agent installed on your premises. To manage Google Cloud resources, install an agent in Google Cloud.

AWS

When the Console agent is installed on-premises, it needs network access to the following AWS endpoints in order to manage NetApp systems (such as Cloud Volumes ONTAP) deployed in AWS.

Endpoints contacted from the Console agent

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

The endpoints listed below are all CNAME entries.

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 AWS resources. The endpoint depends on your AWS region. Refer to AWS documentation for details
Amazon FsX for NetApp ONTAP: • api.workloads.netapp.com	The web-based console contacts this endpoint to interact with the Workload Factory APIs to manage and operate FSx for ONTAP based workloads.
https://mysupport.netapp.com	To obtain licensing information and to send AutoSupport messages to NetApp support.
https://signin.b2c.netapp.com	To update NetApp Support Site (NSS) credentials or to add new NSS credentials to the NetApp Console.
https://support.netapp.com	To obtain licensing information and to send AutoSupport messages to NetApp support as well as to receive software updates for Cloud Volumes ONTAP.
https://api.bluexp.netapp.com https://netapp-cloud-account.auth0.com https://netapp-cloud-account.us.auth0.com https://console.netapp.com https://components.console.bluexp.netapp.com https://cdn.auth0.com	To provide features and services within the NetApp Console.

Endpoints	Purpose
https://bluexpinfraprod.eastus2.data.azurecr.io https://bluexpinfraprod.azurecr.io	To obtain images for Console agent upgrades. • When you deploy a new agent, the validation check tests connectivity to current endpoints. If you use previous endpoints, the validation check fails. To avoid this failure, skip the validation check. Although the previous endpoints are still supported, NetApp recommends updating your firewall rules to the current endpoints as soon as possible. Learn how to update your endpoint list. • When you update to the current endpoints in your firewall, your existing agents will continue to work.

Azure

When the Console agent is installed on-premises, it needs network access to the following Azure endpoints in order to manage NetApp systems (such as Cloud Volumes ONTAP) deployed in Azure.

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://mysupport.netapp.com	To obtain licensing information and to send AutoSupport messages to NetApp support.
https://signin.b2c.netapp.com	To update NetApp Support Site (NSS) credentials or to add new NSS credentials to the NetApp Console.
https://support.netapp.com	To obtain licensing information and to send AutoSupport messages to NetApp support as well as to receive software updates for Cloud Volumes ONTAP.

Endpoints	Purpose
https://api.bluexp.netapp.com https://netapp-cloud-account.auth0.com https://netapp-cloud-account.us.auth0.com https://console.netapp.com https://components.console.bluexp.netapp.com https://cdn.auth0.com	To provide features and services within the NetApp Console.
https://bluexpinfraprod.eastus2.data.azurecr.io https://bluexpinfraprod.azurecr.io	To obtain images for Console agent upgrades. • When you deploy a new agent, the validation check tests connectivity to current endpoints. If you use previous endpoints, the validation check fails. To avoid this failure, skip the validation check. Although the previous endpoints are still supported, NetApp recommends updating your firewall rules to the current endpoints as soon as possible. Learn how to update your endpoint list. • When you update to the current endpoints in your firewall, your existing agents will continue to work.

Proxy server

NetApp supports both explicit and transparent proxy configurations. If you are using a transparent proxy, you only need to provide the certificate for the proxy server. If you are using an explicit proxy, you'll also need the IP address and credentials.

- IP address
- Credentials
- HTTPS certificate

Ports

There's no incoming traffic to the Console agent, unless you initiate it or if it 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, the Console automatically configures those systems to use a proxy server that's included with the Console agent. The only requirement is to ensure that the Console agent's security group allows inbound connections over port 3128. You'll need to open this port after you deploy the Console agent.

Enable NTP

If you’re planning to use NetApp Data Classification to scan your corporate data sources, you should enable a Network Time Protocol (NTP) service on both the Console agent and the NetApp Data Classification system so that the time is synchronized between the systems. Learn more about NetApp Data classification

Create Console agent cloud permissions for AWS or Azure

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

> ⓘ You can’t manage resources in Google Cloud with a Console agent installed on your premises. If you want to manage Google Cloud resources, you need to install an agent in Google Cloud.

AWS

For on-premises Console agents, provide AWS permissions by adding IAM user access keys.

Use IAM user access keys for on-premises Console agents; IAM roles are not supported for on-premises Console agents.

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 Console agent.
   c. Finish the remaining steps to create the policy.

      Depending on the NetApp data 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 Console agent.
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 the NetApp Console after you install the Console agent.

Result

You should now have IAM user access keys with the required permissions.After you install the Console agent, associate these credentials with the Console agent from the Console.

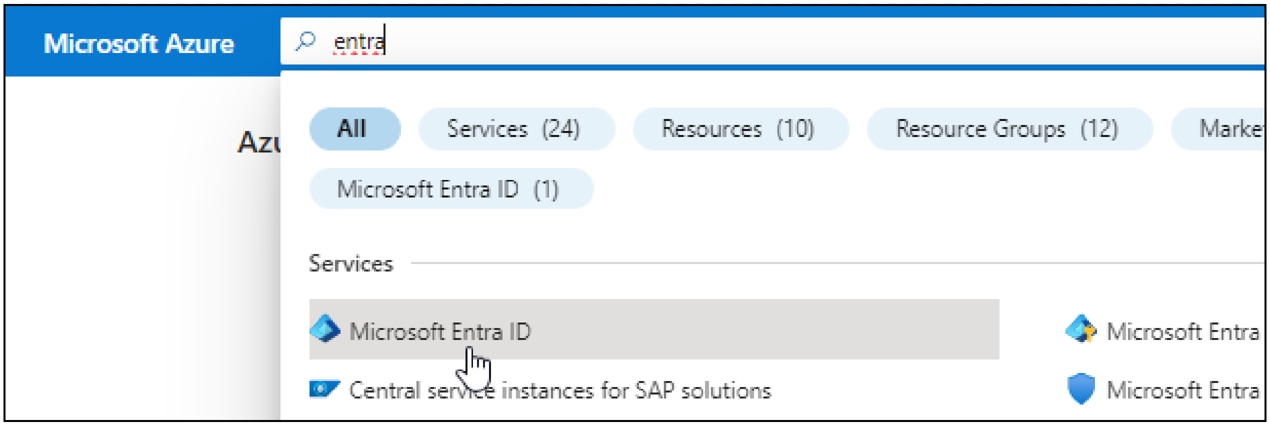
Azure

When the Console agent is installed on-premises, you need to give the Console agent Azure permissions by setting up a service principal in Microsoft Entra ID and getting the Azure credentials that the Console agent needs.

Create a Microsoft Entra 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 **Microsoft Entra ID** 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 the NetApp Console).
   - **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 Console agent 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.

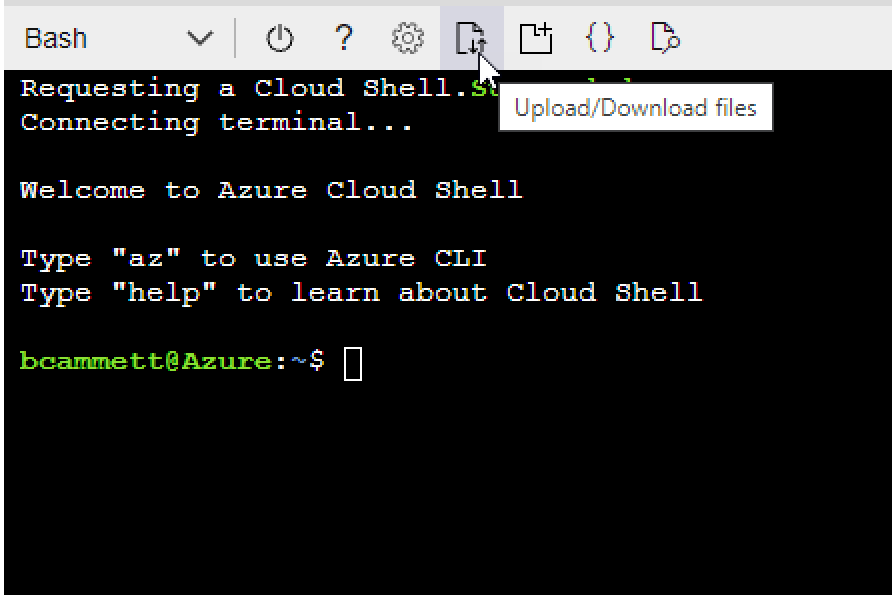
   Example

```
"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.



```
Requesting a Cloud Shell.Su
Connecting terminal...

Welcome to Azure Cloud Shell

Type "az" to use Azure CLI
Type "help" to learn about Cloud Shell

bcammett@Azure:~$
```

- Use the Azure CLI to create the custom role:

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

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

2. Assign the application to the role:

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

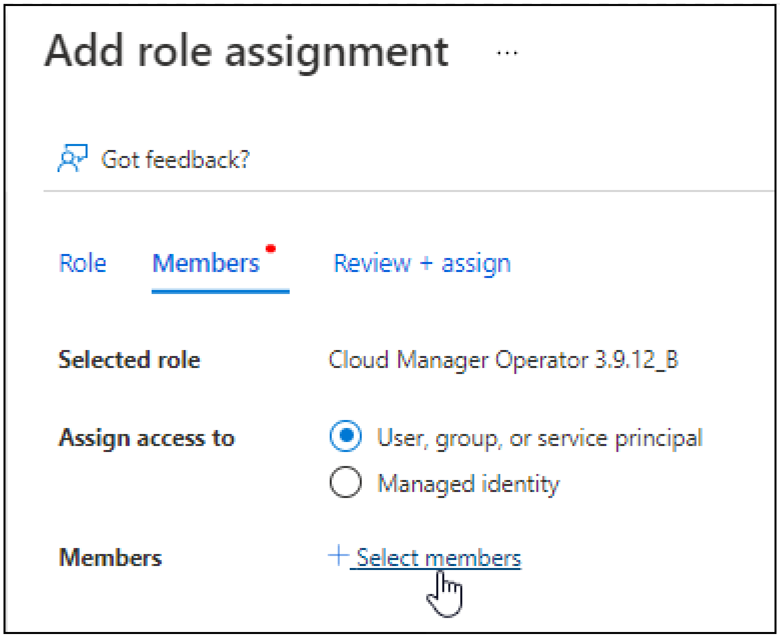
   b. Select the subscription.

   c. Select **Access control (IAM) > Add > Add role assignment**.

   d. In the **Role** tab, select the **Console Operator** role and select **Next**.

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

   - Keep **User, group, or service principal** selected.
   - Select **Select members**.


Add role assignment

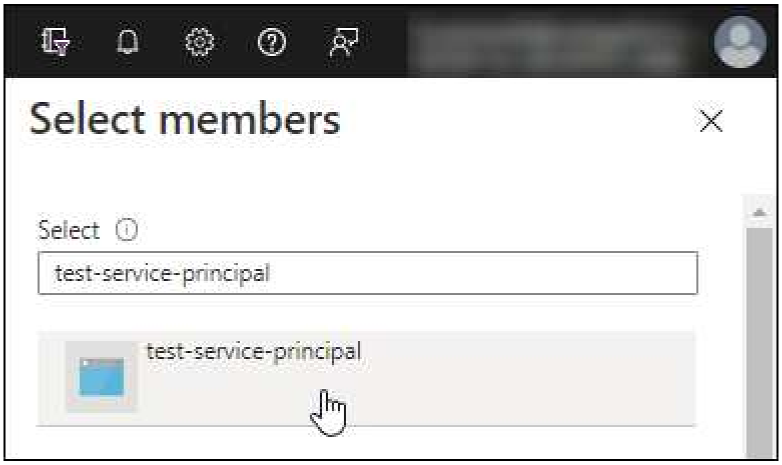
Selected role: Cloud Manager Operator 3.9.12_B

Assign access to: ● User, group, or service principal ○ Managed identity

Members: + Select members

- Search for the name of the application.

  Here's an example:


Select members

Select ⓘ: test-service-principal

test-service-principal

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

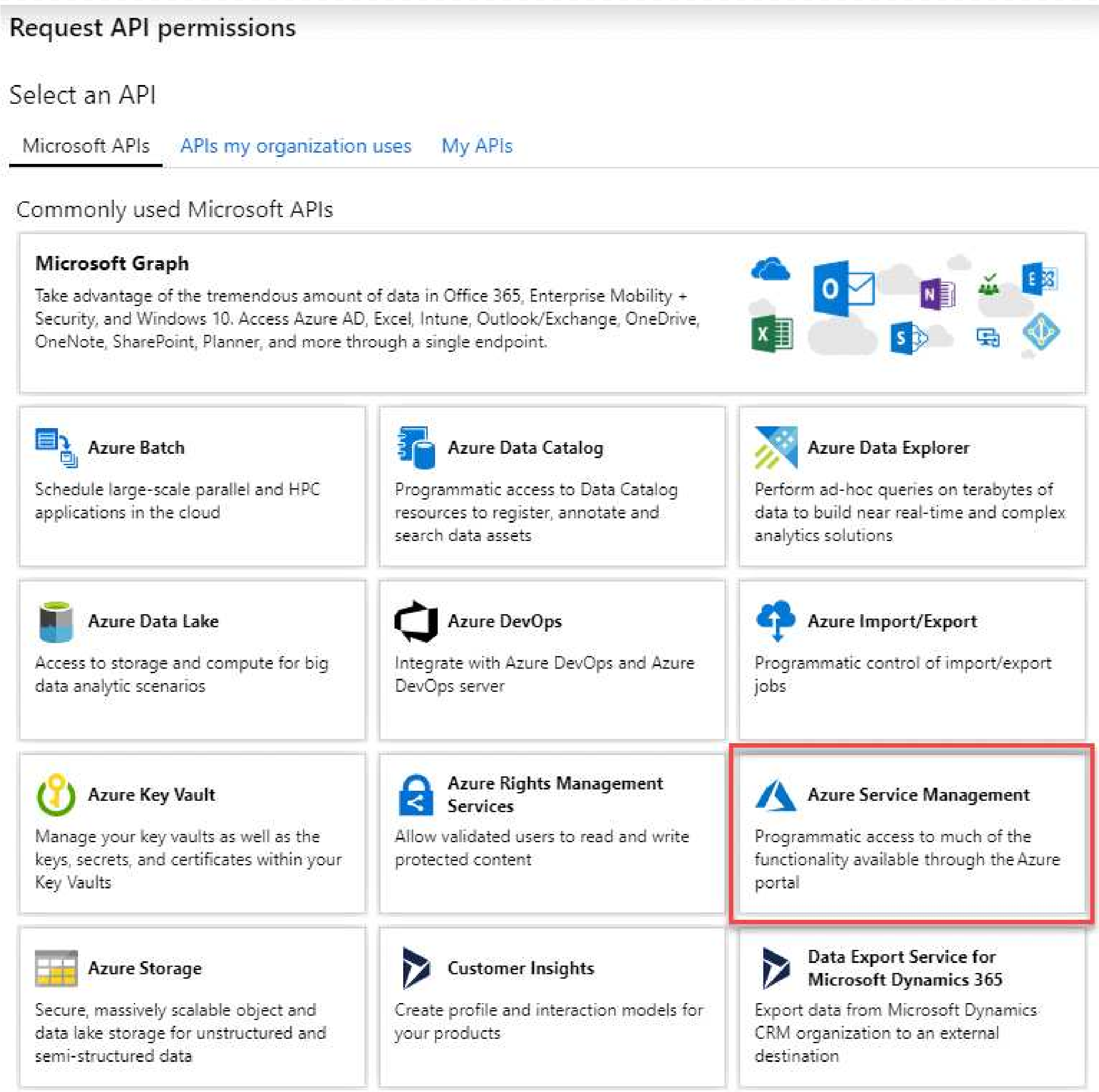
f. Select **Review + assign**.

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

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

Add Windows Azure Service Management API permissions

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



Request API permissions

Select an API

Commonly used Microsoft APIs

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

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

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

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

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

Azure DevOps
Integrate with Azure DevOps and Azure DevOps server

Azure Import/Export
Programmatic control of import/export jobs

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

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

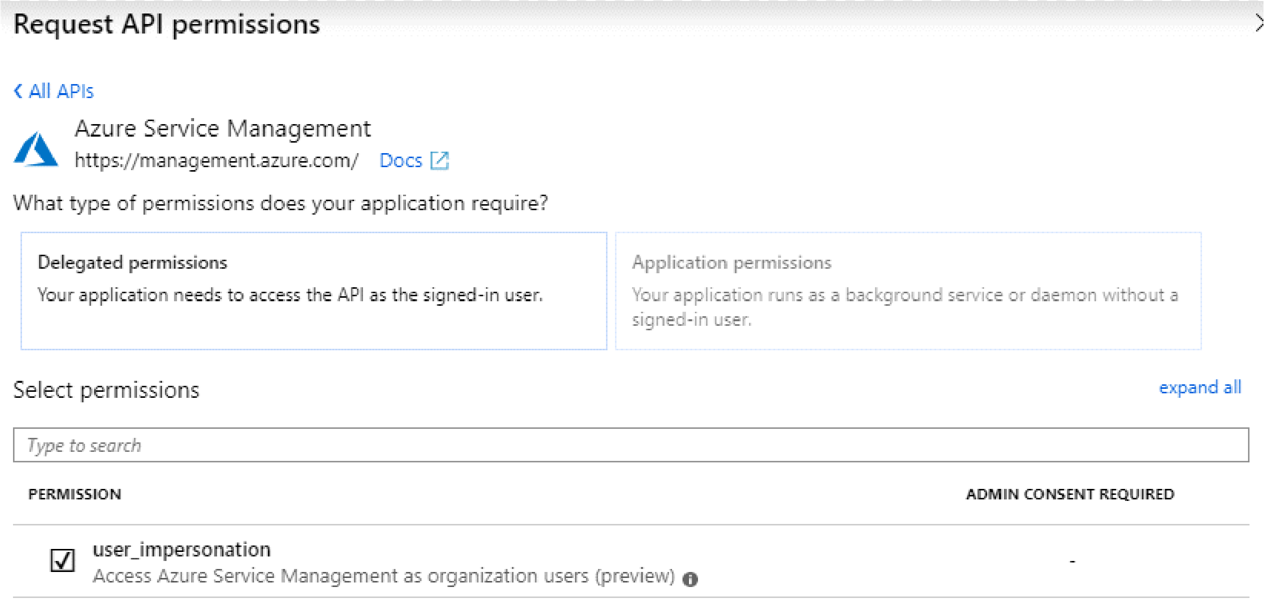
Azure Service Management
Programmatic access to much of the functionality available through the Azure portal

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

Customer Insights
Create profile and interaction models for your products

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

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



Request API permissions

< All APIs

Azure Service Management
https://management.azure.com/ Docs

What type of permissions does your application require?

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

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

Select permissions

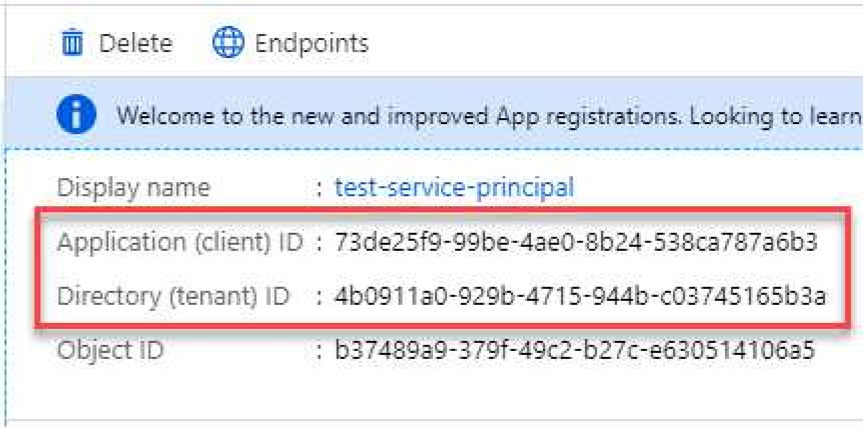
expand all

Type to search

PERMISSION	ADMIN CONSENT REQUIRED
☑ user_impersonation Access Azure Service Management as organization users (preview)	-

Get the application ID and directory ID for the application

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



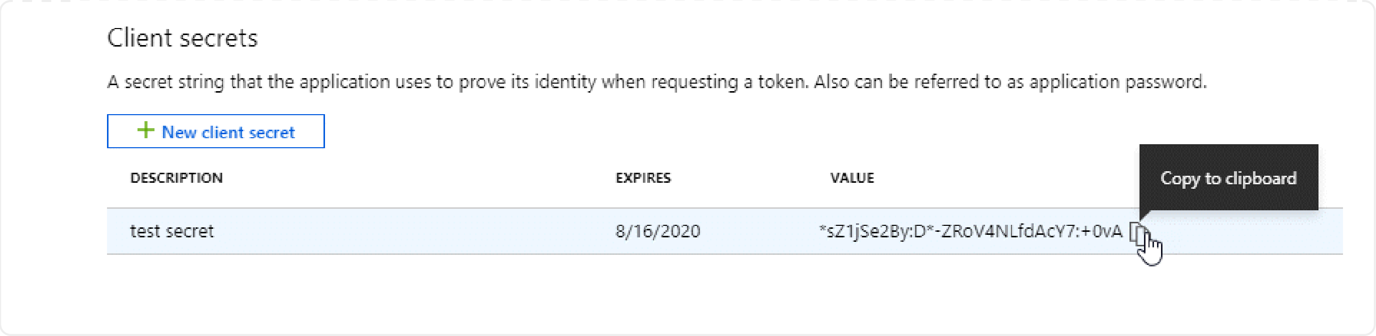
Welcome to the new and improved App registrations. Looking to learn

Display name : test-service-principal
Application (client) ID : 73de25f9-99be-4ae0-8b24-538ca787a6b3
Directory (tenant) ID : 4b0911a0-929b-4715-944b-c03745165b3a
Object ID : b37489a9-379f-49c2-b27c-e630514106a5

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

Create a client secret

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



Client secrets

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

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

Install a Console agent in your VCenter environment

NetApp supports installing the Console agent in your VCenter environment. The OVA file includes a pre-configured VM image that you can deploy in your VMware environment. A file download or URL deployment is available directly from the NetApp Console. It includes the Console agent software and a self-signed certificate.

Download the OVA or copy the URL

Download the OVA or copy the OVA URL directly from the NetApp Console.

1. Select **Administration > Agents**.
2. On the **Overview** page, select **Deploy agent > On-Premises**.
3. Select **With OVA**.
4. Choose to either download the OVA or copy the URL to use in VCenter.

Deploy the agent in your VCenter

Log into your VCenter environment to deploy the agent.

Steps

1. Upload the self-signed certificate to your trusted certificates if your environment requires it. You replace this certificate after installation.Learn how to replace the self-signed certificate.
2. Deploy the OVA from the content library or local system.

From the local system	From the content library
a. Right-click and select **Deploy OVF template…**. b. Choose the OVA file from the URL or browse to its location, then select **Next**.	a. Go to your content library and select the Console agent OVA. b. Select **Actions** > **New VM from this template**

3. Complete the Deploy OVF Template wizard to deploy the Console agent.
4. Select a name and folder for the VM, then select **Next**.
5. Select a compute resource, then select **Next**.
6. Review the details of the template, then select **Next**.
7. Accept the license agreement, then select **Next**.
8. Choose the type of proxy configuration you want to use: explicit proxy, transparent proxy, or no proxy.
9. Select the datastore where you want to deploy the VM, then select **Next**. Be sure it meets host

requirements.

10. Select the network to which you want to connect the VM, then select **Next**. Ensure the network is IPv4 and has outbound internet access to the required endpoints.
11. in the **Customize template** window, complete the following fields:
    - **Proxy information**
        - If you selected explicit proxy, enter the proxy server hostname or IP address and port number, as well as the username, password.
        - If you selected transparent proxy, upload the respective certificate.
    - **Virtual Machine Configuration**
        - **Skip config check**: This check box is unchecked by default which means the agent runs a configuration check to validate network access.
            - NetApp recommends leaving this box unchecked so that the installation includes a configuration check of the agent. The Configuration check validates that the agent has network access to the required endpoints. If it deployment fails because of connectivity issues, you can access the validation report and logs from the agent host. In some cases, if you are confident that the agent has network access, you can choose to skip the check. For example, if you are still using the previous endpoints used for agent upgrades, the validation fails with an error. To avoid this, mark the check box to install without a validation check. Learn how to update your endpoint list.
        - **Maintenance password**: Set the password for the `maint` user that allows access to the agent maintenance console.
        - **NTP servers**: Specify one or more NTP servers for time synchronization.
        - **Hostname**: Set the hostname for this VM. It must not include the search domain. For example, an FQDN of console10.searchdomain.company.com should be entered as console10.
        - **Primary DNS**: Specify the primary DNS server to use for name resolution.
        - **Secondary DNS**: Specify the secondary DNS server to use for name resolution.
        - Search domains: Specify the search domain name to use when resolving the hostname. For example, if the FQDN is console10.searchdomain.company.com, then enter searchdomain.company.com.
        - **IPv4 address**: The IP address that is mapped to the hostname.
        - **IPv4 subnet mask**: The subnet mask for the IPv4 address.
        - **IPv4 gateway address**: The gateway address for the IPv4 address.
12. Select **Next**.
13. Review the details in the **Ready to complete** window, select **Finish**.

    The vSphere task bar shows the progress as the Console agent is deployed.

14. Power on the VM.

> If the deployment fails, you can access the validation report and logs from the agent host. Learn how to troubleshoot installation issues.

Register the Console agent with NetApp Console

Log into the Console and associate the Console agent with your organization. How you log in depends on the mode in which you are using Console. If you are using the Console in standard mode, you log in through the SaaS website. If you are using the Console in restricted or private mode, you log in locally from the Console agent host.

Steps

1. Open a web browser and enter the Console agent host URL:

   The Console host URL can be a localhost, a private IP address, or a public IP address, depending on the configuration of the host. For example, if the Console agent 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 Console agent host.

2. Sign up or log in.
3. After you log in, set up the Console:
   a. Specify the Console organization to associate with the Console agent.
   b. Enter a name for the system.
   c. Under **Are you running in a secured environment?** keep restricted mode disabled.

      Restricted mode isn’t supported when the Console agent is installed on-premises.

   d. Select **Let’s start**.

Add cloud provider credentials to the Console

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

AWS

Before you begin

If you just created these AWS credentials, they may take a few minutes to become available. Wait a few minutes before you add the credentials to the Console.

Steps

1. Select **Administration > Credentials**.
2. Select **Organization credentials**.
3. Select **Add Credentials** and follow the steps in the wizard.
   a. **Credentials Location**: Select *Amazon Web Services > Agent.
   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**.

You can now go to the NetApp Console to start using the Console agent.

Azure

Before you begin

If you just created these Azure credentials, they may take a few minutes to become available. Wait a few minutes before you add the credentials the Console agent.

Steps

1. Select **Administration > Credentials**.
2. Select **Add Credentials** and follow the steps in the wizard.
   a. **Credentials Location**: Select **Microsoft Azure > Agent**.
   b. **Define Credentials**: Enter information about the Microsoft Entra 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

THe Console agent now has the permissions that it needs to perform actions in Azure on your behalf. You can now go to the NetApp Console to start using the Console agent.

Ports for the on-premises Console agent

The Console agent uses *inbound* ports when installed manually on an on-premises Linux host. Refer to these ports for planning purposes.

These inbound rules apply to all NetApp Console deployment modes.

Protocol	Port	Purpose
HTTP	80	• Provides HTTP access from client web browsers to the local user interface • Used during the Cloud Volumes ONTAP upgrade process
HTTPS	443	Provides HTTPS access from client web browsers to the local user interface

Maintain Console agents

Maintain a VCenter or ESXi host for the Console agent

You can make changes to your existing VCenter or ESXi host after you deploy the Console agent. For example, you can increase the CPU or RAM of the VM instance that hosts the Console agent.

Perform these maintenance tasks using the VM web console:

- Increase disk size
- Restart the agent
- Update static routes
- Update search domains

Limitations

Upgrading the agent through the console is not yet supported. In addition, you can only view information about the IP address, DNS, and gateways.

Access the VM maintenance console

You can access the maintenance Console from the VSphere client.

Steps

1. Open the VSphere client and log in to your VCenter.
2. Select the VM instance that hosts the Console agent.
3. Select **Launch Web Console**.
4. Log in to the VM instance using the user name and password that you specified when you created the VM instance. The username is `maint` and the password is the one that you specified when you created the VM instance.

Change the maint user password

You can change the password for the `maint` user.

Steps

1. Open the VSphere client and log in to your VCenter.
2. Select the VM instance that hosts the Console agent.

3. Select **Launch Web Console**.
4. Log in to the VM instance using the user name and password that you specified when you created the VM instance. The username is `maint` and the password is the one that you specified when you created the VM instance.
5. Enter `1` to view the `System Configuration` menu.
6. Enter `1` to change the maintenance user password and follow the on-screen prompts.

Increase the CPU or RAM of the VM instance

You can increase the CPU or RAM of the VM instance that hosts the Console agent.

Edit the VM instance settings in your VCenter or ESXi host, then use the maintenance Console to apply the changes.

Steps in the VSphere client

1. Open the VSphere client and log in to your VCenter.
2. Select the VM instance that hosts the Console agent.
3. Right-click the VM instance and select **Edit Settings**.
4. Increase the hard drive space used for /opt or the /var partition.
   a. Select **Hard Disk 2** to increase the hard drive space used for /opt.
   b. Select **Hard Disk 3** to increase the hard drive space used for /var.
5. Save your changes.

Steps in the maintenance console

1. Open the VSphere client and log in to your VCenter.
2. Select the VM instance that hosts the Console agent.
3. Select **Launch Web Console**.
4. Log in to the VM instance using the user name and password that you specified when you created the VM instance. The username is `maint` and the password is the one that you specified when you created the VM instance.
5. Enter `1 to view the `System Configuration` menu.
6. Enter `2` and follow the on-screen prompts. The console scans for new settings and increases the size of the partitions.

View network settings for the agent VM

View the network settings for the agent VM in the VSphere client to confirm or troubleshoot network issues. You can only view (not update) the following network settings: IP address and DNS details.

Steps

1. Open the VSphere client and log in to your VCenter.
2. Select the VM instance that hosts the Console agent.
3. Select **Launch Web Console**.
4. Log in to the VM instance using the user name and password that you specified when you created the VM instance. The username is `maint` and the password is the one that you specified when you created the VM instance.

5. Enter `2` to view the `Network Configuration` menu.
6. Enter a number between 1 and 6 to view the corresponding network settings.

Update the static routes for the agent VM

Add, update, or remove static routes for the agent VM as needed.

Steps

1. Open the VSphere client and log in to your VCenter.
2. Select the VM instance that hosts the Console agent.
3. Select **Launch Web Console**.
4. Log in to the VM instance using the user name and password that you specified when you created the VM instance. The username is `maint` and the password is the one that you specified when you created the VM instance.
5. Enter `2` to view the `Network Configuration` menu.
6. Enter `7` to update static routes and follow the on-screen prompts.
7. Press Enter.
8. Optionally, make additional changes.
9. Enter `9` to commit your changes.

Update domain search settings for the agent VM

You can update the search domain settings for the agent VM.

Steps

1. Open the VSphere client and log in to your VCenter.
2. Select the VM instance that hosts the Console agent.
3. Select **Launch Web Console**.
4. Log in to the VM instance using the user name and password that you specified when you created the VM instance. The username is `maint` and the password is the one that you specified when you created the VM instance.
5. Enter ``2` `` to view the `Network Configuration` menu.
6. Enter `8` to update the domain search settings and follow the on-screen prompts.
7. Press Enter.
8. Optionally, make additional changes.
9. Enter `9` to commit your changes.

Access the agent diagnostic tools

Access diagnostic tools to troubleshoot issues with the Console agent. NetApp Support may ask you to do this when troubleshooting issues.

Steps

1. Open the VSphere client and log in to your VCenter.

2. Select the VM instance that hosts the Console agent.
3. Select **Launch Web Console**.
4. Log in to the VM instance using the user name and password that you specified when you created the VM instance. The username is `maint` and the password is the one that you specified when you created the VM instance.
5. Enter `3` to view the Support and Diagnostics menu.
6. Enter `1` to access the diagnostic tools and follow the on-screen prompts.
   + For example, you can verify that all agent services are running. Check the Console agent status.

Access the agent diagnostic tools remotely

You can access diagnostic tools remotely with a tool such as Putty. Enable SSH access to the agent VM by assigning a one-time password.

SSH access enables advanced terminal features like copy and paste.

Steps

1. Open the VSphere client and log in to your VCenter.
2. Select the VM instance that hosts the Console agent.
3. Select **Launch Web Console**.
4. Log in to the VM instance using the user name and password that you specified when you created the VM instance. The username is `maint` and the password is the one that you specified when you created the VM instance.
5. Enter `3` to view the `Support and Diagnostics` menu.
6. Enter `2` to access the diagnostic tools and follow the on-screen prompts to configure a one-time password that expires in 24 hours.
7. Use an SSH tool such as Putty to connect to the agent VM using the user name `diag` and the one-time password that you configured.

Install a CA-signed certificate for web-based console access

When you use the NetApp Console in restricted mode, the user interface is accessible from the Console agent virtual machine that’s deployed in your cloud region or on-premises. By default, the Console uses a self-signed SSL certificate to provide secure HTTPS access to the web-based console running on the Console agent.

If required by your business, you can install a certificate signed by a certificate authority (CA), which provides better security protection than a self-signed certificate. After you install the certificate, the Console uses the CA-signed certificate when users access the web-based console.

Install an HTTPS certificate

Install a certificate signed by a CA for secure access to the web-based console running on the Console agent.

About this task

You can install the certificate using one of the following options:

- Generate a certificate signing request (CSR) from the Console, submit the certificate request to a CA, and then install the CA-signed certificate on the Console agent.

The key pair that the Console uses to generate the CSR is stored internally on the Console agent. The Console automatically retrieves the same key pair (private key) when you install the certificate on the Console agent.

- Install a CA-signed certificate that you already have.

  With this option, the CSR is not generated through the Console. You generate the CSR separately and store the private key externally. You provide the Console with the private key when you install the certificate.

Steps

1. Select **Administration > Agents**.
2. On the **Overview** page, select the action menu for a Console agent and select **HTTPS Setup**.

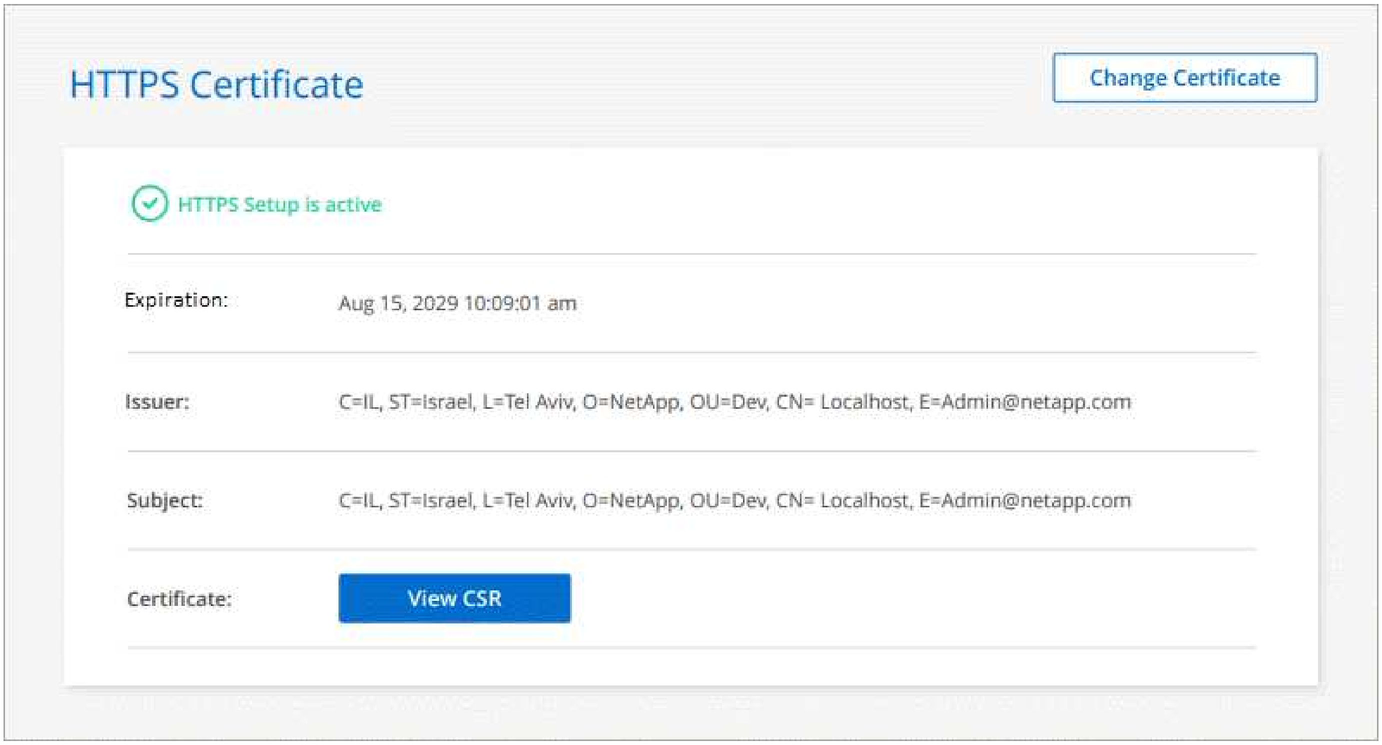
   The Console agent must be connected to edit it.

3. In the HTTPS Setup page, install a certificate by generating a certificate signing request (CSR) or by installing your own CA-signed certificate:

Option	Description
Generate a CSR	a. Enter the host name or DNS of the Console agent host (its Common Name), and then select **Generate CSR**. The Console displays a certificate signing request. b. Use the CSR to submit an SSL certificate request to a CA. The certificate must use the Privacy Enhanced Mail (PEM) Base-64 encoded X.509 format. c. Upload the certificate file and then select **Install**.
Install your own CA-signed certificate	a. Select **Install CA-signed certificate**. b. Load both the certificate file and the private key and then select **Install**. The certificate must use the Privacy Enhanced Mail (PEM) Base-64 encoded X.509 format.

Result

The Console agent now uses the CA-signed certificate to provide secure HTTPS access. The following image shows an agent that is configured for secure access:


HTTPS Certificate

HTTPS Setup is active

Expiration:	Aug 15, 2029 10:09:01 am
Issuer:	C=IL, ST=Israel, L=Tel Aviv, O=NetApp, OU=Dev, CN= Localhost, E=Admin@netapp.com
Subject:	C=IL, ST=Israel, L=Tel Aviv, O=NetApp, OU=Dev, CN= Localhost, E=Admin@netapp.com
Certificate:	View CSR

Renew the Console HTTPS certificate

You should renew the agent's HTTPS certificate before it expires to ensure secure access. If you don't renew the certificate before it expires, a warning appears when users access the web console using HTTPS.

Steps

1. Select **Administration > Agents**.
2. On the **Overview** page, select the action menu for a Console agent and select **HTTPS Setup**.

   Details about the certificate displays, including the expiration date.

3. Select **Change Certificate** and follow the steps to generate a CSR or install your own CA-signed certificate.

Configure a Console agent to use a proxy server

If your corporate policies require you to use a proxy server for all communication to the internet, then you need to configure your agents to use that proxy server. If you didn't configure a Console agent to use a proxy server during installation, then you can configure the Console agent to use that proxy server at any time.

The agent's proxy server enables outbound internet access without a public IP or NAT gateway. The proxy server provides outbound connectivity only for the Console agent, not for Cloud Volumes ONTAP systems.

If Cloud Volumes ONTAP systems lack outbound internet access, the Console configures them to use the Console agent's proxy server. You must ensure that the Console agent's security group allows inbound connections over port 3128. Open this port after deploying the Console agent.

If the Console agent itself doesn't have an outbound internet connection, Cloud Volumes ONTAP systems cannot use the configured proxy server.

Supported configurations

- Transparent proxy servers are supported for agents that serve Cloud Volumes ONTAP systems. If you use NetApp data services with Cloud Volumes ONTAP, create a dedicated agent for Cloud Volumes ONTAP where you can use a transparent proxy server.
- Explicit proxy servers are supported with all agents, including those that manage Cloud Volumes ONTAP systems and those that manage NetApp data services.
- HTTP and HTTPS.
- The proxy server can reside in the cloud or in your network.

> ⓘ Once you have configured a proxy, you cannot change the proxy type. If you need to change the proxy type, you remove the Console agent and add a new agent with the new proxy type.

Enable an explicit proxy on a Console agent

When you configure a Console agent to use a proxy server, that agent and the Cloud Volumes ONTAP systems that it manages (including any HA mediators), all use the proxy server.

This operation restarts the Console agent. Verify the Console agent is idle before proceeding.

Steps

1. Select **Administration > Agents**.
2. On the **Overview** page, select the action menu for a Console agent and select **Edit agent**.

   The Console agent must be active to edit it.

3. Select **HTTP Proxy Configuration**.
4. Select **Explicit proxy** in the Configuration type field.
5. Select **Enable Proxy**.
6. Specify the server using the syntax http://*address:port* or https://*address:port*
7. Specify a user name and password if basic authentication is required for the server.

   Note the following:

   - The user can be a local user or domain user.
   - For a domain user, you must enter the ASCII code for the \ as follows: domain-name%92user-name

     For example: netapp%92proxy

   - The Console doesn’t support passwords that include the @ character.
8. Select **Save**.

Enable a transparent proxy for a Console agent

Only Cloud Volumes ONTAP supports using a transparent proxy on the Console agent. If you use NetApp data services in addition to Cloud Volumes ONTAP, you should create a separate agent to use for data services or to use for Cloud Volumes ONTAP.

Before enabling a transparent proxy, ensure that the following requirements are met:

- The agent is installed on the same network as the transparent proxy server.
- TLS inspection is enabled on the proxy server.
- You have a certificate in PEM format that matches the one used on the transparent proxy server.
- You do not use the Console agent for any NetApp data services other than Cloud Volumes ONTAP.

To configure an existing agent to use a transparent proxy server, you use the Console agent maintenance tool that is available through the command line on the Console agent host.

When you configure a proxy server, the Console agent restarts. Verify the Console agent is idle before proceeding.

Steps

Ensure that you have a certificate file in PEM format for the proxy server. If you do not have a certificate, contact your network administrator to obtain one.

1. Open a command-line interface on the Console agent host.
2. Navigate to the Console agent maintenance tool directory: `/opt/application/netapp/service-manager-2/agent-maint-console`
3. Run the following command to enable the transparent proxy, where `/home/ubuntu/<certificate-file>.pem` is the directory and name certificate file that you have for the proxy server:

   ```
   ./agent-maint-console proxy add -c /home/ubuntu/<certificate-file>.pem
   ```

   Ensure that the certificate file is in PEM format and resides in the same directory as the command or specify the full path to the certificate file.

   ```
   ./agent-maint-console proxy add -c /home/ubuntu/<certificate-file>.pem
   ```

Modify the transparent proxy for the Console agent

You can update a Console agent's existing transparent proxy server by using the `proxy update` command or remove the transparent proxy server by using the `proxy remove` command. For more information, review the documentation for Agent maintenance console.

> Once you have configured a proxy, you cannot change the proxy type. If you need to change the proxy type, you remove the Console agent and add a new agent with the new proxy type.

Update the Console agent proxy if it loses access to the internet

If the proxy configuration for your network changes, your agent might lose access to the internet. For example, if someone changes the password for the proxy server or updates the certificate. In this case, you'll need to access the UI from the Console agent host directly and update the settings. Ensure you have network access to the Console agent host and that you can log into the Console.

Enable direct API traffic

If you configured a Console agent to use a proxy server, you can enable direct API traffic on the Console agent in order to send API calls directly to cloud provider services without going through the proxy. Agents running in AWS, Azure, or Google Cloud support this option.

If you disable Azure Private Links with Cloud Volumes ONTAP and use service endpoints, enable direct API traffic. Otherwise, the traffic won't be routed properly.

Learn more about using an Azure Private Link or service endpoints with Cloud Volumes ONTAP

Steps

1. Select **Administration > Agents**.
2. On the **Overview** page, select the action menu for a Console agent and select **Edit agent**.

   The Console agent must be active to edit it.

3. Select **Support Direct API Traffic**.
4. Select the checkbox to enable the option and then select **Save**.

Troubleshoot the Console agent

To troubleshoot issues with a Console agent, you can verify issues yourself or work with NetApp Support who might ask for your system ID, agent version, or the latest AutoSupport messages.

If you have a NetApp Support Site account, you can also view the NetApp Knowledge Base.

Common error messages and resolutions

This table lists common error messages and shows how to fix them:

Error message	Explanation	What to do
Unable to load the Console agent UI	Agent installation has failed	• Verify that the Service Manager service is active. • Verify that all containers are running. • Ensure your firewall allows access to the service at port 8888. • If you still have problems, contact support.
Cannot access the NetApp agent UI	This message appears when trying to access the IP address of an agent. The agent can fail to initialize if it doesn't have the correct network access or if it is unstable.	• Connect to the Console agent. • Verify that the Service Manager service • Verify that the agent has the network access it needs. Learn more about required network access endpoints.

Error message	Explanation	What to do
Unable to load agent settings	The Console displays this message when you try to access the Agent settings page..	• Check if the OCCM container is running and working. • If the issue persists, contact support.
Unable to load support information for the agent.	This message displays if the agent cannot access your support account.	• Verify that the agent has outbound access to the required endpoints. Learn more about required network access endpoints.

Check the Console agent status

Use one of the following commands to verify your Console agent. All services should have a status of *Running*. If this isn't the case, contact NetApp support.

> ⓘ For more detailed information about accessing the Console agent diagnostics, see the following topics:
>
> - Check the Console agent status (for Linux host deployments)
> - Check the Console agent status (for VCenter deployments)

Docker (for Ubuntu and VCenter deployments)

```
docker ps -a
```

Podman (for RedHat Enterprise Linux deployments)

```
podman ps -a
```

View the Console agent version

View the Console agent version to confirm the upgrade or share it with your NetApp representative.

Steps

1. Select **Administration > Support > Agents**.

   The Console displays the version at the top of the page.

Verify network access

Ensure that the Console agent has the network access it needs. Learn more about required network access points.

Run configuration checks on the Console agent

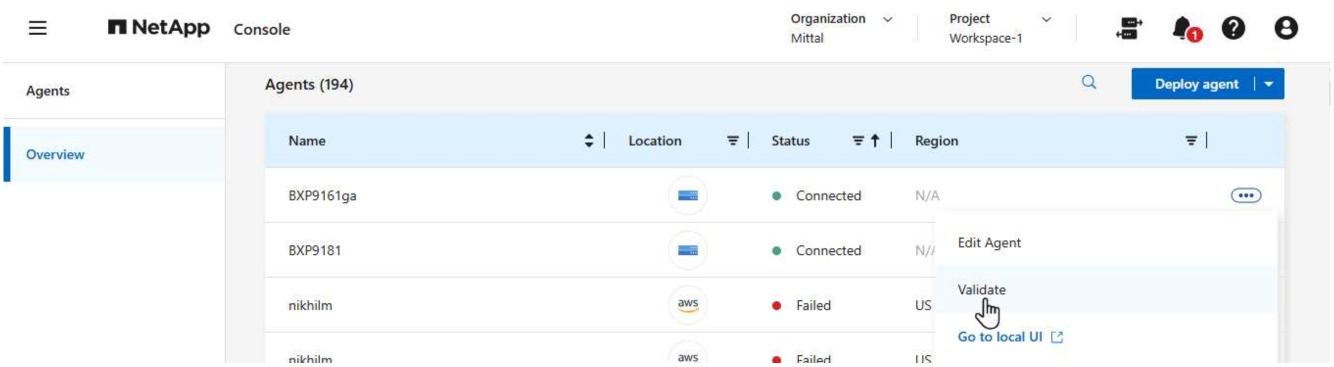
Run configuration checks on Console agents from the Console or or the Agent maintenance console to make sure they are connected.

You can also run configuration checks using the agent maintenance console. Learn more about using the config-checker validate command.

> ⓘ You can only validate agents that have a status of **Connected**.

Steps from the Console

1. Select **Administration > Agents**.
2. Select the action menu for a Console agent that you want to check and choose **Validate**.



Name	Location	Status	Region
BXP9161ga		Connected	N/A
BXP9181		Connected	N/
nikhilm	aws	Failed	US
nikhilm	aws	Failed	US

Validation can take up to 15 minutes. Results show when it is done.

Console agent installation issues

If the installation fails, view the report and logs to resolve the issues.

You can also access the validation report in JSON format and the configuration logs directly from the Console agent host in the following directories:

```
/tmp/netapp-console-agents/logs

/tmp/netapp-console-agents/results.json
```

> ⓘ
> - For new agent deployments, NetApp checks for the following endpoints: listed here. This configuration check fails with an error if you are using the previous endpoints used for upgrades, listed here. NetApp recommends updating your firewall rules to allow access to the current endpoints and block access to the previous endpoints at your earliest convenience Learn how to update your networking.
> - If you update the endpoints in your firewall, your existing agents will continue to work.

Disable configuration checks for manual installations

There may be times when you need to disable the configuration checks that verify outbound connectivity during installation. For example, when manually installing an agent in your Government Cloud environment, you need to disable the configuration checks or the installation will fail.

Steps

You disable the configuration check by setting the *skipConfigCheck* flag in the *com/opt/application/netapp/service-manager-2/config.json* file. By default, this flag is set to false and the configuration check verifies outbound access for the agent. Set this flag to true to disable the check. Be familiar with JSON syntax before completing this step.

To re-enable the configuration check, use these steps and set the *skipConfigCheck* flag to false.

Steps

1. Access the Console agent host as root or with sudo privileges.
2. Create a backup copy of the */opt/application/netapp/service-manager-2/config.json* file to ensure you can revert your changes.
3. Stop the service manager 2 service by running the following command:

```
systemctl stop netapp-service-manager.service
```

1. Edit the */opt/application/netapp/service-manager-2/config.json* file and change the value of the *skipConfigCheck* flag to true.

   ```
     "skipConfigCheck": true
   ```

2. Save your file.
3. Restart the service manager 2 service by running the following command:

   ```
   systemctl restart netapp-service-manager.service
   ```

Work with NetApp Support

If you haven't been able to resolve the issues with your Console agent, you may want to contact NetApp Support. NetApp support may ask for the Console agent ID or for you to send the Console agent logs to them if they don't have them already.

Find the Console agent ID

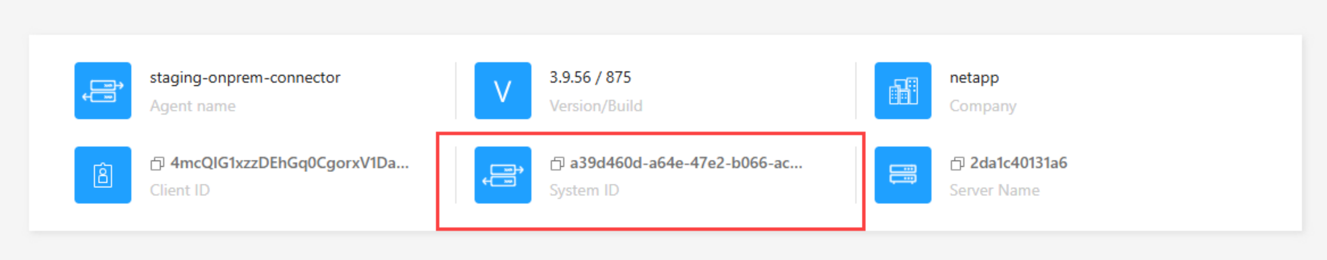
To help you get started, you may need the system ID of your Console agent. The ID is typically used for licensing and troubleshooting purposes.

Steps

1. Select **Administration > Support > Agents**.

   You can find the system ID at the top of the page.

   Example



staging-onprem-connector
Agent name

3.9.56 / 875
Version/Build

netapp
Company

4mcQIG1xzzDEhGq0CgorxV1Da...
Client ID

a39d460d-a64e-47e2-b066-ac...
System ID

2da1c40131a6
Server Name

2. Hover and click on the ID to copy it.

Download or send an AutoSupport message

If you're having problems, NetApp might ask you to send an AutoSupport message to NetApp support for troubleshooting purposes.

> ⓘ The NetApp Console takes up to five hours to send AutoSupport messages due to load balancing. For urgent communication, download the file and send it manually.

Steps

1. Select **Administration > Support > Agents**.
2. Depending on how you need to send the information to NetApp support, choose one of the following options:
   a. Select the option to download the AutoSupport message to your local machine. You can then send it to NetApp Support using a preferred method.
   b. Select **Send AutoSupport** to directly send the message to NetApp Support.

Fix download failures when using a Google Cloud NAT gateway

The Console agent automatically downloads software updates for Cloud Volumes ONTAP. Your configuration can cause the download to fail if it uses a Google Cloud NAT gateway. You can correct this issue by limiting the number of parts that the software image is divided into. This step must be completed by using the API.

Step

1. Submit a PUT request to /occm/config with the following JSON as body:

```
{
  "maxDownloadSessions": 32
}
```

The value for *maxDownloadSessions* can be 1 or any integer greater than 1. If the value is 1, then the downloaded image will not be divided.

Note that 32 is an example value. The value depends on your NAT configuration and the number of simultaneous sessions.

Learn more about the /occm/config API call

Get help from the NetApp Knowledge Base

View troubleshooting information created by the NetApp Support team.

Uninstall and remove a Console agent

Uninstall the a Console agent to troubleshoot issues or to permanently remove it from the host. The steps that you need to use depends on the deployment mode that you're using. Once you have removed a Console agent from your environment, you can remove it from the Console.

Learn about NetApp Console deployment modes.

Uninstall the agent when using standard or restricted mode

If you're using standard mode or restricted mode (in other words, the agent host has outbound connectivity), then you should follow the steps below to uninstall the agent.

Steps

1. Connect to the Linux VM for the agent.
2. From the Linux host, run the uninstallation script:

   ```
   /opt/application/netapp/service-manager-2/uninstall.sh [silent]
   ```

   silent runs the script without prompting you for confirmation.

Remove Console agents from the Console

If you have deleted an agent VM or uninstalled the agent, you should remove it from the list of agents in the Console. After you delete an agent VM or uninstall the agent software, the agent shows a status of **Disconnected** in the Console.

Note the following about removing a Console agent:

- This action doesn't delete the virtual machine.
- This action can't be reverted—once you remove a Console agent, you can't add it back.

Steps

1. Select **Administration > Agents**.
2. On the **Overview** page , select the action menu for a disconnected agent and select **Remove agent**.
3. Enter the name of the agent to confirm and then select **Remove**.

Manage cloud provider credentials

AWS

Learn about AWS credentials and permissions in NetApp Console

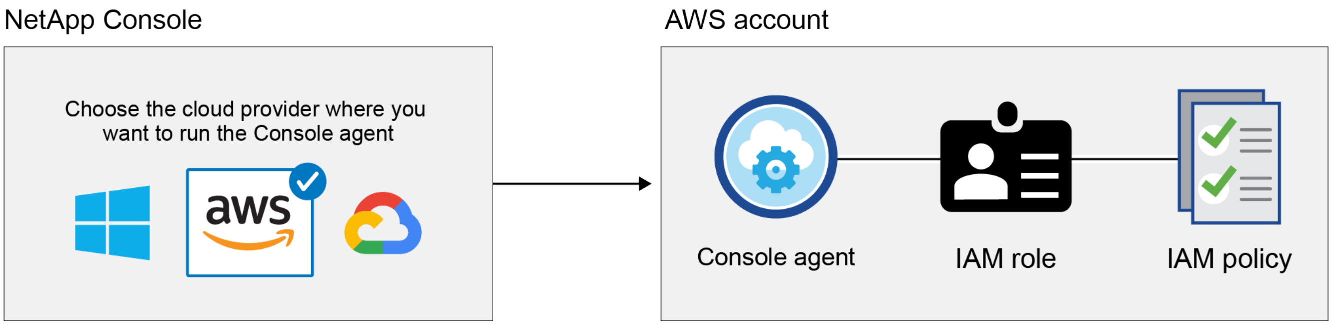
You manage AWS credentials and marketplace subscriptions directly from NetApp

Console to ensure secure deployment of Cloud Volumes ONTAP and other data services by providing appropriate IAM credentials during Console agent deployment and associating them with AWS Marketplace subscriptions for billing.

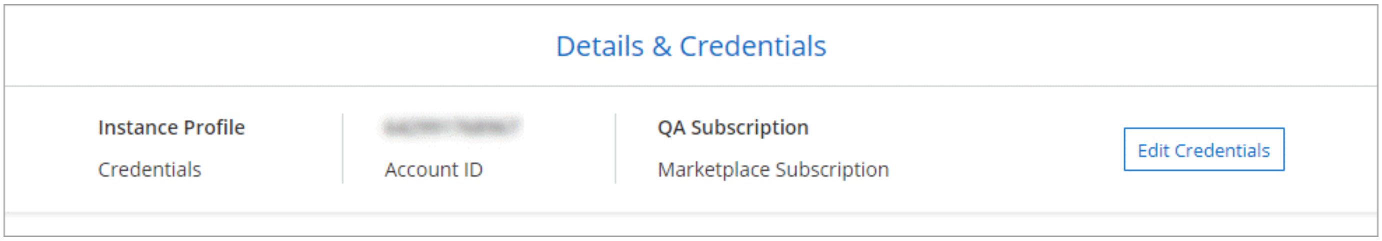
Initial AWS credentials

When you deploy an Console agent from the Console, you need to provide the ARN of an IAM role or access keys for an IAM user. The authentication method must have permissions to deploy the Console agent in AWS. The required permissions are listed in the Agent deployment policy for AWS.

When the Console launches the Console agent in AWS, it creates an IAM role and a profile for the agent. It also attaches a policy that provides the Console agent with permissions to manage resources and processes within that AWS account. Review how the Agent uses the permissions.


NetApp Console
Choose the cloud provider where you want to run the Console agent
aws
AWS account
Console agent
IAM role
IAM policy

If you add a new Cloud Volumes ONTAP system, the Console selects these AWS credentials by default:



Details & Credentials

Instance Profile	[redacted]	QA Subscription	Edit Credentials
Credentials	Account ID	Marketplace Subscription	

Deploy all of your Cloud Volumes ONTAP systems using the initial AWS credentials, or you can add additional credentials.

Additional AWS credentials

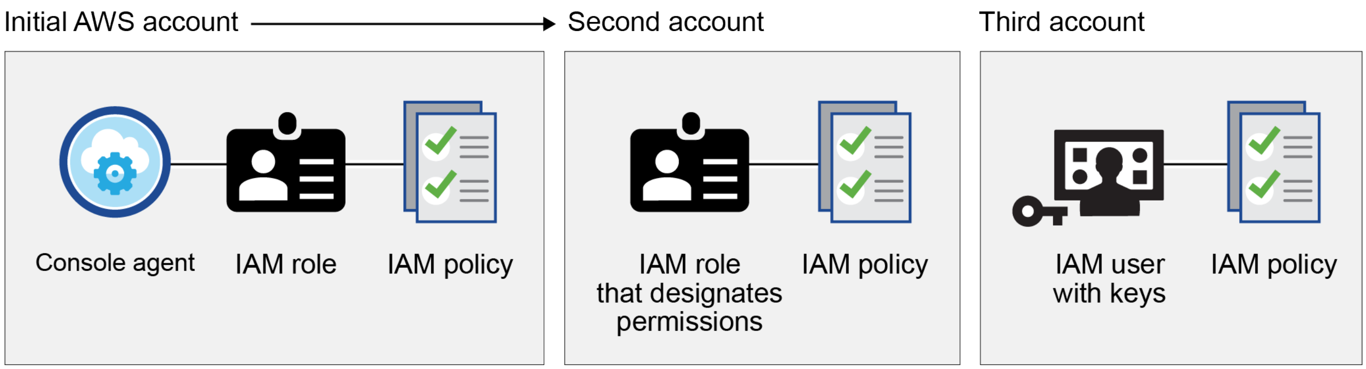
You might add additional AWS credentials to the Console in the following cases:

- To use your existing Console agent with an additional AWS account
- To create a new agent in a specific AWS account
- To create and manage FSx for ONTAP file systems

Review the sections below for more details.

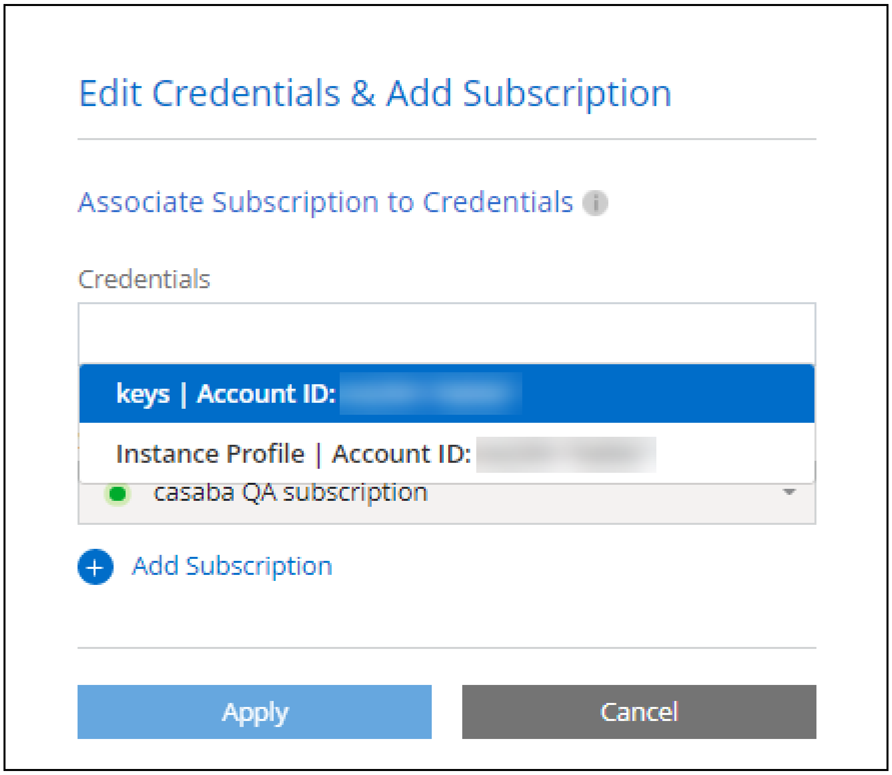
Add AWS credentials to use a Console agent with another AWS account

To use the Console with additional AWS accounts, provide AWS keys or the ARN of a role in a trusted account. The following image shows two additional accounts, one providing permissions through an IAM role in a trusted account and another through the AWS keys of an IAM user:



You add account credentials to the Console by specifying the Amazon Resource Name (ARN) of IAM role or the AWS keys for the IAM user.

For example, you can switch between credentials when creating a new Cloud Volumes ONTAP system:



Edit Credentials & Add Subscription

Associate Subscription to Credentials

Credentials

keys | Account ID: [redacted]

Instance Profile | Account ID: [redacted]

casaba QA subscription

Learn how to add AWS credentials to an existing agent.

Add AWS credentials to create a Console agent

Adding AWS credentials provides permissions to create a Console agent.

Learn how to add AWS credentials to the Console for creating a Console agent

Add AWS credentials for FSx for ONTAP

Add AWS credentials to the Console to provide the necessary permissions to create and manage an FSx for ONTAP system.

Learn how to add AWS credentials to the Console for Amazon FSx for ONTAP

Credentials and marketplace subscriptions

You must associate the credentials that you add to a Console agent with an AWS Marketplace subscription to pay for Cloud Volumes ONTAP at an hourly rate (PAYGO) and other NetApp data services or through an annual contract.
Learn how to associate an AWS subscription.

Note the following about AWS credentials and marketplace subscriptions:

- You can associate only one AWS Marketplace subscription with a set of AWS credentials
- You can replace an existing marketplace subscription with a new subscription

FAQ

The following questions are related to credentials and subscriptions.

How can I securely rotate my AWS credentials?

As described in the sections above, the Console enables you to provide AWS credentials in a few ways: an IAM role associated with the Console agent, by assuming an IAM role in a trusted account, or by providing AWS access keys.

With the first two options, the Console uses the AWS Security Token Service to obtain temporary credentials that rotate constantly. This process is the best practice—it's automatic and secure.

If you provide the Console with AWS access keys, you should rotate the keys by updating them in the Console at a regular interval. This is a completely manual process.

Can I change the AWS Marketplace subscription for Cloud Volumes ONTAP systems?

Yes, you can. When you change the AWS Marketplace subscription that's associated with a set of credentials, all existing and new Cloud Volumes ONTAP systems are charged against the new subscription.

Learn how to associate an AWS subscription.

Can I add multiple AWS credentials, each with different marketplace subscriptions?

All AWS credentials that belong to the same AWS account will be associated with the same AWS Marketplace subscription.

If you have multiple AWS credentials that belong to different AWS accounts, then those credentials can be associated with the same AWS Marketplace subscription or with different subscriptions.

Can I move existing Cloud Volumes ONTAP systems to a different AWS account?

No, it's not possible to move the AWS resources associated with your Cloud Volumes ONTAP system to a different AWS account.

How do credentials work for marketplace deployments and on-premises deployments?

The sections above describe the recommended deployment method for the Console agent, which is from the Console. You can also deploy an agent in AWS from the AWS Marketplace and you can manually install the Console agent software on your own Linux host or in your VCenter.

If you use the Marketplace, permissions are provided in the same way. You just need to manually create and set up the IAM role, and then provide permissions for any additional accounts.

For on-premises deployments, you can't set up an IAM role for the Console, but you can provide permissions using AWS access keys.

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

- Standard mode
  - Set up permissions for an AWS Marketplace deployment
  - Set up permissions for on-premises deployments
- Restricted mode
  - Set up permissions for restricted mode

Manage AWS credentials and marketplace subscriptions for NetApp Console

Add and manage AWS credentials so that you deploy and manage cloud resources in your AWS accounts from the NetApp Console. If you manage multiple AWS Marketplace subscriptions, you can assign each one of them to different AWS credentials from the Credentials page.

Overview

You can add AWS credentials to an existing Console agent or directly to the Console:

- Add additional AWS credentials to an existing agent

  Add AWS credentials to a Console agent to manage cloud resources. Learn how to add AWS credentials to a Console agent.

- Add AWS credentials to the Console for creating a Console agent

  Adding new AWS credentials to the Console provides the permissions needed to create a Console agent. Learn how to add AWS credentials to the NetApp Console.

- Add AWS credentials to the Console for FSx for ONTAP

  Add new AWS credentials to the Console to create and manage FSx for ONTAP. Learn how to set up permissions for FSx for ONTAP

How to rotate credentials

The NetApp Console enables you to provide AWS credentials in a few ways: an IAM role associated with the agent instance, by assuming an IAM role in a trusted account, or by providing AWS access keys. Learn more about AWS credentials and permissions.

With the first two options, the Console uses the AWS Security Token Service to obtain temporary credentials that rotate constantly. This process is the best practice because it's automatic and it's secure.

Manually rotate AWS access keys by updating them in the Console.

Add additional credentials to a Console agent

Add additional AWS credentials to a Console agent so that it has the permissions needed to manage resources and processes within your public cloud environment. You can either provide the ARN of an IAM role in another account or provide AWS access keys.

Learn how the NetApp Console uses AWS credentials and permissions.

Grant permissions

Grant permissions before adding AWS credentials to a Console agent. The permissions allow a Console agent to manage resources and processes within that AWS account. You can provide the permissions with the ARN of a role in a trusted account or AWS keys.

> ⓘ If you deployed a Console agent from the Console, it automatically added AWS credentials for the account in which you deployed a Console agent. This ensures the necessary permissions are in place for managing resources.

Choices

- Grant permissions by assuming an IAM role in another account
- Grant permissions by providing AWS keys

Grant permissions by assuming an IAM role in another account

You can set up a trust relationship between the source AWS account in which you deployed a Console agent and other AWS accounts by using IAM roles. You would then provide the Console with the ARN of the IAM roles from the trusted accounts.

If a Console agent is installed on-premises, you can’t use this authentication method. You must use AWS keys.

Steps

1. Go to the IAM console in the target account in which you want to provide a Console agent with permissions.
2. Under Access Management, select **Roles > Create Role** and follow the steps to create the role.

   Be sure to do the following:

   - Under **Trusted entity type**, select **AWS account**.
   - Select **Another AWS account** and enter the ID of the account where a Console agent instance resides.
   - Create the required policies by copying and pasting the contents of the IAM policies for a Console agent.
3. Copy the Role ARN of the IAM role so that you can paste it in the Console later on.

Result

The account has the required permissions. You can now add the credentials to a Console agent.

Grant permissions by providing AWS keys

If you want to provide the Console with AWS keys for an IAM user, then you need to grant the required permissions to that user. The the Console IAM policy defines the AWS actions and resources that the Console is allowed to use.

You must use this authentication method if a Console agent is installed on-premises. You can't use an IAM role.

Steps

1. From the IAM console, create policies by copying and pasting the contents of the IAM policies for a Console agent.

   AWS Documentation: Creating IAM Policies

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

Add the credentials to an existing agent

After you provide an AWS account with the required permissions, you can add the credentials for that account to an existing agent. This enables you to launch Cloud Volumes ONTAP systems in that account using the same agent.

> ⓘ New credentials in your cloud provider may take a few minutes to become available.

Steps

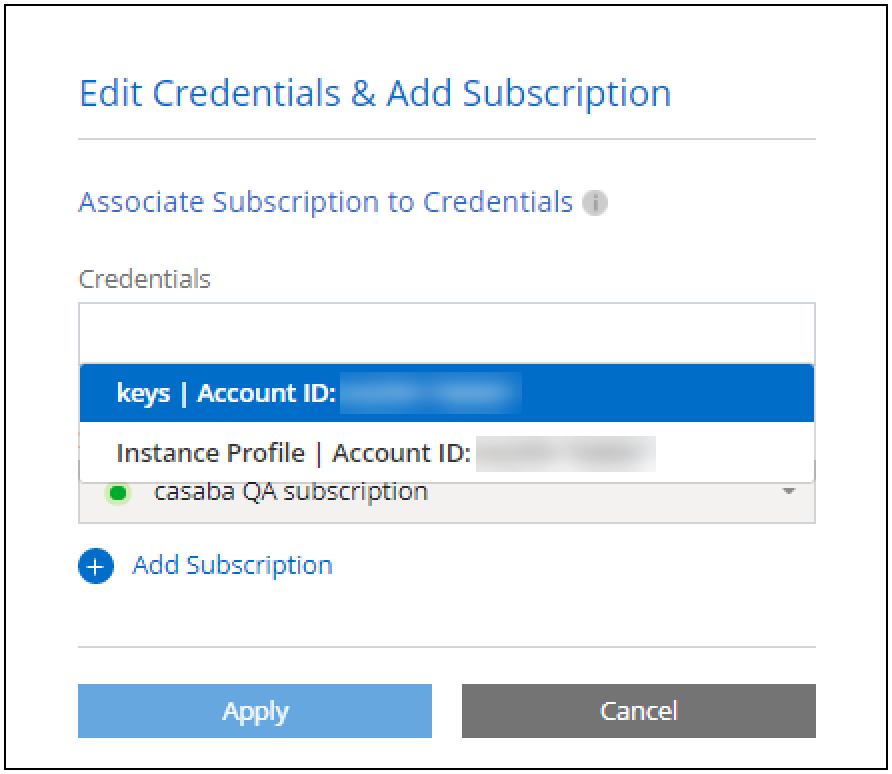
1. Use the top navigation bar to select a Console agent to which you want to add credentials.
2. In the left navigation bar, select **Administration > Credentials**.
3. On the **Organization credentials** page, select **Add Credentials** and follow the steps in the wizard.
   a. **Credentials Location**: Select **Amazon Web Services > Agent**.
   b. **Define Credentials**: Provide the ARN (Amazon Resource Name) of a trusted IAM role, or 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.

      To pay for services at an hourly rate (PAYGO) or with an annual contract, you must associate AWS credentials with your AWS Marketplace subscription.

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

Result

You can now switch to a different set of credentials from the Details and Credentials page when adding a subscription to the Console.



Edit Credentials & Add Subscription

Associate Subscription to Credentials

Credentials

keys | Account ID: [redacted]

Instance Profile | Account ID: [redacted]

casaba QA subscription

Add credentials to the Console for creating a Console agent

Add AWS credentials by providing the ARN of an IAM role that gives the permissions needed to create a Console agent. You can choose these credentials when creating a new agent.

Set up the IAM role

Set up an IAM role that enables the NetApp Console software as a service (SaaS) layer to assume the role.

Steps

1. Go to the IAM console in the target account.
2. Under Access Management, select **Roles > Create Role** and follow the steps to create the role.

   Be sure to do the following:

   - Under **Trusted entity type**, select **AWS account**.
   - Select **Another AWS account** and enter the ID of the NetApp Console SaaS: 952013314444
   - For Amazon FSx for NetApp ONTAP specifically, edit the **Trust relationships** policy to include "AWS": "arn:aws:iam::952013314444:root".

     For example, the policy should look like this:

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Principal": {
        "AWS": "arn:aws:iam::952013314444:root",
        "Service": "ec2.amazonaws.com"
      },
      "Action": "sts:AssumeRole"
    }
  ]
}
```

Refer to AWS Identity and Access Management (IAM) documentation for more information on cross account resource access in IAM.

- Create a policy that includes the permissions required to create a Console agent.
  - View the permissions needed for FSx for ONTAP
  - View the agent deployment policy

3. Copy the Role ARN of the IAM role so that you can paste it in the Console in the next step.

Result

The IAM role now has the required permissions. You can now add it to the Console.

Add the credentials

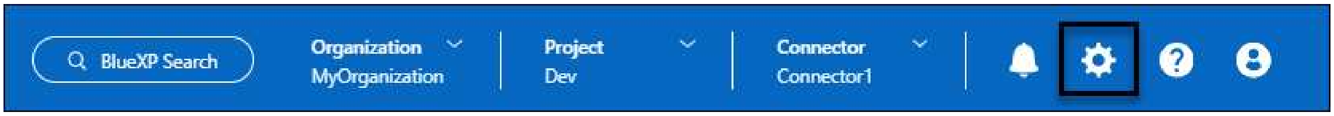
After you provide the IAM role with the required permissions, add the role ARN to the Console.

Before you begin

If you just created the IAM role, it might take a few minutes until they are available for use. Wait a few minutes before you add the credentials to the Console.

Steps

1. Select **Administration > Credentials**.



2. On the **Organization credentials** page, select **Add Credentials** and follow the steps in the wizard.
   a. **Credentials Location**: Select **Amazon Web Services > Console**.
   b. **Define Credentials**: Provide the ARN (Amazon Resource Name) of the IAM role.
   c. **Review**: Confirm the details about the new credentials and select **Add**.

Add credentials to the Console for Amazon FSx for ONTAP

For details, refer to the the Console documentation for Amazon FSx for ONTAP

Configure an AWS subscription

After you add your AWS credentials, you can configure an AWS Marketplace subscription with those credentials. The subscription enables you to pay for NetApp data services and Cloud Volumes ONTAP at an hourly rate (PAYGO) or using an annual contract.

There are two scenarios in which you might configure an AWS Marketplace subscription after you've already added the credentials:

- You didn't configure a subscription when you initially added the credentials.
- You want to change the AWS Marketplace subscription that is configured to the AWS credentials.

  Replacing the current marketplace subscription with a new subscription changes the marketplace subscription for any existing Cloud Volumes ONTAP systems and all new systems.

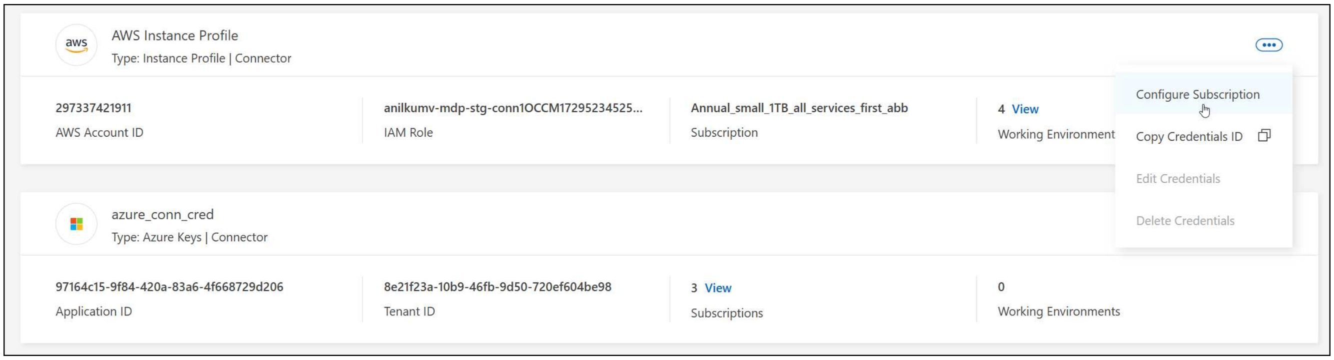
Before you begin

You need to create a Console agent before you can configure a subscription. Learn how to create a Console agent.

Steps

1. Select **Administration > Credentials**.
2. Select **Organization credentials**.
3. Select the action menu for a set of credentials that are associated with a Console agent and then select **Configure Subscription**.

   You must select credentials that are associated with a Console agent. You can't associate a marketplace subscription with credentials that are associated with the NetApp Console.

   AWS Instance Profile
   Type: Instance Profile | Connector

   297337421911
   AWS Account ID

   anilkumv-mdp-stg-conn1OCCM17295234525...
   IAM Role

   Annual_small_1TB_all_services_first_abb
   Subscription

   4 View
   Working Environment

   azure_conn_cred
   Type: Azure Keys | Connector

   97164c15-9f84-420a-83a6-4f668729d206
   Application ID

   8e21f23a-10b9-46fb-9d50-720ef604be98
   Tenant ID

   3 View
   Subscriptions

   0
   Working Environments

4. To associate the credentials with an existing subscription, select the subscription from the down-down list and select **Configure**.
5. 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 NetApp Console.

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

   - Select the Console organizations or 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 organization or account with this new subscription.

     The Console replaces the existing subscription for all credentials in the organization or 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 organizations or accounts, you'll need to manually associate the subscription by repeating these steps.

   - Select **Save**.

Associate an existing subscription with your organization

When you subscribe to from the AWS Marketplace, the last step in the process is to associate the subscription with your organization. If you didn't complete this step, then you can't use the subscription with your organization.

- Learn about the Console deployment modes
- Learn about the Console identity and access management

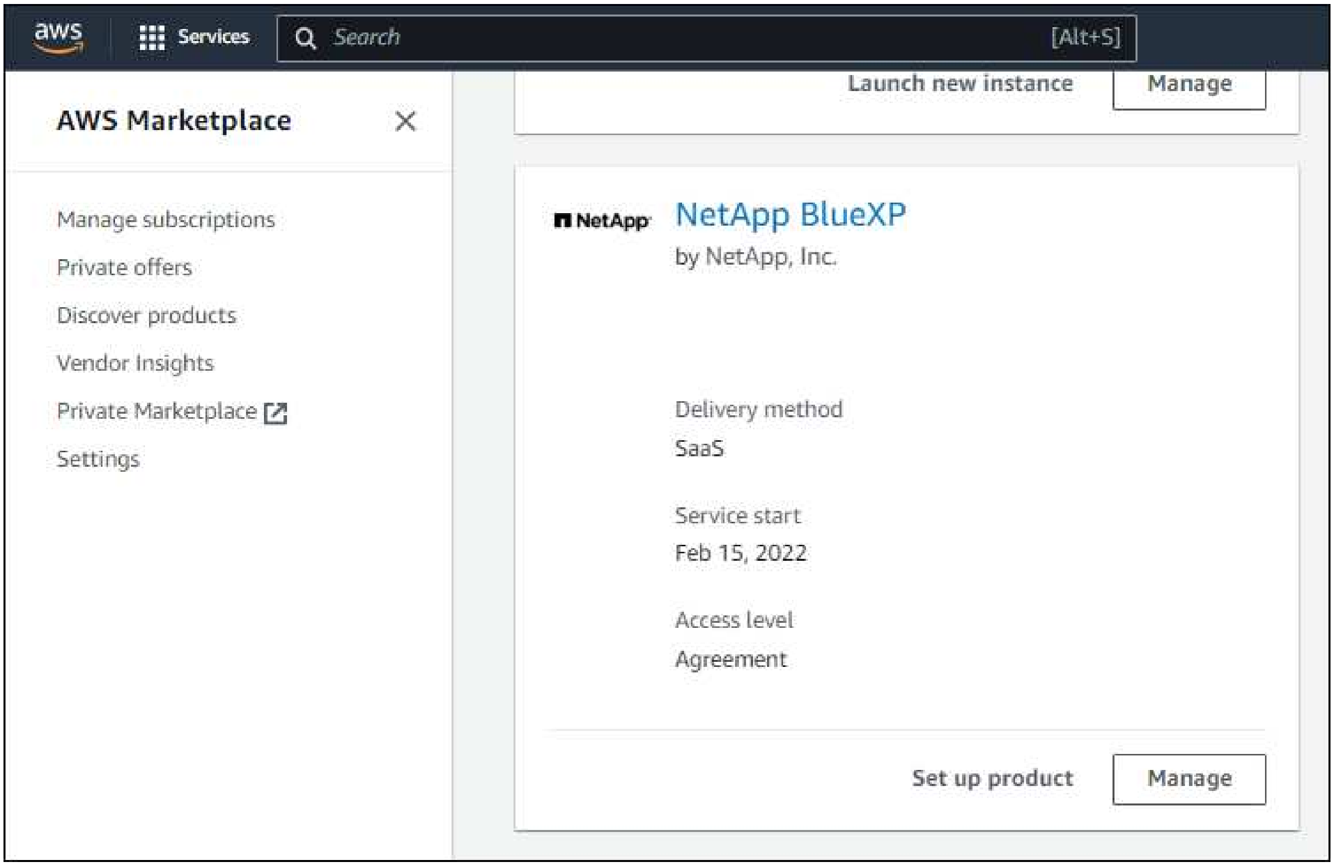
Follow the steps below if you subscribed to NetApp Intelligent Services from the AWS Marketplace, but you missed the step to associate the subscription with your account.

Steps

1. Confirm that you didn't associate your subscription with your Console organization.
   a. From the navigation menu, select **Administration > Licenses and subscriptions**.
   b. Select **Subscriptions**.
   c. Verify that your subscription doesn't appear.

      You'll only see the subscriptions that are associated with the organization or account that you're currently viewing. If you don't see your subscription, proceed with the following steps.

2. Log in to the AWS Console and navigate to **AWS Marketplace Subscriptions**.
3. Find the subscription.



Delivery method
SaaS

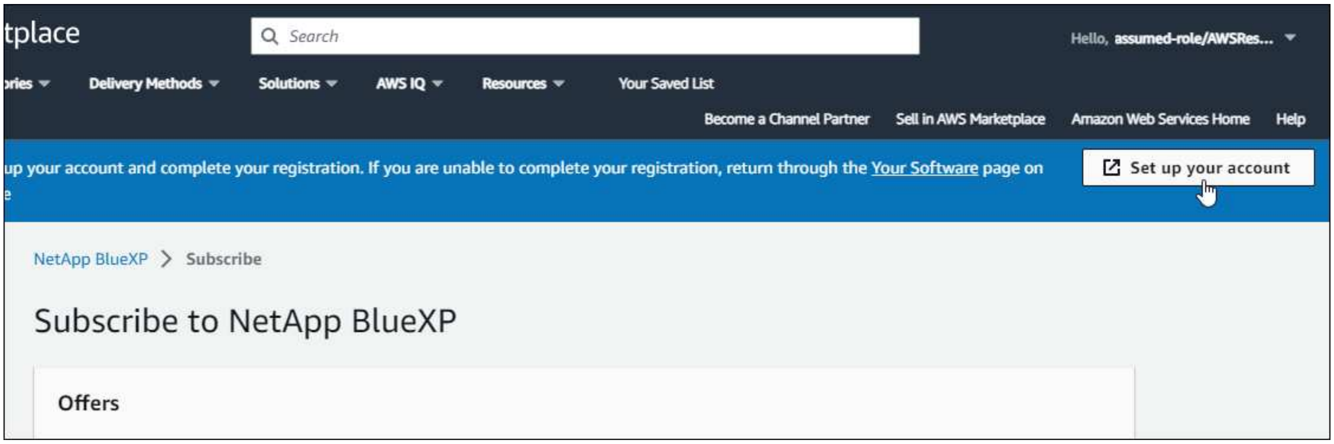
Service start
Feb 15, 2022

Access level
Agreement

4. Select **Set up product**.

   The subscription offer page should load in a new browser tab or window.

5. Select **Set up your account**.



up your account and complete your registration. If you are unable to complete your registration, return through the Your Software page on
e

Subscribe to NetApp BlueXP

   The **Subscription Assignment** page on netapp.com should load in a new browser tab or window.

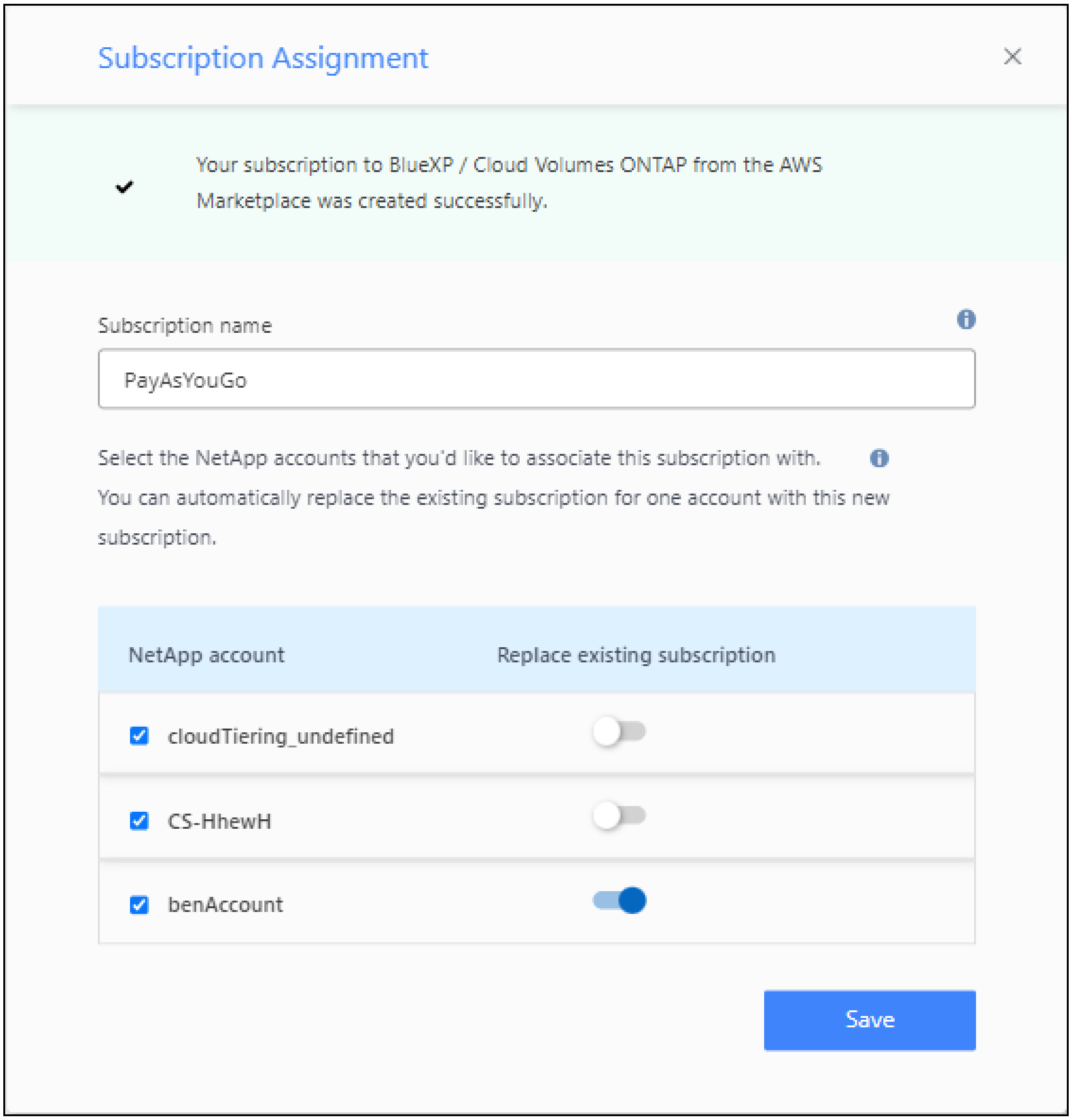
   Note that you might be prompted to log in to the Console first.

6. From the **Subscription Assignment** page:

   - Select the Console organizations or 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 organization or account with this new subscription.

The Console replaces the existing subscription for all credentials in the organization or 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 organizations or accounts, you'll need to manually associate the subscription by repeating these steps.



Subscription Assignment

✓ Your subscription to BlueXP / Cloud Volumes ONTAP from the AWS Marketplace was created successfully.

Subscription name: PayAsYouGo

Select the NetApp accounts that you'd like to associate this subscription with. You can automatically replace the existing subscription for one account with this new subscription.

NetApp account	Replace existing subscription
☑ cloudTiering_undefined	○
☑ CS-HhewH	○
☑ benAccount	●

7. Confirm that the subscription is associated with your organization.

   a. From the navigation menu, select **Administration > License and subscriptions**.

   b. Select **Subscriptions**.

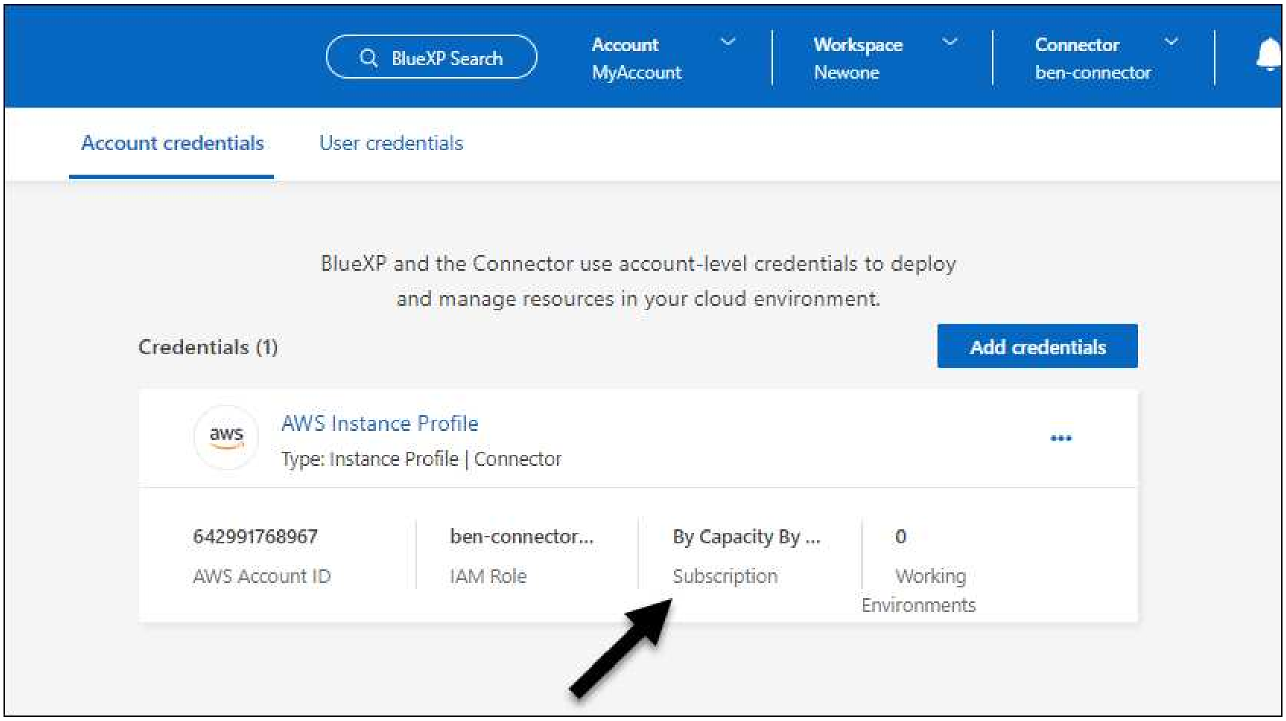
   c. Verify that your subscription appears.

8. Confirm that the subscription is associated with your AWS credentials.

   a. Select **Administration > Credentials**.

   b. On the **Organization credentials** page, verify that the subscription is associated with your AWS credentials.

Here's an example.



BlueXP and the Connector use account-level credentials to deploy and manage resources in your cloud environment.

Credentials (1)

Type: Instance Profile | Connector

642991768967	ben-connector...	By Capacity By ...	0
AWS Account ID	IAM Role	Subscription	Working Environments

Edit credentials

Edit your AWS credentials by changing the account type (AWS keys or assume role), by editing the name, or by updating the credentials themselves (the keys or the role ARN).

> You can't edit the credentials for an instance profile that are associated with a Console agent instance or an Amazon FSx for ONTAP instance. You can only rename the credentials for an FSx for ONTAP instance.

Steps

1. Select **Administration > Credentials**.
2. On the **Organization credentials** page, select the action menu for a set of credentials and then select **Edit Credentials**.
3. Make the required changes and then select **Apply**.

Delete credentials

If you no longer need a set of credentials, you can delete them. You can only delete credentials that aren't associated with a system.

> You can't delete the credentials for an instance profile that is associated with a Console agent.

Steps

1. Select **Administration > Credentials**.
2. On the **Organization credentials** or **Account credentials** page, select the action menu for a set of credentials and then select **Delete Credentials**.
3. Select **Delete** to confirm.

Azure

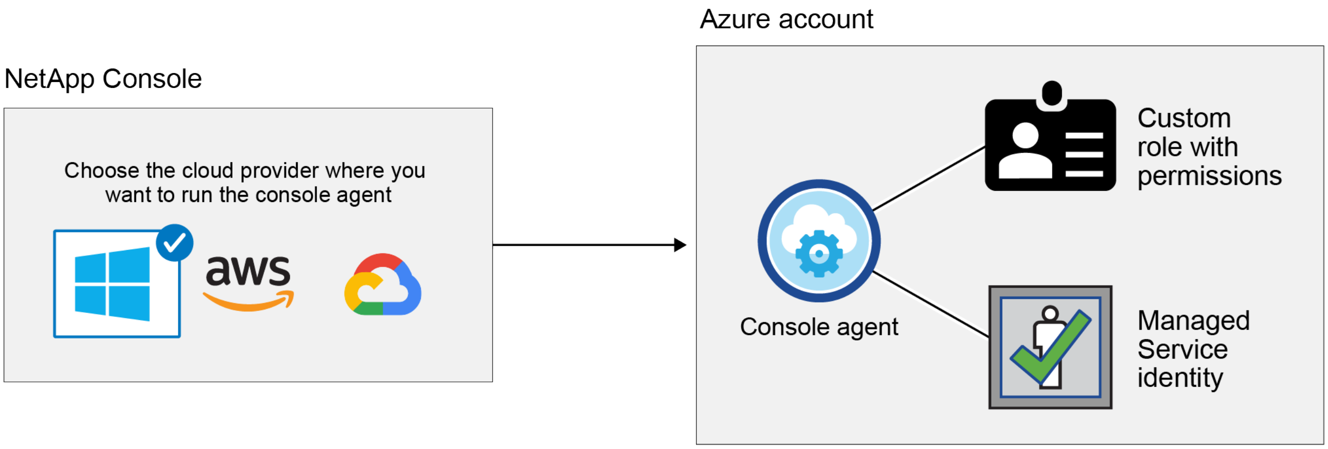
Learn about Azure credentials and permissions in NetApp Console

Learn how the NetApp Console uses Azure credentials to perform actions on your behalf and how those credentials are associated with marketplace subscriptions. Understanding these details can be helpful as you manage the credentials for one or more Azure subscriptions. For example, you might want to learn when to add additional Azure credentials to the Console.

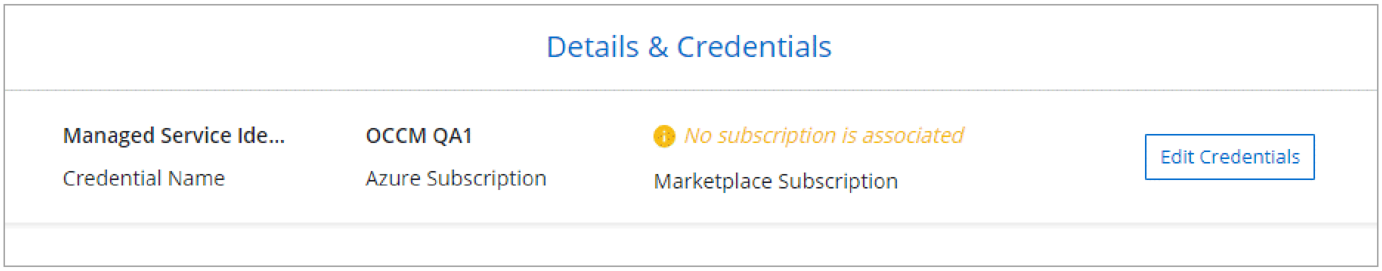
Initial Azure credentials

When you deploy a Console agent from the Console, you need to use an Azure account or service principal that has permissions to deploy the Console agent virtual machine. The required permissions are listed in the Agent deployment policy for Azure.

When the Console deploys the Console agent virtual machine in Azure, it enables a system-assigned managed identity on the virtual machine, creates a custom role, and assigns it to the virtual machine. The role provides the Console with the permissions required to manage resources and processes within that Azure subscription. Review how the Console uses the permissions.


NetApp Console
Choose the cloud provider where you want to run the console agent
aws
Azure account
Console agent
Custom role with permissions
Managed Service identity

If you create a new system for Cloud Volumes ONTAP, the Console selects these Azure credentials by default:


Details & Credentials

Managed Service Ide...	OCCM QA1	No subscription is associated	Edit Credentials
Credential Name	Azure Subscription	Marketplace Subscription	

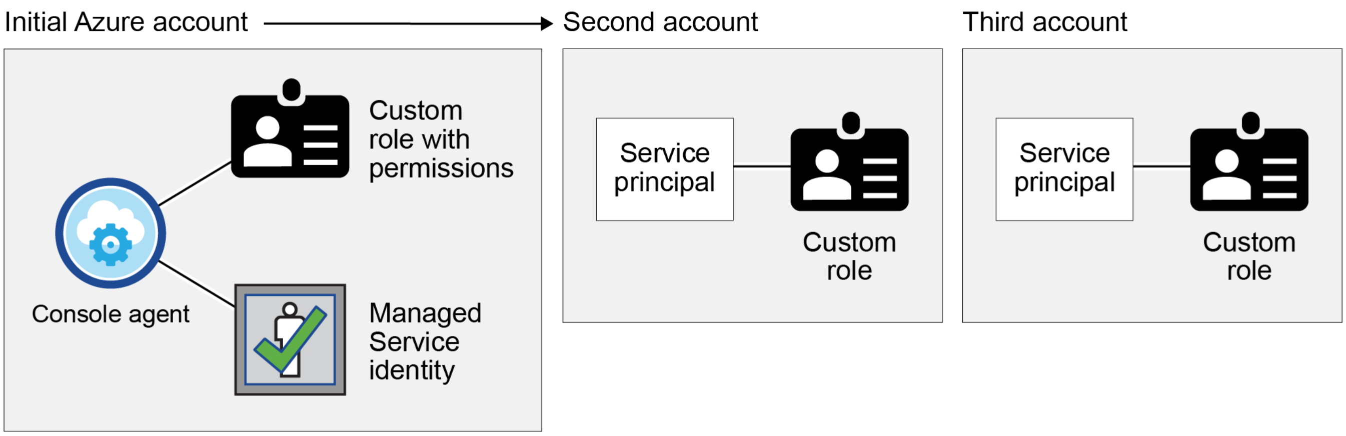
You can deploy all of your Cloud Volumes ONTAP systems using the initial Azure credentials, or you can add additional credentials.

Additional Azure subscriptions for a managed identity

The system-assigned managed identity assigned to the Console agent VM is associated with the subscription in which you launched the Console agent. If you want to select a different Azure subscription, then you need to associate the managed identity with those subscriptions.

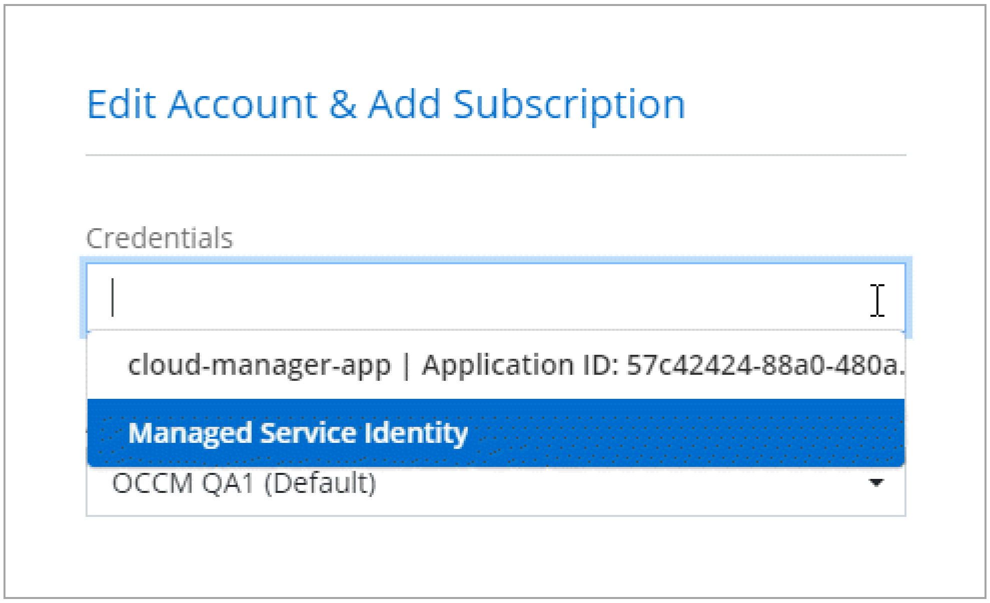
Additional Azure credentials

If you want to use different Azure credentials with the Console, then you must grant the required permissions by creating and setting up a service principal in Microsoft Entra ID for each Azure account. The following image shows two additional accounts, each set up with a service principal and custom role that provides permissions:



You would then add the account credentials to the Console by providing details about the AD service principal.

For example, you can switch between credentials when creating a new Cloud Volumes ONTAP system:


Edit Account & Add Subscription

Credentials

cloud-manager-app | Application ID: 57c42424-88a0-480a.

Managed Service Identity

OCCM QA1 (Default)

Credentials and marketplace subscriptions

The credentials that you add to a console agent must be associated with an Azure Marketplace subscription so that you can pay for Cloud Volumes ONTAP at an hourly rate (PAYGO) or NetApp data services or through an annual contract.

Learn how to associate an Azure subscription.

Note the following about Azure credentials and marketplace subscriptions:

- You can associate only one Azure Marketplace subscription with a set of Azure credentials
- You can replace an existing marketplace subscription with a new subscription

FAQ

The following question is related to credentials and subscriptions.

Can I change the Azure Marketplace subscription for Cloud Volumes ONTAP systems?

Yes, you can. When you change the Azure Marketplace subscription that's associated with a set of Azure credentials, all existing and new Cloud Volumes ONTAP systems will be charged against the new subscription.

Learn how to associate an Azure subscription.

Can I add multiple Azure credentials, each with different marketplace subscriptions?

All Azure credentials that belong to the same Azure subscription will be associated with the same Azure Marketplace subscription.

If you have multiple Azure credentials that belong to different Azure subscriptions, then those credentials can be associated with the same Azure Marketplace subscription or with different marketplace subscriptions.

Can I move existing Cloud Volumes ONTAP systems to a different Azure subscription?

No, it's not possible to move the Azure resources associated with your Cloud Volumes ONTAP system to a different Azure subscription.

How do credentials work for marketplace deployments and on-premises deployments?

The sections above describe the recommended deployment method for the Console agent, which is from the Console. You can also deploy a console agent in Azure from the Azure Marketplace, and you can install the Console agent software on your own Linux host.

If you use the Marketplace, you can provide permissions by assigning a custom role to the Console agent VM and to a system-assigned managed identity, or you can use a Microsoft Entra service principal.

For on-premises deployments, you can't set up a managed identity for the Console agent, but you can provide permissions by using a service principal.

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

- Standard mode
  - Set up permissions for an Azure Marketplace deployment
  - Set up permissions for on-premises deployments
- Restricted mode
  - Set up permissions for restricted mode

Manage Azure credentials and marketplace subscriptions for NetApp Console

Add and manage Azure credentials so that the NetApp Console has the permissions that it needs to deploy and manage cloud resources in your Azure subscriptions. If you manage multiple Azure Marketplace subscriptions, you can assign each one of them to different Azure credentials from the Credentials page.

Overview

There are two ways to add additional Azure subscriptions and credentials in the Console.

1. Associate additional Azure subscriptions with the Azure managed identity.
2. To deploy Cloud Volumes ONTAP using different Azure credentials, grant Azure permissions using a service principal and add its credentials to the Console.

Associate additional Azure subscriptions with a managed identity

The Console enables you to choose the Azure credentials and Azure subscription in which you want to deploy Cloud Volumes ONTAP. You can’t select a different Azure subscription for the managed identity profile unless you associate the managed identity with those subscriptions.

About this task

A managed identity is the initial Azure account when you deploy a Console agent from the Console. When you deploy the Console agent, the Console assigns the Console Operator role to the Console agent virtual machine.

Steps

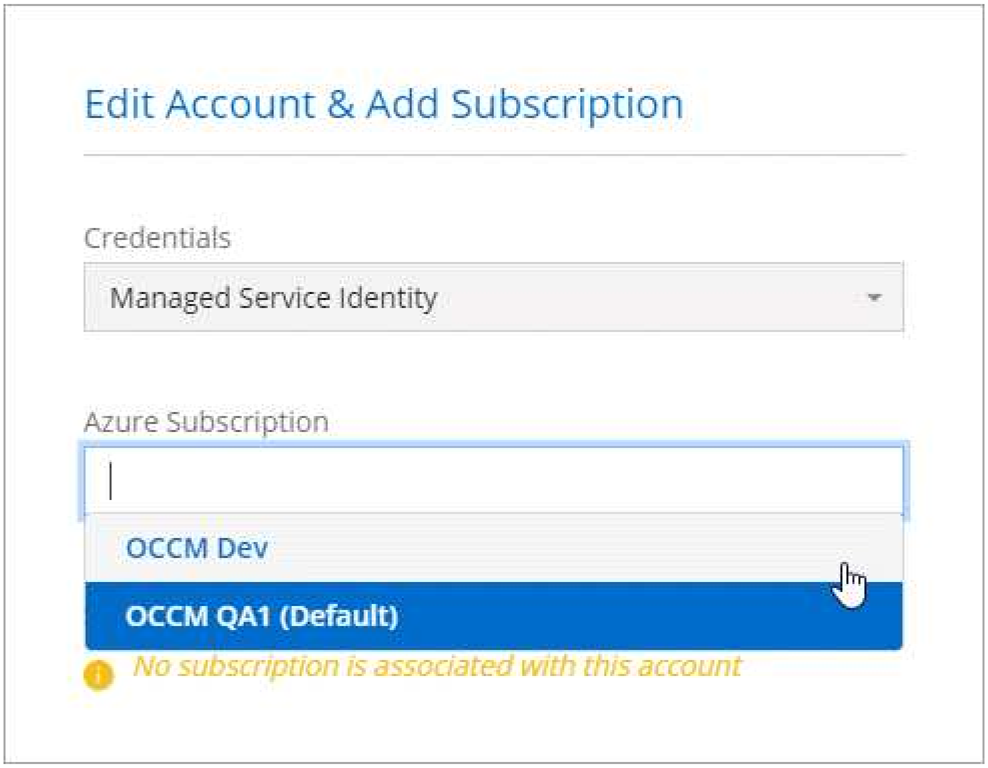
1. Log in to the Azure portal.
2. Open the **Subscriptions** service and then select the subscription in which you want to deploy Cloud Volumes ONTAP.
3. Select **Access control (IAM)**.
    a. Select **Add** > **Add role assignment** and then add the permissions:
        - Select the **Console Operator** role.

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

        - Assign access to a **Virtual Machine**.
        - Select the subscription in which a Console agent virtual machine was created.
        - Select a Console agent virtual machine.
        - Select **Save**.
4. Repeat these steps for additional subscriptions.

Result

When creating a new system, you can now select from multiple Azure subscriptions for the managed identity profile.



Edit Account & Add Subscription

Credentials

Managed Service Identity

Azure Subscription

OCCM Dev

OCCM QA1 (Default)

No subscription is associated with this account

Add additional Azure credentials to NetApp Console

When you deploy a Console agent from the Console, the Console enables a system-assigned managed identity on the virtual machine that has the required permissions. The Console selects these Azure credentials by default when you create a new system for Cloud Volumes ONTAP.

> An initial set of credentials isn't added if you manually installed a Console agent software on an existing system. Learn about Azure credentials and permissions.

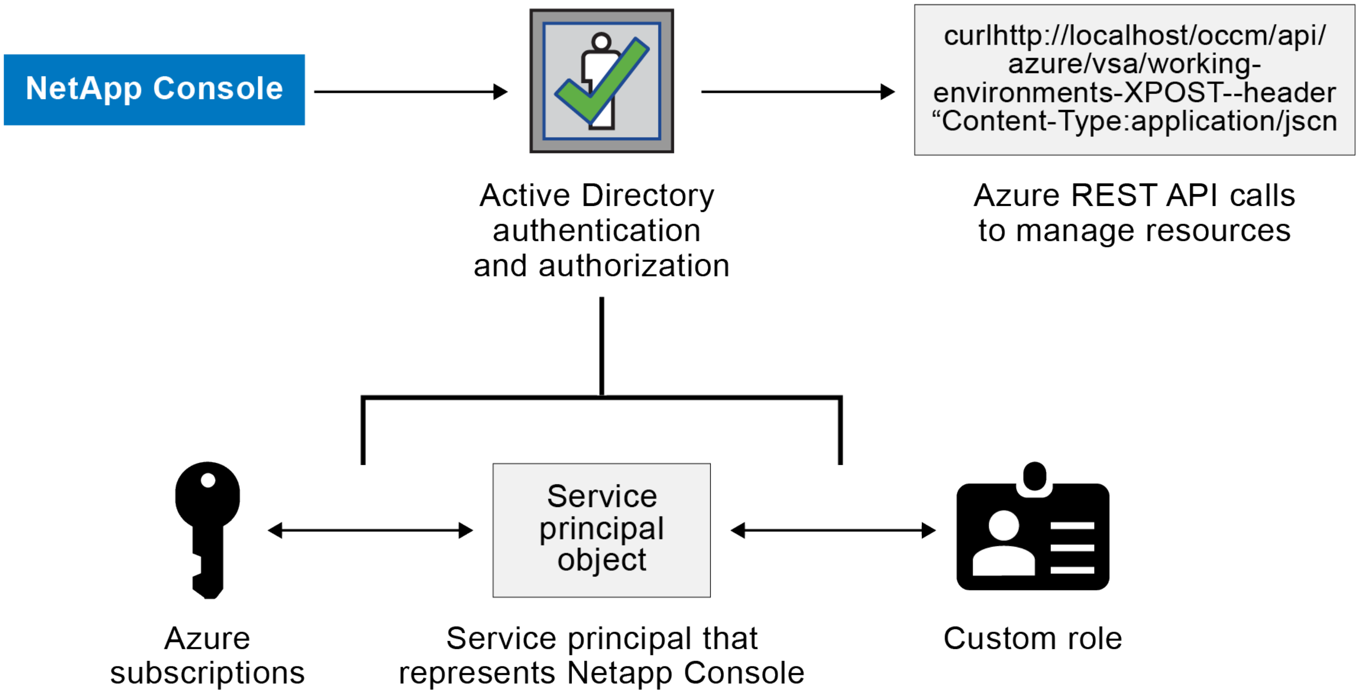
If you want to deploy Cloud Volumes ONTAP using *different* Azure credentials, then you must grant the required permissions by creating and setting up a service principal in Microsoft Entra ID for each Azure account. You can then add the new credentials to the Console.

Grant Azure permissions using a service principal

The Console needs permissions to perform actions in Azure. You can grant the required permissions to an Azure account by creating and setting up a service principal in Microsoft Entra ID and by obtaining the Azure credentials that the Console needs.

About this task

The following image depicts how the Console obtains permissions to perform operations in Azure. A service principal object, which is tied to one or more Azure subscriptions, represents the Console in Microsoft Entra ID and is assigned to a custom role that allows the required permissions.


NetApp Console
curlhttp://localhost/occm/api/azure/vsa/working-environments-XPOST--header “Content-Type:application/jscn
Active Directory authentication and authorization
Azure REST API calls to manage resources
Service principal object
Azure subscriptions
Service principal that represents Netapp Console
Custom role

Steps

1. Create a Microsoft Entra application.
2. Assign the application to a role.
3. Add Windows Azure Service Management API permissions.
4. Get the application ID and directory ID.
5. Create a client secret.

Create a Microsoft Entra application

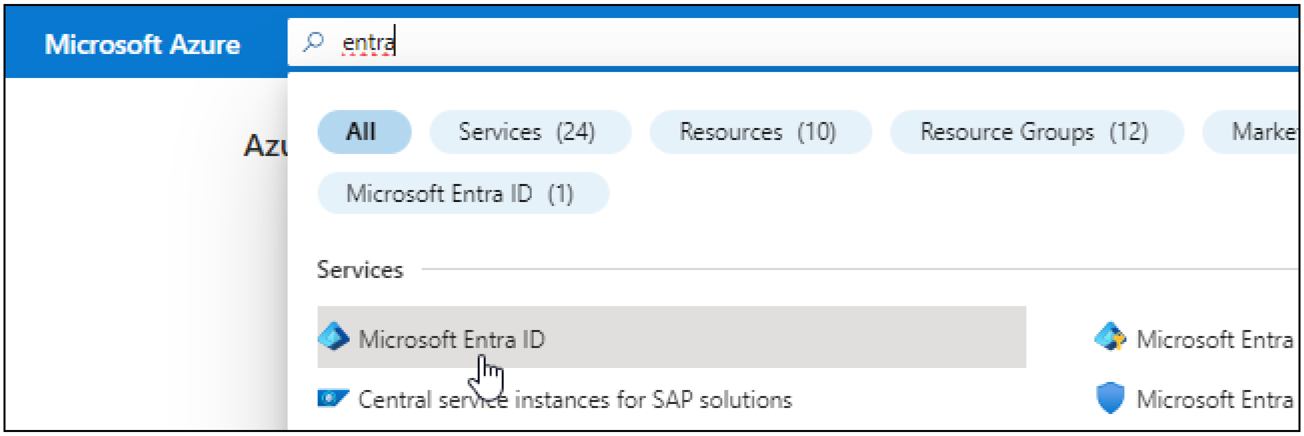
Create a Microsoft Entra application and service principal that the Console can use for role-based access control.

Steps

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 **Microsoft Entra ID** 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 the NetApp Console).
   - **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

You must bind the service principal to one or more Azure subscriptions and assign it the custom "Console Operator" role so the Console has permissions in Azure.

Steps

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 Console agent 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.

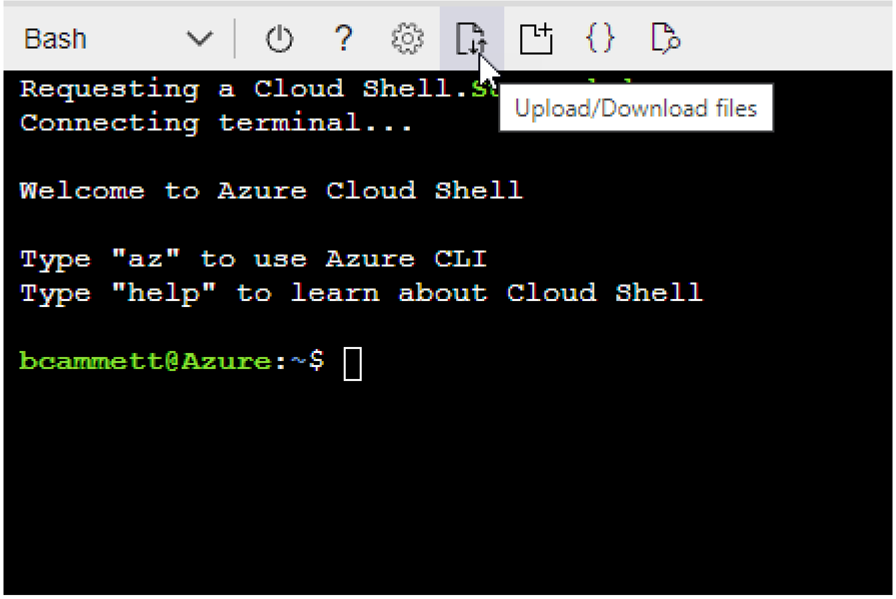
      Example

```
"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.



```
Requesting a Cloud Shell.Su
Connecting terminal...

Welcome to Azure Cloud Shell

Type "az" to use Azure CLI
Type "help" to learn about Cloud Shell

bcammett@Azure:~$
```

   - Use the Azure CLI to create the custom role:

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

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

2. Assign the application to the role:

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

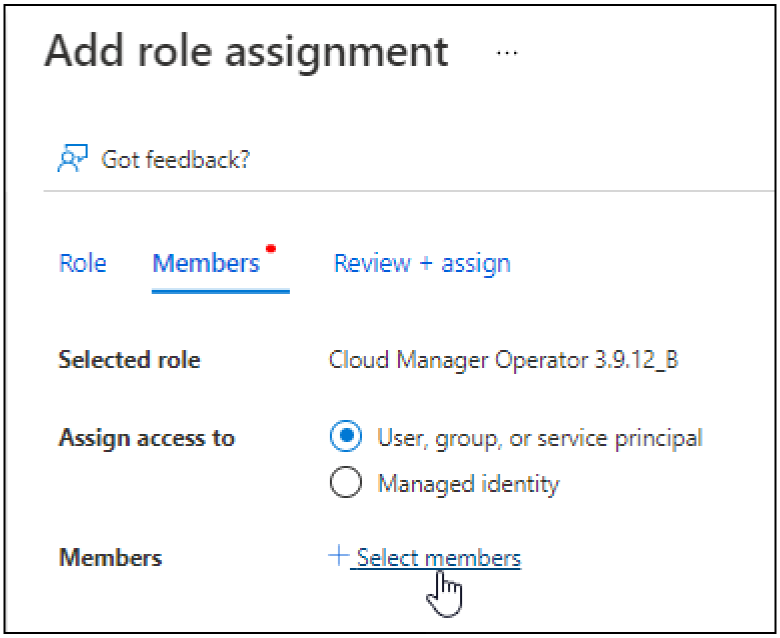
   b. Select the subscription.

   c. Select **Access control (IAM) > Add > Add role assignment**.

   d. In the **Role** tab, select the **Console Operator** role and select **Next**.

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

   - Keep **User, group, or service principal** selected.
   - Select **Select members**.


Add role assignment ...

Got feedback?

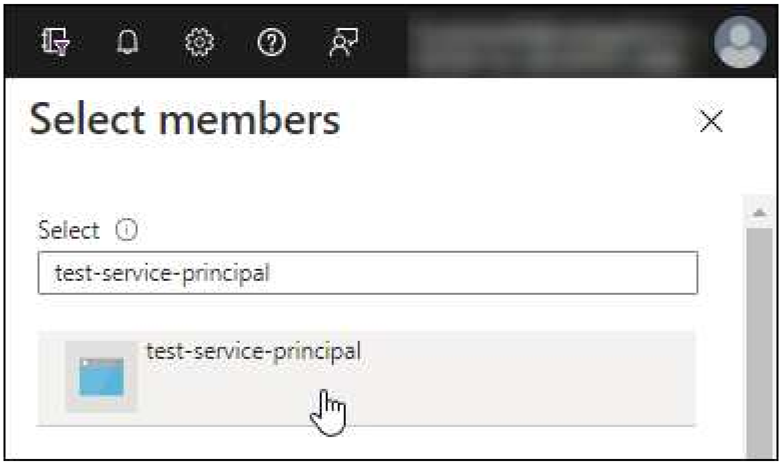
Selected role: Cloud Manager Operator 3.9.12_B

Assign access to: ● User, group, or service principal ○ Managed identity

Members: + Select members

- Search for the name of the application.

  Here’s an example:


Select members

Select ⓘ

test-service-principal

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

f. Select **Review + assign**.

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

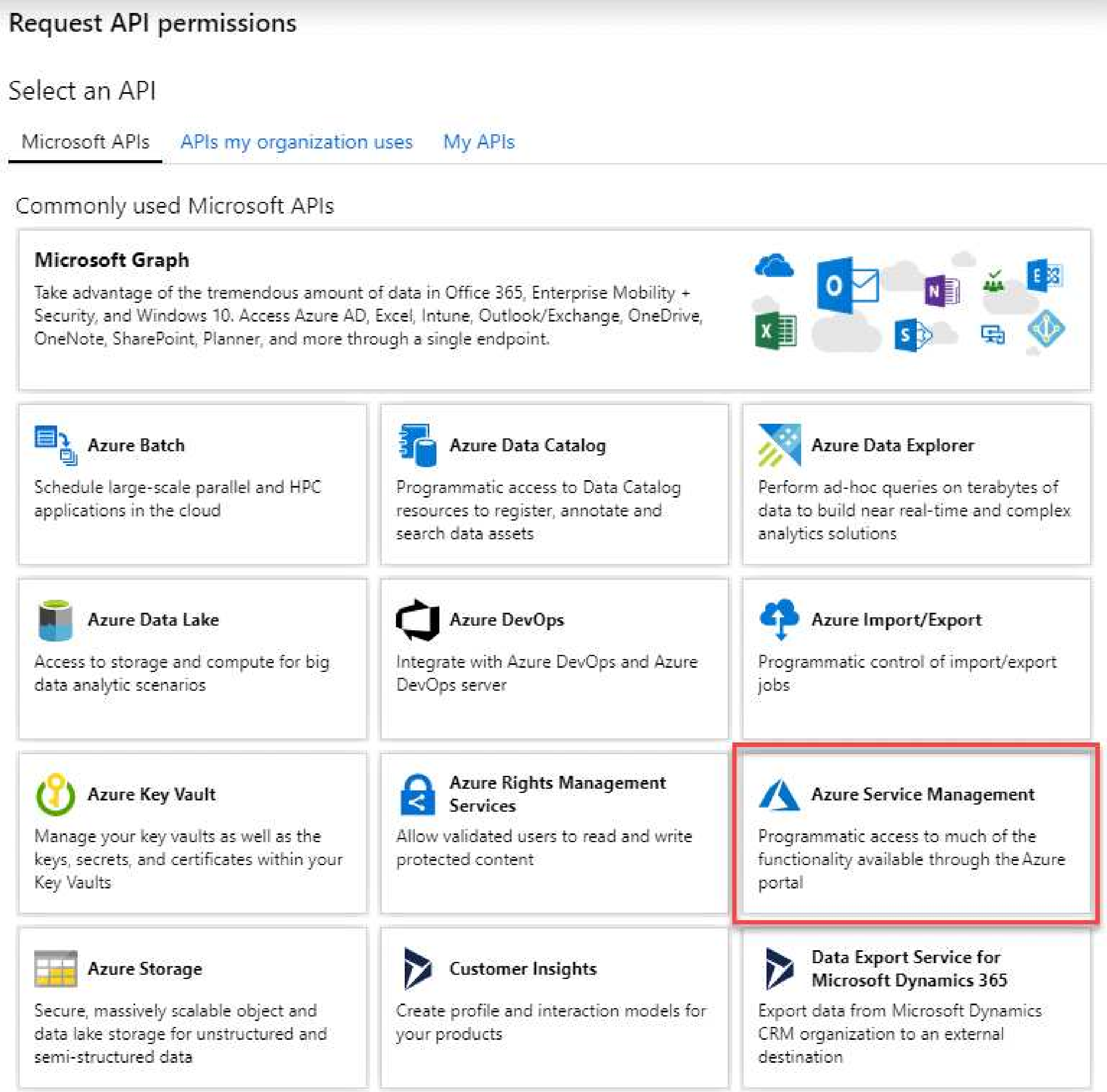
If you want to deploy Cloud Volumes ONTAP from multiple Azure subscriptions, then you must bind the service principal to each of those subscriptions. In the NetApp Console, you can select the subscription that you want to use when deploying Cloud Volumes ONTAP.

Add Windows Azure Service Management API permissions

You must assign "Windows Azure Service Management API" permissions to the service principal.

Steps

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



Request API permissions

Select an API

Microsoft APIs | APIs my organization uses | My APIs

Commonly used Microsoft APIs

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

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

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

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

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

Azure DevOps
Integrate with Azure DevOps and Azure DevOps server

Azure Import/Export
Programmatic control of import/export jobs

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

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

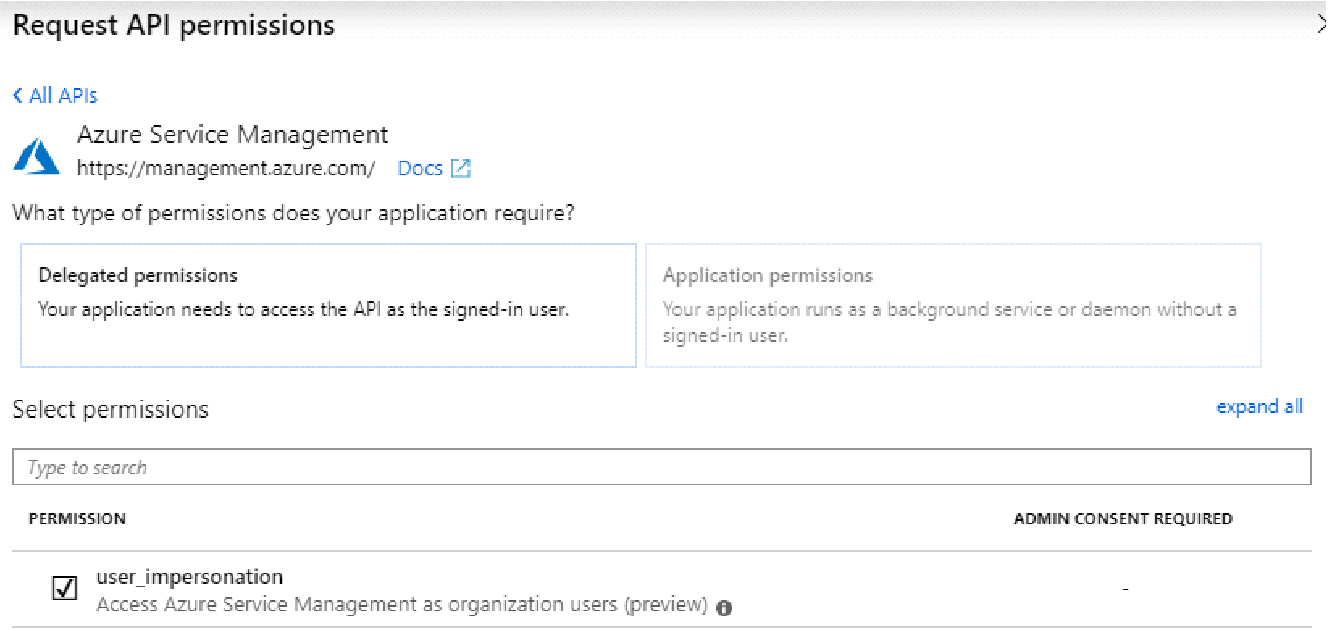
Azure Service Management
Programmatic access to much of the functionality available through the Azure portal

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

Customer Insights
Create profile and interaction models for your products

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

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



Request API permissions

‹ All APIs

Azure Service Management
https://management.azure.com/ Docs

What type of permissions does your application require?

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

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

Select permissions — expand all

Type to search

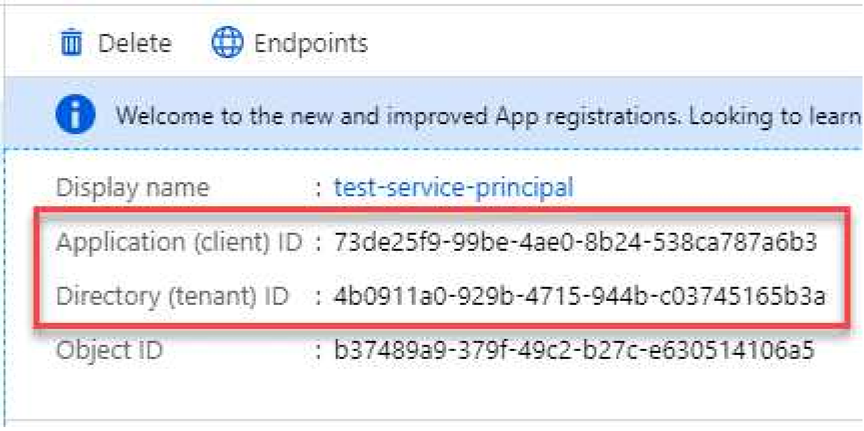
PERMISSION	ADMIN CONSENT REQUIRED
☑ user_impersonation Access Azure Service Management as organization users (preview)	-

Get the application ID and directory ID

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

Steps

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



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

Display name : test-service-principal
Application (client) ID : 73de25f9-99be-4ae0-8b24-538ca787a6b3
Directory (tenant) ID : 4b0911a0-929b-4715-944b-c03745165b3a
Object ID : b37489a9-379f-49c2-b27c-e630514106a5

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

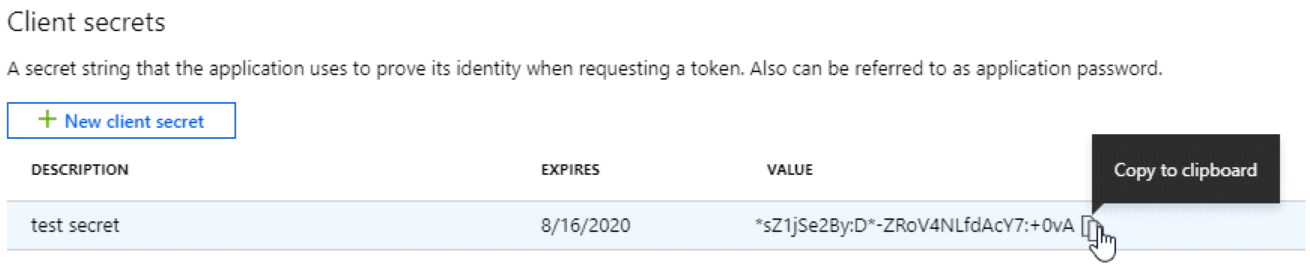
Create a client secret

Create a client secret and provide its value to the Console for authentication with Microsoft Entra ID.

Steps

1. Open the **Microsoft Entra ID** service.

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



Client secrets

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

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

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 the Console when you add an Azure account.

Add the credentials to the Console

After you provide an Azure account with the required permissions, you can add the credentials for that account to the Console. Completing this step enables you to launch Cloud Volumes ONTAP using different Azure credentials.

Before you begin

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

Before you begin

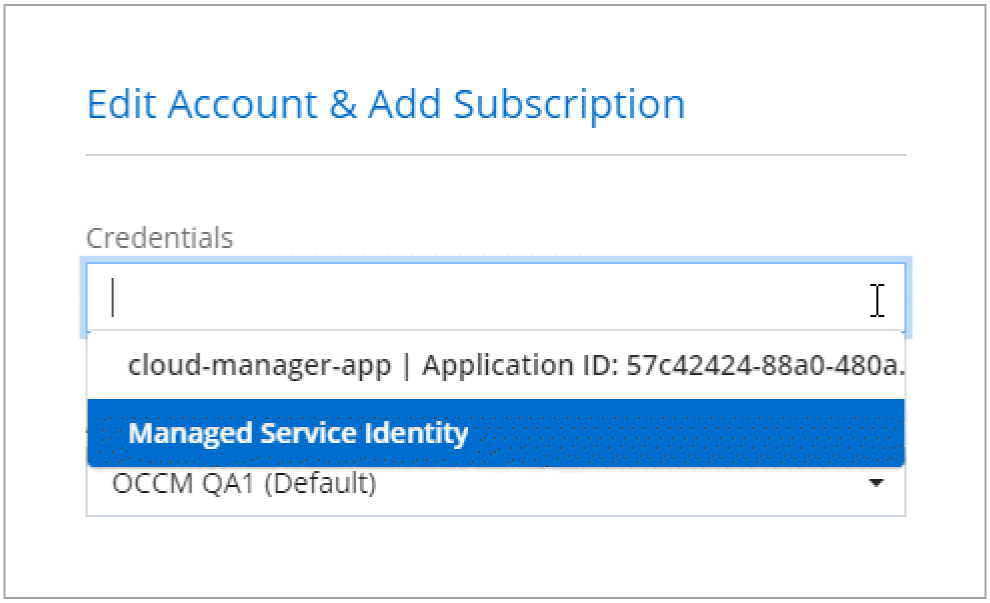
You need to create a Console agent before you can change Console settings. Learn how to create a Console agent.

Steps

1. Select **Administration > Credentials**.
2. Select **Add Credentials** and follow the steps in the wizard.
   a. **Credentials Location**: Select **Microsoft Azure > Agent**.
   b. **Define Credentials**: Enter information about the Microsoft Entra 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

You can switch to a different set of credentials from the Details and Credentials page when adding a system to the Console



Edit Account & Add Subscription

Credentials

cloud-manager-app | Application ID: 57c42424-88a0-480a.

Managed Service Identity

OCCM QA1 (Default)

Manage existing credentials

Manage the Azure credentials that you've already added to the Console by associating a Marketplace subscription, editing credentials, and deleting them.

Associate an Azure Marketplace subscription to credentials

After you add your Azure credentials to the Console, you can associate an Azure Marketplace subscription to those credentials. You can use the subscription to create a pay-as-you-go Cloud Volumes ONTAP system and access NetApp data services.

There are two scenarios in which you might associate an Azure Marketplace subscription after you've already added the credentials to the Console:

- You didn't associate a subscription when you initially added the credentials to the Console.
- You want to change the Azure Marketplace subscription that is associated with Azure credentials.

  Replacing the current marketplace subscription updates it for existing and new Cloud Volumes ONTAP systems.

Steps

1. Select **Administration > Credentials**.
2. Select **Organization credentials**.
3. Select the action menu for a set of credentials that are associated with a Console agent and then select **Configure Subscription**.

   You must select credentials that are associated with a Console agent. You can't associate a marketplace subscription with credentials that are associated with the NetApp Console.
4. To associate the credentials with an existing subscription, select the subscription from the down-down list

and select **Configure**.

5. 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 NetApp Console.

   e. From the **Subscription Assignment** page:
      - Select the Console organizations or 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 organization or account with this new subscription.

        The Console replaces the existing subscription for all credentials in the organization or 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 organizations or accounts, you'll need to manually associate the subscription by repeating these steps.

      - Select **Save**.

Edit credentials

Edit your Azure credentials in the Console. For example, you can update the client secret if a new secret was created for the service principal application.

Steps

1. Select **Administration > Credentials**.
2. Select **Organization credentials**.
3. Select the action menu for a set of credentials and then select **Edit Credentials**.
4. Make the required changes and then select **Apply**.

Delete credentials

If you no longer need a set of credentials, you can delete them. You can only delete credentials that aren't associated with a system.

Steps

1. Select **Administration > Credentials**.
2. Select **Organization credentials**.
3. On the **Organization credentials** page, select the action menu for a set of credentials and then select **Delete Credentials**.
4. Select **Delete** to confirm.

Google Cloud

Learn about Google Cloud projects and permissions

Learn how the NetApp Console uses Google Cloud credentials to perform actions on your behalf and how those credentials are associated with marketplace subscriptions. Understanding these details can be helpful as you manage the credentials for one or more Google Cloud projects. For example, you might want to learn about the service account that's associated with the Console agent VM.

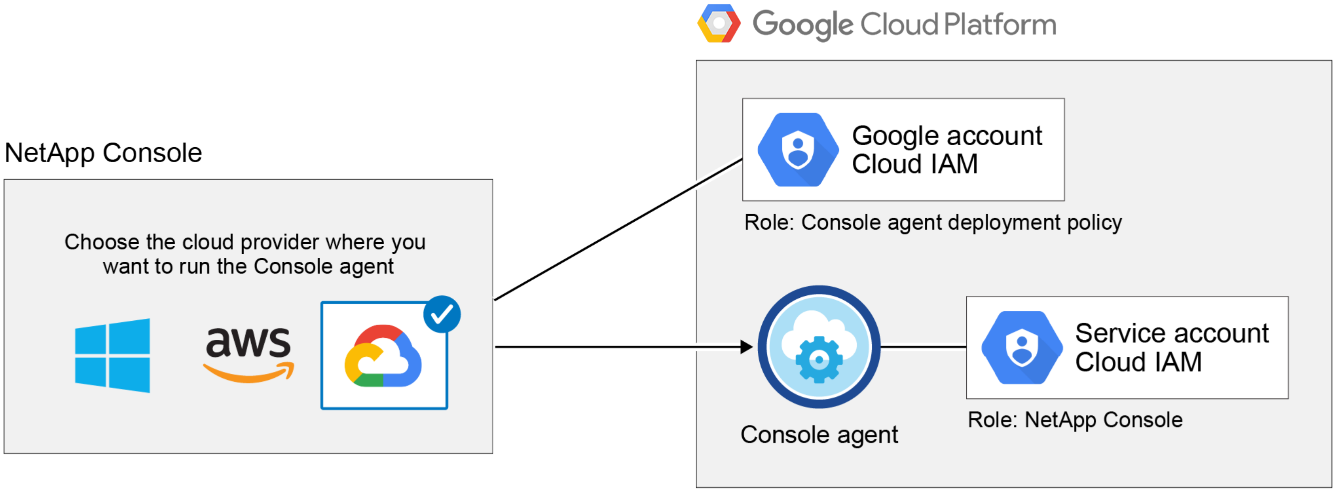
Project and permissions for NetApp Console

Before you can use the Console to manage resources in your Google Cloud project, you must first deploy a Console agent. The agent can't be running on your premises, or in a different cloud provider.

Two sets of permissions must be in place before you deploy a Console agent directly from the Console:

1. You need to deploy a Console agent using a Google account that has permissions to launch the Console agent from the Console.
2. When deploying the Console agent, you are prompted to select a service account for the agent The Console gets permissions from the service account to create and manage Cloud Volumes ONTAP systems, to manage backups using NetApp backup and recovery, and more. Permissions are provided by attaching a custom role to the service account.

The following image depicts the permission requirements described in numbers 1 and 2 above:


Google Cloud Platform
NetApp Console
Choose the cloud provider where you want to run the Console agent
aws
Google account Cloud IAM
Role: Console agent deployment policy
Console agent
Service account Cloud IAM
Role: NetApp Console

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

- Set up Google Cloud permissions for standard mode
- Set up permissions for restricted mode

Credentials and marketplace subscriptions

When you deploy a Console agent in Google Cloud, the Console creates a default set of credentials for the Google Cloud service account in the project in which the Console agent resides. These credentials must be associated with a Google Cloud Marketplace subscription so that you can pay for Cloud Volumes ONTAP and NetApp data services.

Learn how to associate a Google Cloud Marketplace subscription.

Note the following about Google Cloud credentials and marketplace subscriptions:

- Only one set of Google Cloud credentials can be associated with a Console agent
- You can associate only one Google Cloud Marketplace subscription with the credentials
- You can replace an existing marketplace subscription with a new subscription

Project for Cloud Volumes ONTAP

Cloud Volumes ONTAP can reside in the same project as the Console agent, or in a different project. To deploy Cloud Volumes ONTAP in a different project, you need to first add the Console agent service account and role to that project.

- Learn how to set up the service account
- Learn how to deploy Cloud Volumes ONTAP in Google Cloud and select a project

Manage Console agent permissions for Google Cloud deployments

Occasionally, NetApp updates the permissions required for the service account used for the Console agent when it is deployed in Google Cloud.

Verify the required Google permissions list.

Use Google Cloud Console to update the IAM role assigned to the service account to match the new set of permissions.

Google Cloud docs: Edit a custom role

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