



Reference

Set up and administration

NetApp
October 13, 2022

Table of Contents

Reference	1
Permissions	1
Ports	40

Reference

Permissions

Permissions summary for Cloud Manager

In order to use the features and services in Cloud Manager, you'll need to provide permissions so that Cloud Manager can perform operations in your cloud environment. Use the links on this page to quickly access the permissions that you need based on your goal.

AWS permissions

Purpose	Description	Link
Connector deployment	The user who creates a Connector from Cloud Manager needs specific permissions to deploy the instance in AWS.	Create a Connector in AWS from Cloud Manager
Connector operation	<p>When Cloud Manager launches the Connector, it attaches a policy to the instance that provides the permissions required to manage resources and processes in your AWS account.</p> <p>You need to set up the policy yourself if you launch a Connector from the marketplace or if you add more AWS credentials to a Connector.</p> <p>You also need to ensure that the policy is up to date as new permissions are added in subsequent releases.</p>	AWS permissions for the Connector
Cloud Volumes ONTAP operation	An IAM role must be attached to each Cloud Volumes ONTAP node in AWS. The same is true for the HA mediator. The default option is to let Cloud Manager create the IAM roles for you, but you can use your own.	Learn how to set up the IAM roles yourself

Azure permissions

Purpose	Description	Link
Connector deployment	When you deploy a Connector from Cloud Manager, you need to use an Azure account or service principal that has permissions to deploy the Connector VM in Azure.	Create a Connector in Azure from Cloud Manager

Purpose	Description	Link
Connector operation	<p>When Cloud Manager deploys the Connector VM in Azure, it creates a custom role that provides the permissions required to manage resources and processes within that Azure subscription.</p> <p>You need to set up the custom role yourself if you launch a Connector from the marketplace or if you add more Azure credentials to a Connector.</p> <p>You also need to ensure that the policy is up to date as new permissions are added in subsequent releases.</p>	Azure permissions for the Connector

Google Cloud permissions

Purpose	Description	Link
Connector deployment	The Google Cloud user who deploys a Connector from Cloud Manager needs specific permissions to deploy the Connector in Google Cloud.	Set up permissions to deploy the Connector
Connector operation	<p>The service account for the Connector VM instance must have specific permissions for day-to-day operations. You need to associate the service account with the Connector when you deploy it from Cloud Manager.</p> <p>You also need to ensure that the policy is up to date as new permissions are added in subsequent releases.</p>	Set up a service account for the Connector

AWS permissions for the Connector

When Cloud Manager launches the Connector instance in AWS, it attaches a policy to the instance that provides the Connector with permissions to manage resources and processes within that AWS account. The Connector uses the permissions to make API calls to several AWS services, including EC2, S3, CloudFormation, IAM, the Key Management Service (KMS), and more.

IAM policy

The IAM policy shown below provides the permissions that a Connector needs to manage resources and processes within your public cloud environment based on your AWS region.

When you create a Connector directly from Cloud Manager, Cloud Manager automatically applies this policy to the Connector.

If you deploy the Connector from the AWS Marketplace or if you manually install the Connector on a Linux host, then you'll need to set up the policy yourself.

You also need to ensure that the policy is up to date as new permissions are added in subsequent releases.

Standard regions

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Sid": "cvoServicePolicy",
      "Effect": "Allow",
      "Action": [
        "ec2:DescribeInstances",
        "ec2:DescribeInstanceStatus",
        "ec2:RunInstances",
        "ec2:ModifyInstanceAttribute",
        "ec2:DescribeInstanceAttribute",
        "ec2:DescribeRouteTables",
        "ec2:DescribeImages",
        "ec2:CreateTags",
        "ec2:CreateVolume",
        "ec2:DescribeVolumes",
        "ec2:ModifyVolumeAttribute",
        "ec2:CreateSecurityGroup",
        "ec2:DescribeSecurityGroups",
        "ec2:RevokeSecurityGroupEgress",
        "ec2:AuthorizeSecurityGroupEgress",
        "ec2:AuthorizeSecurityGroupIngress",
        "ec2:RevokeSecurityGroupIngress",
        "ec2:CreateNetworkInterface",
        "ec2:DescribeNetworkInterfaces",
        "ec2:ModifyNetworkInterfaceAttribute",
        "ec2:DescribeSubnets",
        "ec2:DescribeVpcs",
        "ec2:DescribeDhcpOptions",
        "ec2:CreateSnapshot",
        "ec2:DescribeSnapshots",
        "ec2:GetConsoleOutput",
        "ec2:DescribeKeyPairs",
        "ec2:DescribeRegions",
        "ec2:DescribeTags",
        "cloudformation:CreateStack",
        "cloudformation:DescribeStacks",
        "cloudformation:DescribeStackEvents",
        "cloudformation:ValidateTemplate",
        "iam:PassRole",
        "iam:CreateRole",
        "iam:PutRolePolicy",
        "iam:CreateInstanceProfile",
```

```
"iam:AddRoleToInstanceProfile",
"iam:RemoveRoleFromInstanceProfile",
"iam:ListInstanceProfiles",
"sts:DecodeAuthorizationMessage",
"ec2:AssociateIamInstanceProfile",
"ec2:DescribeIamInstanceProfileAssociations",
"ec2:DisassociateIamInstanceProfile",
"s3:GetBucketTagging",
"s3:GetBucketLocation",
"s3:ListBucket",
"s3:CreateBucket",
"s3:GetLifecycleConfiguration",
"s3:ListBucketVersions",
"s3:GetBucketPolicyStatus",
"s3:GetBucketPublicAccessBlock",
"s3:GetBucketPolicy",
"s3:GetBucketAcl",
"kms:List*",
"kms:ReEncrypt*",
"kms:Describe*",
"kms:CreateGrant",
"ce:GetReservationUtilization",
"ce:GetDimensionValues",
"ce:GetCostAndUsage",
"ce:GetTags",
"ec2:CreatePlacementGroup",
"ec2:DescribeReservedInstancesOfferings",
"sts:AssumeRole",
"ec2:AssignPrivateIpAddresses",
"ec2:CreateRoute",
"ec2:DescribeVpcs",
"ec2:ReplaceRoute",
"ec2:UnassignPrivateIpAddresses",
"s3:PutObjectTagging",
"s3:GetObjectTagging",
"fsx:Describe*",
"fsx:List*",
"ec2:DeleteSecurityGroup",
"ec2:DeleteNetworkInterface",
"ec2:DeleteSnapshot",
"ec2:DeleteTags",
"ec2:DeleteRoute",
"ec2:DeletePlacementGroup",
"iam:DeleteRole",
"iam:DeleteRolePolicy",
"iam:DeleteInstanceProfile",
```

```

        "cloudformation:DeleteStack",
        "ec2:DescribePlacementGroups",
        "iam:GetRolePolicy",
        "s3:ListAllMyBuckets",
        "s3:GetObject",
        "iam:GetRole",
        "s3:DeleteObject",
        "s3:DeleteObjectVersion",
        "s3:PutObject",
        "ec2:ModifyVolume",
        "ec2:DescribeVolumesModifications",
        "s3:GetEncryptionConfiguration"
    ],
    "Resource": "*"
},
{
    "Sid": "backupPolicy",
    "Effect": "Allow",
    "Action": [
        "ec2:StartInstances",
        "ec2:StopInstances",
        "ec2:DescribeInstances",
        "ec2:DescribeInstanceStatus",
        "ec2:RunInstances",
        "ec2:TerminateInstances",
        "ec2:DescribeInstanceAttribute",
        "ec2:DescribeImages",
        "ec2:CreateTags",
        "ec2:CreateVolume",
        "ec2:CreateSecurityGroup",
        "ec2:DescribeSubnets",
        "ec2:DescribeVpcs",
        "ec2:DescribeRegions",
        "cloudformation:CreateStack",
        "cloudformation:DeleteStack",
        "cloudformation:DescribeStacks",
        "kms:List*",
        "kms:Describe*",
        "ec2:describeVpcEndpoints",
        "kms:ListAliases",
        "athena:StartQueryExecution",
        "athena:GetQueryResults",
        "athena:GetQueryExecution",
        "athena:StopQueryExecution",
        "glue:CreateDatabase",
        "glue:CreateTable",
    ]
}

```

```

        "glue:BatchDeletePartition"
    ],
    "Resource": "*"
},
{
    "Sid": "backupS3Policy",
    "Effect": "Allow",
    "Action": [
        "s3:GetBucketLocation",
        "s3:ListAllMyBuckets",
        "s3:ListBucket",
        "s3:CreateBucket",
        "s3:GetLifecycleConfiguration",
        "s3:PutLifecycleConfiguration",
        "s3:PutBucketTagging",
        "s3:ListBucketVersions",
        "s3:GetBucketAcl",
        "s3:PutBucketPublicAccessBlock",
        "s3:GetObject",
        "s3:PutEncryptionConfiguration",
        "s3:DeleteObject",
        "s3:DeleteObjectVersion",
        "s3:ListBucketMultipartUploads",
        "s3:PutObject",
        "s3:PutBucketAcl",
        "s3:AbortMultipartUpload",
        "s3:ListMultipartUploadParts",
        "s3:DeleteBucket",
        "s3:GetObjectVersionTagging",
        "s3:GetObjectVersionAcl",
        "s3:GetObjectRetention",
        "s3:GetObjectTagging",
        "s3:GetObjectVersion",
        "s3:PutObjectVersionTagging",
        "s3:PutObjectRetention",
        "s3:DeleteObjectTagging",
        "s3:DeleteObjectVersionTagging",
        "s3:GetBucketObjectLockConfiguration",
        "s3:GetBucketVersioning",
        "s3:PutBucketObjectLockConfiguration",
        "s3:PutBucketVersioning",
        "s3:BypassGovernanceRetention"
    ],
    "Resource": [
        "arn:aws:s3:::netapp-backup-*"
    ]
}

```



```

},
{
  "Sid": "tagServicePolicy",
  "Effect": "Allow",
  "Action": [
    "ec2:CreateTags",
    "ec2:DeleteTags",
    "ec2:DescribeTags",
    "tag:getResources",
    "tag:getTagKeys",
    "tag:getTagValues",
    "tag:TagResources",
    "tag:UntagResources"
  ],
  "Resource": "*"
},
{
  "Sid": "fabricPoolS3Policy",
  "Effect": "Allow",
  "Action": [
    "s3:CreateBucket",
    "s3:GetLifecycleConfiguration",
    "s3:PutLifecycleConfiguration",
    "s3:PutBucketTagging",
    "s3:ListBucketVersions",
    "s3:GetBucketPolicyStatus",
    "s3:GetBucketPublicAccessBlock",
    "s3:GetBucketAcl",
    "s3:GetBucketPolicy",
    "s3:PutBucketPublicAccessBlock",
    "s3>DeleteBucket"
  ],
  "Resource": [
    "arn:aws:s3:::fabric-pool*"
  ]
},
{
  "Sid": "fabricPoolPolicy",
  "Effect": "Allow",
  "Action": [
    "ec2:DescribeRegions"
  ],
  "Resource": "*"
},
{
  "Effect": "Allow",

```

```

    "Action": [
        "ec2:StartInstances",
        "ec2:StopInstances",
        "ec2:TerminateInstances"
    ],
    "Condition": {
        "StringLike": {
            "ec2:ResourceTag/netapp-adc-manager": "*"
        }
    },
    "Resource": [
        "arn:aws:ec2:*:*:instance/*"
    ]
},
{
    "Effect": "Allow",
    "Action": [
        "ec2:StartInstances",
        "ec2:TerminateInstances",
        "ec2:AttachVolume",
        "ec2:DetachVolume"
    ],
    "Condition": {
        "StringLike": {
            "ec2:ResourceTag/GFCInstance": "*"
        }
    },
    "Resource": [
        "arn:aws:ec2:*:*:instance/*"
    ]
},
{
    "Effect": "Allow",
    "Action": [
        "ec2:StartInstances",
        "ec2:TerminateInstances",
        "ec2:AttachVolume",
        "ec2:DetachVolume",
        "ec2:StopInstances",
        "ec2>DeleteVolume"
    ],
    "Condition": {
        "StringLike": {
            "ec2:ResourceTag/WorkingEnvironment": "*"
        }
    }
},

```

```

    "Resource": [
        "arn:aws:ec2:*:*:instance/*"
    ]
},
{
    "Effect": "Allow",
    "Action": [
        "ec2:AttachVolume",
        "ec2:DetachVolume"
    ],
    "Resource": [
        "arn:aws:ec2:*:*:volume/*"
    ]
},
{
    "Effect": "Allow",
    "Action": [
        "ec2:DeleteVolume"
    ],
    "Condition": {
        "StringLike": {
            "ec2:ResourceTag/WorkingEnvironment": "*"
        }
    },
    "Resource": [
        "arn:aws:ec2:*:*:volume/*"
    ]
},
{
    "Sid": "K8sServicePolicy",
    "Effect": "Allow",
    "Action": [
        "ec2:DescribeRegions",
        "eks:ListClusters",
        "eks:DescribeCluster",
        "iam:GetInstanceProfiles"
    ],
    "Resource": "*"
},
{
    "Sid": "GFCservicePolicy",
    "Effect": "Allow",
    "Action": [
        "cloudformation:DescribeStacks",
        "cloudwatch:GetMetricStatistics",
        "cloudformation:ListStacks"
    ]
}

```

```

    ],
    "Resource": "*"
  }
]
}

```

GovCloud (US) regions

```

{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Action": [
        "iam:ListInstanceProfiles",
        "iam:CreateRole",
        "iam:DeleteRole",
        "iam:PutRolePolicy",
        "iam:CreateInstanceProfile",
        "iam:DeleteRolePolicy",
        "iam:AddRoleToInstanceProfile",
        "iam:RemoveRoleFromInstanceProfile",
        "iam:DeleteInstanceProfile",
        "ec2:ModifyVolumeAttribute",
        "sts:DecodeAuthorizationMessage",
        "ec2:DescribeImages",
        "ec2:DescribeRouteTables",
        "ec2:DescribeInstances",
        "iam:PassRole",
        "ec2:DescribeInstanceStatus",
        "ec2:RunInstances",
        "ec2:ModifyInstanceAttribute",
        "ec2:CreateTags",
        "ec2:CreateVolume",
        "ec2:DescribeVolumes",
        "ec2:DeleteVolume",
        "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:CreateSnapshot",
        "ec2:DeleteSnapshot",
        "ec2:DescribeSnapshots",
        "ec2:StopInstances",
        "ec2:GetConsoleOutput",
        "ec2:DescribeKeyPairs",
        "ec2:DescribeRegions",
        "ec2:DeleteTags",
        "ec2:DescribeTags",
        "cloudformation:CreateStack",
        "cloudformation:DeleteStack",
        "cloudformation:DescribeStacks",
        "cloudformation:DescribeStackEvents",
        "cloudformation:ValidateTemplate",
        "s3:GetObject",
        "s3:ListBucket",
        "s3:ListAllMyBuckets",
        "s3:GetBucketTagging",
        "s3:GetBucketLocation",
        "s3:CreateBucket",
        "s3:GetBucketPolicyStatus",
        "s3:GetBucketPublicAccessBlock",
        "s3:GetBucketAcl",
        "s3:GetBucketPolicy",
        "kms:List*",
        "kms:ReEncrypt*",
        "kms:Describe*",
        "kms:CreateGrant",
        "ec2:AssociateIamInstanceProfile",
        "ec2:DescribeIamInstanceProfileAssociations",
        "ec2:DisassociateIamInstanceProfile",
        "ec2:DescribeInstanceAttribute",
        "ce:GetReservationUtilization",
        "ce:GetDimensionValues",
        "ce:GetCostAndUsage",
        "ce:GetTags",
        "ec2:CreatePlacementGroup",
        "ec2>DeletePlacementGroup"
    ],
    "Resource": "*"
},
{

```

```

    "Sid": "fabricPoolPolicy",
    "Effect": "Allow",
    "Action": [
        "s3:DeleteBucket",
        "s3:GetLifecycleConfiguration",
        "s3:PutLifecycleConfiguration",
        "s3:PutBucketTagging",
        "s3:ListBucketVersions",
        "s3:GetBucketPolicyStatus",
        "s3:GetBucketPublicAccessBlock",
        "s3:GetBucketAcl",
        "s3:GetBucketPolicy",
        "s3:PutBucketPublicAccessBlock"
    ],
    "Resource": [
        "arn:aws-us-gov:s3:::fabric-pool*"
    ]
},
{
    "Sid": "backupPolicy",
    "Effect": "Allow",
    "Action": [
        "s3:DeleteBucket",
        "s3:GetLifecycleConfiguration",
        "s3:PutLifecycleConfiguration",
        "s3:PutBucketTagging",
        "s3:ListBucketVersions",
        "s3:GetObject",
        "s3:ListBucket",
        "s3:ListAllMyBuckets",
        "s3:GetBucketTagging",
        "s3:GetBucketLocation",
        "s3:GetBucketPolicyStatus",
        "s3:GetBucketPublicAccessBlock",
        "s3:GetBucketAcl",
        "s3:GetBucketPolicy",
        "s3:PutBucketPublicAccessBlock"
    ],
    "Resource": [
        "arn:aws-us-gov:s3:::netapp-backup-*"
    ]
},
{
    "Effect": "Allow",
    "Action": [
        "ec2:StartInstances",

```

```

        "ec2:TerminateInstances",
        "ec2:AttachVolume",
        "ec2:DetachVolume"
    ],
    "Condition": {
        "StringLike": {
            "ec2:ResourceTag/WorkingEnvironment": "*"
        }
    },
    "Resource": [
        "arn:aws-us-gov:ec2:*:*:instance/*"
    ]
},
{
    "Effect": "Allow",
    "Action": [
        "ec2:AttachVolume",
        "ec2:DetachVolume"
    ],
    "Resource": [
        "arn:aws-us-gov:ec2:*:*:volume/*"
    ]
}
]
}

```

C2S environment

```

{
    "Version": "2012-10-17",
    "Statement": [{
        "Effect": "Allow",
        "Action": [
            "ec2:DescribeInstances",
            "ec2:DescribeInstanceStatus",
            "ec2:RunInstances",
            "ec2:ModifyInstanceAttribute",
            "ec2:DescribeRouteTables",
            "ec2:DescribeImages",
            "ec2:CreateTags",
            "ec2:CreateVolume",
            "ec2:DescribeVolumes",
            "ec2:ModifyVolumeAttribute",
            "ec2>DeleteVolume",
            "ec2:CreateSecurityGroup",
            "ec2>DeleteSecurityGroup",

```

```
"ec2:DescribeSecurityGroups",
"ec2:RevokeSecurityGroupEgress",
"ec2:RevokeSecurityGroupIngress",
"ec2:AuthorizeSecurityGroupEgress",
"ec2:AuthorizeSecurityGroupIngress",
"ec2:CreateNetworkInterface",
"ec2:DescribeNetworkInterfaces",
"ec2>DeleteNetworkInterface",
"ec2:ModifyNetworkInterfaceAttribute",
"ec2:DescribeSubnets",
"ec2:DescribeVpcs",
"ec2:DescribeDhcpOptions",
"ec2:CreateSnapshot",
"ec2>DeleteSnapshot",
"ec2:DescribeSnapshots",
"ec2:GetConsoleOutput",
"ec2:DescribeKeyPairs",
"ec2:DescribeRegions",
"ec2>DeleteTags",
"ec2:DescribeTags",
"cloudformation:CreateStack",
"cloudformation>DeleteStack",
"cloudformation:DescribeStacks",
"cloudformation:DescribeStackEvents",
"cloudformation:ValidateTemplate",
"iam:PassRole",
"iam:CreateRole",
"iam>DeleteRole",
"iam:PutRolePolicy",
"iam:CreateInstanceProfile",
"iam>DeleteRolePolicy",
"iam:AddRoleToInstanceProfile",
"iam:RemoveRoleFromInstanceProfile",
"iam>DeleteInstanceProfile",
"s3:GetObject",
"s3:ListBucket",
"s3:GetBucketTagging",
"s3:GetBucketLocation",
"s3:ListAllMyBuckets",
"kms:List*",
"kms:Describe*",
"ec2:AssociateIamInstanceProfile",
"ec2:DescribeIamInstanceProfileAssociations",
"ec2:DisassociateIamInstanceProfile",
"ec2:DescribeInstanceAttribute",
"ec2:CreatePlacementGroup",
```



```

        "ec2:DeletePlacementGroup",
        "iam:ListInstanceProfiles"
    ],
    "Resource": "*"
},
{
    "Sid": "fabricPoolPolicy",
    "Effect": "Allow",
    "Action": [
        "s3:DeleteBucket",
        "s3:GetLifecycleConfiguration",
        "s3:PutLifecycleConfiguration",
        "s3:PutBucketTagging",
        "s3:ListBucketVersions"
    ],
    "Resource": [
        "arn:aws-iso:s3:::fabric-pool*"
    ]
},
{
    "Effect": "Allow",
    "Action": [
        "ec2:StartInstances",
        "ec2:StopInstances",
        "ec2:TerminateInstances",
        "ec2:AttachVolume",
        "ec2:DetachVolume"
    ],
    "Condition": {
        "StringLike": {
            "ec2:ResourceTag/WorkingEnvironment": "*"
        }
    },
    "Resource": [
        "arn:aws-iso:ec2:*:*:instance/*"
    ]
},
{
    "Effect": "Allow",
    "Action": [
        "ec2:AttachVolume",
        "ec2:DetachVolume"
    ],
    "Resource": [
        "arn:aws-iso:ec2:*:*:volume/*"
    ]
}

```

```
}  
]  
}
```

How the AWS permissions are used

The following sections describe how the permissions are used for each NetApp cloud service. This information can be helpful if your corporate policies dictate that permissions are only provided as needed.

AppTemplate tags

The Connector makes the following API requests to manage tags on AWS resources when you use the AppTemplate Tagging service:

- ec2:CreateTags
- ec2:DeleteTags
- ec2:DescribeTags
- tag:getResources
- tag:getTagKeys
- tag:getTagValues
- tag:TagResources
- tag:UntagResources

Cloud Backup

The Connector makes the following API requests to deploy the restore instance for Cloud Backup:

- ec2:StartInstances
- ec2:StopInstances
- ec2:DescribeInstances
- ec2:DescribeInstanceStatus
- ec2:RunInstances
- ec2:TerminateInstances
- ec2:DescribeInstanceAttribute
- ec2:DescribeImages
- ec2:CreateTags
- ec2:CreateVolume
- ec2:CreateSecurityGroup
- ec2:DescribeSubnets
- ec2:DescribeVpcs
- ec2:DescribeRegions
- cloudformation:CreateStack

- cloudformation:DeleteStack
- cloudformation:DescribeStacks

The Connector makes the following API requests to manage backups in Amazon S3:

- s3:GetBucketLocation
- s3:ListAllMyBuckets
- s3:ListBucket
- s3>CreateBucket
- s3:GetLifecycleConfiguration
- s3:PutLifecycleConfiguration
- s3:PutBucketTagging
- s3:ListBucketVersions
- s3:GetBucketAcl
- s3:PutBucketPublicAccessBlock
- kms:List*
- kms:Describe*
- s3:GetObject
- ec2:describeVpcEndpoints
- kms:ListAliases
- s3:PutEncryptionConfiguration

The Connector makes the following API requests when you use the Search & Restore method to restore volumes and files:

- s3>CreateBucket
- s3>DeleteObject
- s3>DeleteObjectVersion
- s3:GetBucketAcl
- s3:ListBucket
- s3:ListBucketVersions
- s3:ListBucketMultipartUploads
- s3:PutObject
- s3:PutBucketAcl
- s3:PutLifecycleConfiguration
- s3:PutBucketPublicAccessBlock
- s3:AbortMultipartUpload
- s3:ListMultipartUploadParts
- athena:StartQueryExecution
- athena:GetQueryResults

- athena:GetQueryExecution
- athena:StopQueryExecution
- glue>CreateDatabase
- glue>CreateTable
- glue:BatchDeletePartition

The Connector makes the following API requests when you use DataLock and Ransomware protection for your volume backups:

- s3:GetObjectVersionTagging
- s3:GetBucketObjectLockConfiguration
- s3:GetObjectVersionAcl
- s3:PutObjectTagging
- s3:DeleteObject
- s3:DeleteObjectTagging
- s3:GetObjectRetention
- s3:DeleteObjectVersionTagging
- s3:PutObject
- s3:GetObject
- s3:PutBucketObjectLockConfiguration
- s3:GetLifecycleConfiguration
- s3:ListBucketByTags
- s3:GetBucketTagging
- s3:DeleteObjectVersion
- s3:ListBucketVersions
- s3:ListBucket
- s3:PutBucketTagging
- s3:GetObjectTagging
- s3:PutBucketVersioning
- s3:PutObjectVersionTagging
- s3:GetBucketVersioning
- s3:GetBucketAcl
- s3:BypassGovernanceRetention
- s3:PutObjectRetention
- s3:GetBucketLocation
- s3:GetObjectVersion

Cloud Data Sense

The Connector makes the following API requests to deploy the Cloud Data Sense instance:

- ec2:DescribeInstances
- ec2:DescribeInstanceStatus
- ec2:RunInstances
- ec2:TerminateInstances
- ec2:CreateTags
- ec2:CreateVolume
- ec2:AttachVolume
- ec2:CreateSecurityGroup
- ec2>DeleteSecurityGroup
- ec2:DescribeSecurityGroups
- ec2:CreateNetworkInterface
- ec2:DescribeNetworkInterfaces
- ec2>DeleteNetworkInterface
- ec2:DescribeSubnets
- ec2:DescribeVpcs
- ec2:CreateSnapshot
- ec2:DescribeRegions
- cloudformation:CreateStack
- cloudformation>DeleteStack
- cloudformation:DescribeStacks
- cloudformation:DescribeStackEvents
- iam:AddRoleToInstanceProfile
- ec2:AssociateIamInstanceProfile
- ec2:DescribeIamInstanceProfileAssociations

The Connector makes the following API requests to scan S3 buckets when you use Cloud Data Sense:

- iam:AddRoleToInstanceProfile
- ec2:AssociateIamInstanceProfile
- ec2:DescribeIamInstanceProfileAssociations
- s3:GetBucketTagging
- s3:GetBucketLocation
- s3:ListAllMyBuckets
- s3:ListBucket
- s3:GetBucketPolicyStatus
- s3:GetBucketPolicy
- s3:GetBucketAcl
- s3:GetObject

- iam:GetRole
- s3:DeleteObject
- s3:DeleteObjectVersion
- s3:PutObject
- sts:AssumeRole

Cloud Tiering

The Connector makes the following API requests to tier data to Amazon S3 when you use Cloud Tiering.

Action	Used for set up?	Used for daily operations?
s3:CreateBucket	Yes	No
s3:PutLifecycleConfiguration	Yes	No
s3:GetLifecycleConfiguration	Yes	Yes
ec2:DescribeRegions	Yes	Yes

Cloud Volumes ONTAP

The Connector makes the following API requests to deploy and manage Cloud Volumes ONTAP in AWS.

Purpose	Action	Used for deployment?	Used for daily operations?	Used for deletion?
Create and manage IAM roles and instance profiles for Cloud Volumes ONTAP instances	iam:ListInstanceProfiles	Yes	Yes	No
	iam:CreateRole	Yes	No	No
	iam:DeleteRole	No	Yes	Yes
	iam:PutRolePolicy	Yes	No	No
	iam:CreateInstanceProfile	Yes	No	No
	iam:DeleteRolePolicy	No	Yes	Yes
	iam:AddRoleToInstanceProfile	Yes	No	No
	iam:RemoveRoleFromInstanceProfile	No	Yes	Yes
	iam:DeleteInstanceProfile	No	Yes	Yes
	iam:PassRole	Yes	No	No
	ec2:AssociateIamInstanceProfile	Yes	Yes	No
	ec2:DescribeIamInstanceProfileAssociations	Yes	Yes	No
	ec2:DisassociateIamInstanceProfile	No	Yes	No
Decode authorization status messages	sts:DecodeAuthorizationMessage	Yes	Yes	No
Describe the specified images (AMIs) available to the account	ec2:DescribeImages	Yes	Yes	No
Describe the route tables in a VPC (required for HA pairs only)	ec2:DescribeRouteTables	Yes	No	No

Purpose	Action	Used for deployment?	Used for daily operations?	Used for deletion?
Stop, start, and monitor instances	ec2:StartInstances	Yes	Yes	No
	ec2:StopInstances	Yes	Yes	No
	ec2:DescribeInstances	Yes	Yes	No
	ec2:DescribeInstanceStatus	Yes	Yes	No
	ec2:RunInstances	Yes	No	No
	ec2:TerminateInstances	No	No	Yes
	ec2:ModifyInstanceAttribute	No	Yes	No
Verify that enhanced networking is enabled for supported instance types	ec2:DescribeInstanceAttribute	No	Yes	No
Tag resources with the "WorkingEnvironment" and "WorkingEnvironmentId" tags which are used for maintenance and cost allocation	ec2:CreateTags	Yes	Yes	No
Manage EBS volumes that Cloud Volumes ONTAP uses as back-end storage	ec2:CreateVolume	Yes	Yes	No
	ec2:DescribeVolumes	Yes	Yes	Yes
	ec2:ModifyVolumeAttribute	No	Yes	Yes
	ec2:AttachVolume	Yes	Yes	No
	ec2>DeleteVolume	No	Yes	Yes
	ec2:DetachVolume	No	Yes	Yes

Purpose	Action	Used for deployment?	Used for daily operations?	Used for deletion?
Create and manage security groups for Cloud Volumes ONTAP	ec2:CreateSecurityGroup	Yes	No	No
	ec2:DeleteSecurityGroup	No	Yes	Yes
	ec2:DescribeSecurityGroups	Yes	Yes	Yes
	ec2:RevokeSecurityGroupEgress	Yes	No	No
	ec2:AuthorizeSecurityGroupEgress	Yes	No	No
	ec2:AuthorizeSecurityGroupIngress	Yes	No	No
	ec2:RevokeSecurityGroupIngress	Yes	Yes	No
Create and manage network interfaces for Cloud Volumes ONTAP in the target subnet	ec2:CreateNetworkInterface	Yes	No	No
	ec2:DescribeNetworkInterfaces	Yes	Yes	No
	ec2>DeleteNetworkInterface	No	Yes	Yes
	ec2:ModifyNetworkInterfaceAttribute	No	Yes	No
Get the list of destination subnets and security groups	ec2:DescribeSubnets	Yes	Yes	No
	ec2:DescribeVpcs	Yes	Yes	No
Get DNS servers and the default domain name for Cloud Volumes ONTAP instances	ec2:DescribeDhcpOptions	Yes	No	No
Take snapshots of EBS volumes for Cloud Volumes ONTAP	ec2:CreateSnapshot	Yes	Yes	No
	ec2>DeleteSnapshot	No	Yes	Yes
	ec2:DescribeSnapshots	No	Yes	No
Capture the Cloud Volumes ONTAP console, which is attached to AutoSupport messages	ec2:GetConsoleOutput	Yes	Yes	No

Purpose	Action	Used for deployment?	Used for daily operations?	Used for deletion?
Get the list of available key pairs	ec2:DescribeKeyPairs	Yes	No	No
Get the list of available AWS regions	ec2:DescribeRegions	Yes	Yes	No
Manage tags for resources associated with Cloud Volumes ONTAP instances	ec2:DeleteTags	No	Yes	Yes
	ec2:DescribeTags	No	Yes	No
Create and manage stacks for AWS CloudFormation templates	cloudformation:CreateStack	Yes	No	No
	cloudformation:DeleteStack	Yes	No	No
	cloudformation:DescribeStacks	Yes	Yes	No
	cloudformation:DescribeStackEvents	Yes	No	No
	cloudformation:ValidateTemplate	Yes	No	No

Purpose	Action	Used for deployment?	Used for daily operations?	Used for deletion?
Create and manage an S3 bucket that a Cloud Volumes ONTAP system uses as a capacity tier for data tiering	s3:CreateBucket	Yes	Yes	No
	s3>DeleteBucket	No	Yes	Yes
	s3:GetLifecycleConfiguration	No	Yes	No
	s3:PutLifecycleConfiguration	No	Yes	No
	s3:PutBucketTagging	No	Yes	No
	s3:ListBucketVersions	No	Yes	No
	s3:GetBucketPolicyStatus	No	Yes	No
	s3:GetBucketPublicAccessBlock	No	Yes	No
	s3:GetBucketAcl	No	Yes	No
	s3:GetBucketPolicy	No	Yes	No
	s3:PutBucketPublicAccessBlock	No	Yes	No
	s3:GetBucketTagging	No	Yes	No
	s3:GetBucketLocation	No	Yes	No
	s3:ListAllMyBuckets	No	No	No
	s3:ListBucket	No	Yes	No
Enable data encryption of Cloud Volumes ONTAP using the AWS Key Management Service (KMS)	kms:List*	Yes	Yes	No
	kms:ReEncrypt*	Yes	No	No
	kms:Describe*	Yes	Yes	No
	kms:CreateGrant	Yes	Yes	No
Obtain AWS cost data for Cloud Volumes ONTAP	ce:GetReservationUtilization	No	Yes	No
	ce:GetDimensionValues	No	Yes	No
	ce:GetCostAndUsage	No	Yes	No
	ce:GetTags	No	Yes	No

Purpose	Action	Used for deployment?	Used for daily operations?	Used for deletion?
Create and manage an AWS spread placement group for two HA nodes and the mediator in a single AWS Availability Zone	ec2:CreatePlacementGroup	Yes	No	No
	ec2:DeletePlacementGroup	No	Yes	Yes
Create reports	fsx:Describe*	No	Yes	No
	fsx:List*	No	Yes	No
Create and manage aggregates that support the Amazon EBS Elastic Volumes feature	ec2:DescribeVolumeModifications	No	Yes	No
	ec2:ModifyVolume	No	Yes	No

Global File Cache

The Connector makes the following API requests to deploy Global File Cache instances during deployment:

- cloudformation:DescribeStacks
- cloudwatch:GetMetricStatistics
- cloudformation:ListStacks

FSx for ONTAP

The Connector makes the following API requests to manage FSx for ONTAP:

- ec2:DescribeInstances
- ec2:DescribeInstanceStatus
- ec2:DescribeInstanceAttribute
- ec2:DescribeRouteTables
- ec2:DescribeImages
- ec2:CreateTags
- ec2:DescribeVolumes
- ec2:DescribeSecurityGroups
- ec2:DescribeNetworkInterfaces
- ec2:DescribeSubnets
- ec2:DescribeVpcs
- ec2:DescribeDhcpOptions
- ec2:DescribeSnapshots
- ec2:DescribeKeyPairs
- ec2:DescribeRegions

- ec2:DescribeTags
- ec2:DescribeIamInstanceProfileAssociations
- ec2:DescribeReservedInstancesOfferings
- ec2:describeVpcEndpoints
- ec2:DescribeVpcs
- ec2:DescribeVolumesModifications
- ec2:DescribePlacementGroups
- kms:List*
- kms:Describe*
- kms:CreateGrant
- kms:ListAliases
- fsx:Describe*
- fsx:List*

Kubernetes

The Connector makes the following API requests to discover and manage Amazon EKS clusters:

- ec2:DescribeRegions
- eks:ListClusters
- eks:DescribeCluster
- iam:GetInstanceProfile

S3 bucket discovery

The Connector makes the following API request to discover Amazon S3 buckets:

s3:GetEncryptionConfiguration

Azure permissions for the Connector

When Cloud Manager launches the Connector VM in Azure, it attaches a custom role to the VM that provides the Connector with permissions to manage resources and processes within that Azure subscription. The Connector uses the permissions to make API calls to several Azure services.

Custom role permissions

The custom role shown below provides the permissions that a Connector needs to manage resources and processes within your Azure network.

When you create a Connector directly from Cloud Manager, Cloud Manager automatically applies this custom role to the Connector.

If you deploy the Connector from the Azure Marketplace or if you manually install the Connector on a Linux host, then you'll need to set up the custom role yourself.

You also need to ensure that the role is up to date as new permissions are added in subsequent releases.

```
{
  "Name": "Cloud Manager Operator",
  "Actions": [
    "Microsoft.Compute/disks/delete",
    "Microsoft.Compute/disks/read",
    "Microsoft.Compute/disks/write",
    "Microsoft.Compute/locations/operations/read",
    "Microsoft.Compute/locations/vmSizes/read",

    "Microsoft.Resources/subscriptions/locations/read",
    "Microsoft.Compute/operations/read",

    "Microsoft.Compute/virtualMachines/instanceView/read",

    "Microsoft.Compute/virtualMachines/powerOff/action",
    "Microsoft.Compute/virtualMachines/read",

    "Microsoft.Compute/virtualMachines/restart/action",

    "Microsoft.Compute/virtualMachines/deallocate/action",
    "Microsoft.Compute/virtualMachines/start/action",
    "Microsoft.Compute/virtualMachines/vmSizes/read",
    "Microsoft.Compute/virtualMachines/write",
    "Microsoft.Compute/images/write",
    "Microsoft.Compute/images/read",

    "Microsoft.Network/locations/operationResults/read",
    "Microsoft.Network/locations/operations/read",
    "Microsoft.Network/networkInterfaces/read",
    "Microsoft.Network/networkInterfaces/write",
    "Microsoft.Network/networkInterfaces/join/action",
    "Microsoft.Network/networkSecurityGroups/read",
    "Microsoft.Network/networkSecurityGroups/write",

    "Microsoft.Network/networkSecurityGroups/join/action",
    "Microsoft.Network/virtualNetworks/read",

    "Microsoft.Network/virtualNetworks/checkIpAddressAvailability/read",
    "Microsoft.Network/virtualNetworks/subnets/read",
    "Microsoft.Network/virtualNetworks/subnets/write",

    "Microsoft.Network/virtualNetworks/subnets/virtualMachines/read",

    "Microsoft.Network/virtualNetworks/virtualMachines/read",
```

```
"Microsoft.Network/virtualNetworks/subnets/join/action",
    "Microsoft.Resources/deployments/operations/read",
    "Microsoft.Resources/deployments/read",
    "Microsoft.Resources/deployments/write",
    "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.Storage/checknameavailability/read",
    "Microsoft.Storage/operations/read",

"Microsoft.Storage/storageAccounts/listkeys/action",
    "Microsoft.Storage/storageAccounts/read",
    "Microsoft.Storage/storageAccounts/delete",

"Microsoft.Storage/storageAccounts/regeneratekey/action",
    "Microsoft.Storage/storageAccounts/write",

"Microsoft.Storage/storageAccounts/blobServices/containers/read",
    "Microsoft.Storage/usages/read",
    "Microsoft.Compute/snapshots/write",
    "Microsoft.Compute/snapshots/read",
    "Microsoft.Compute/availabilitySets/write",
    "Microsoft.Compute/availabilitySets/read",
    "Microsoft.Compute/disks/beginGetAccess/action",

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

"Microsoft.MarketplaceOrdering/offertypes/publishers/offers/plans/agreements/write",
    "Microsoft.Network/loadBalancers/read",
    "Microsoft.Network/loadBalancers/write",
    "Microsoft.Network/loadBalancers/delete",

"Microsoft.Network/loadBalancers/backendAddressPools/read",

"Microsoft.Network/loadBalancers/backendAddressPools/join/action",
```

```
"Microsoft.Network/loadBalancers/frontendIPConfigurations/read",

"Microsoft.Network/loadBalancers/loadBalancingRules/read",
    "Microsoft.Network/loadBalancers/probes/read",

"Microsoft.Network/loadBalancers/probes/join/action",
    "Microsoft.Authorization/locks/*",
    "Microsoft.Network/routeTables/join/action",
    "Microsoft.NetApp/netAppAccounts/read",

"Microsoft.NetApp/netAppAccounts/capacityPools/read",

"Microsoft.NetApp/netAppAccounts/capacityPools/volumes/write",

"Microsoft.NetApp/netAppAccounts/capacityPools/volumes/read",

"Microsoft.NetApp/netAppAccounts/capacityPools/volumes/delete",
    "Microsoft.Network/privateEndpoints/write",

"Microsoft.Storage/storageAccounts/PrivateEndpointConnectionsApproval/action",

"Microsoft.Storage/storageAccounts/privateEndpointConnections/read",

"Microsoft.Storage/storageAccounts/managementPolicies/read",

"Microsoft.Storage/storageAccounts/managementPolicies/write",
    "Microsoft.Network/privateEndpoints/read",
    "Microsoft.Network/privateDnsZones/write",

"Microsoft.Network/privateDnsZones/virtualNetworkLinks/write",
    "Microsoft.Network/virtualNetworks/join/action",
    "Microsoft.Network/privateDnsZones/A/write",
    "Microsoft.Network/privateDnsZones/read",

"Microsoft.Network/privateDnsZones/virtualNetworkLinks/read",

"Microsoft.Resources/deployments/operationStatuses/read",
    "Microsoft.Insights/Metrics/Read",

"Microsoft.Compute/virtualMachines/extensions/write",

"Microsoft.Compute/virtualMachines/extensions/delete",

"Microsoft.Compute/virtualMachines/extensions/read",
```



```

        "Microsoft.Compute/virtualMachines/delete",
        "Microsoft.Network/networkInterfaces/delete",
        "Microsoft.Network/networkSecurityGroups/delete",
        "Microsoft.Resources/deployments/delete",
        "Microsoft.Compute/diskEncryptionSets/read",
        "Microsoft.Compute/snapshots/delete",
        "Microsoft.Network/privateEndpoints/delete",
        "Microsoft.Compute/availabilitySets/delete",
        "Microsoft.Network/loadBalancers/delete",
        "Microsoft.KeyVault/vaults/read",
        "Microsoft.KeyVault/vaults/accessPolicies/write",
        "Microsoft.Compute/diskEncryptionSets/write",
        "Microsoft.KeyVault/vaults/deploy/action",
        "Microsoft.Compute/diskEncryptionSets/delete",
        "Microsoft.Resources/tags/read",
        "Microsoft.Resources/tags/write",
        "Microsoft.Resources/tags/delete",

"Microsoft.Network/applicationSecurityGroups/write",

"Microsoft.Network/applicationSecurityGroups/read",

"Microsoft.Network/applicationSecurityGroups/joinIpConfiguration/action",

"Microsoft.Network/networkSecurityGroups/securityRules/write",

"Microsoft.Network/applicationSecurityGroups/delete",

"Microsoft.Network/networkSecurityGroups/securityRules/delete"
    ],
    "NotActions": [],
    "AssignableScopes": [],
    "Description": "Cloud Manager Permissions",
    "IsCustom": "true"
}

```

How Azure permissions are used

Actions	Purpose
"Microsoft.Compute/locations/operations/read", "Microsoft.Compute/locations/vmSizes/read", "Microsoft.Compute/operations/read", "Microsoft.Compute/virtualMachines/instanceView/read", "Microsoft.Compute/virtualMachines/powerOff/action", "Microsoft.Compute/virtualMachines/read", "Microsoft.Compute/virtualMachines/restart/action", "Microsoft.Compute/virtualMachines/start/action", "Microsoft.Compute/virtualMachines/deallocate/action", "Microsoft.Compute/virtualMachines/vmSizes/read", "Microsoft.Compute/virtualMachines/write",	Creates Cloud Volumes ONTAP and stops, starts, deletes, and obtains the status of the system.
"Microsoft.Compute/images/write", "Microsoft.Compute/images/read",	Enables Cloud Volumes ONTAP deployment from a VHD.
"Microsoft.Compute/disks/delete", "Microsoft.Compute/disks/read", "Microsoft.Compute/disks/write", "Microsoft.Storage/checknameavailability/read", "Microsoft.Storage/operations/read", "Microsoft.Storage/storageAccounts/listkeys/action", "Microsoft.Storage/storageAccounts/read", "Microsoft.Storage/storageAccounts/regeneratekey/action", "Microsoft.Storage/storageAccounts/write", "Microsoft.Storage/storageAccounts/delete", "Microsoft.Storage/usages/read",	Manages Azure storage accounts and disks, and attaches the disks to Cloud Volumes ONTAP.
"Microsoft.Storage/storageAccounts/blobServices/containers/read", "Microsoft.KeyVault/vaults/read", "Microsoft.KeyVault/vaults/accessPolicies/write"	Enables backups to Azure Blob storage and encryption of storage accounts
"Microsoft.Network/networkInterfaces/read", "Microsoft.Network/networkInterfaces/write", "Microsoft.Network/networkInterfaces/join/action",	Creates and manages network interfaces for Cloud Volumes ONTAP in the target subnet.
"Microsoft.Network/networkSecurityGroups/read", "Microsoft.Network/networkSecurityGroups/write", "Microsoft.Network/networkSecurityGroups/join/action",	Creates predefined network security groups for Cloud Volumes ONTAP.

Actions	Purpose
"Microsoft.Resources/subscriptions/locations/read", "Microsoft.Network/locations/operationResults/read", "Microsoft.Network/locations/operations/read", "Microsoft.Network/virtualNetworks/read", "Microsoft.Network/virtualNetworks/checkIpAddressAvailability/read", "Microsoft.Network/virtualNetworks/subnets/read", "Microsoft.Network/virtualNetworks/subnets/virtualMachines/read", "Microsoft.Network/virtualNetworks/virtualMachines/read", "Microsoft.Network/virtualNetworks/subnets/join/action",	Gets network information about regions, the target VNet and subnet, and adds Cloud Volumes ONTAP to VNets.
"Microsoft.Network/virtualNetworks/subnets/write", "Microsoft.Network/routeTables/join/action",	Enables VNet service endpoints for data tiering.
"Microsoft.Resources/deployments/operations/read", "Microsoft.Resources/deployments/read", "Microsoft.Resources/deployments/write",	Deploys Cloud Volumes ONTAP from a template.
"Microsoft.Resources/deployments/operations/read", "Microsoft.Resources/deployments/read", "Microsoft.Resources/deployments/write", "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",	Creates and manages resource groups for Cloud Volumes ONTAP.
"Microsoft.Compute/snapshots/write", "Microsoft.Compute/snapshots/read", "Microsoft.Compute/snapshots/delete", "Microsoft.Compute/disks/beginGetAccess/action",	Creates and manages Azure managed snapshots.
"Microsoft.Compute/availabilitySets/write", "Microsoft.Compute/availabilitySets/read",	Creates and manages availability sets for Cloud Volumes ONTAP.
"Microsoft.MarketplaceOrdering/offertypes/publishers/offers/plans/agreements/read", "Microsoft.MarketplaceOrdering/offertypes/publishers/offers/plans/agreements/write",	Enables programmatic deployments from the Azure Marketplace.

Actions	Purpose
"Microsoft.Network/loadBalancers/read", "Microsoft.Network/loadBalancers/write", "Microsoft.Network/loadBalancers/delete", "Microsoft.Network/loadBalancers/backendAddressPools/read", "Microsoft.Network/loadBalancers/backendAddressPools/join/action", "Microsoft.Network/loadBalancers/frontendIPConfigurations/read", "Microsoft.Network/loadBalancers/loadBalancingRules/read", "Microsoft.Network/loadBalancers/probes/read", "Microsoft.Network/loadBalancers/probes/join/action",	Manages an Azure load balancer for HA pairs.
"Microsoft.Authorization/locks/**",	Enables management of locks on Azure disks.
"Microsoft.Authorization/roleDefinitions/write", "Microsoft.Authorization/roleAssignments/write", "Microsoft.Web/sites/**"	Manages failover for HA pairs.
"Microsoft.Network/privateEndpoints/write", "Microsoft.Storage/storageAccounts/PrivateEndpointConnectionsApproval/action", "Microsoft.Storage/storageAccounts/privateEndpointConnections/read", "Microsoft.Network/privateEndpoints/read", "Microsoft.Network/privateDnsZones/write", "Microsoft.Network/privateDnsZones/virtualNetworkLinks/write", "Microsoft.Network/virtualNetworks/join/action", "Microsoft.Network/privateDnsZones/A/write", "Microsoft.Network/privateDnsZones/read", "Microsoft.Network/privateDnsZones/virtualNetworkLinks/read",	Enables the management of private endpoints. Private endpoints are used when connectivity isn't provided to outside the subnet. Cloud Manager creates the storage account for HA with only internal connectivity within the subnet.
"Microsoft.NetApp/netAppAccounts/capacityPools/volumes/delete",	Enables Cloud Manager to delete volumes for Azure NetApp Files.
"Microsoft.Resources/deployments/operationStatuses/read"	Azure requires this permission for some virtual machine deployments (it depends on the underlying physical hardware that's used during deployment).
"Microsoft.Resources/deployments/operationStatuses/read", "Microsoft.Insights/Metrics/Read", "Microsoft.Compute/virtualMachines/extensions/write", "Microsoft.Compute/virtualMachines/extensions/read", "Microsoft.Compute/virtualMachines/extensions/delete", "Microsoft.Compute/virtualMachines/delete", "Microsoft.Network/networkInterfaces/delete", "Microsoft.Network/networkSecurityGroups/delete", "Microsoft.Resources/deployments/delete",	Enables you to use Global File Cache.

Actions	Purpose
"Microsoft.Network/privateEndpoints/delete", "Microsoft.Compute/availabilitySets/delete",	Enables Cloud Manager to remove resources from a resource group that belong to Cloud Volumes ONTAP in case of deployment failure or deletion.
"Microsoft.Compute/diskEncryptionSets/read", "Microsoft.Compute/diskEncryptionSets/write", "Microsoft.Compute/diskEncryptionSets/delete", "Microsoft.KeyVault/vaults/deploy/action", "Microsoft.KeyVault/vaults/read", "Microsoft.KeyVault/vaults/accessPolicies/write",	Enables use of customer-managed encryption keys with Cloud Volumes ONTAP. This feature is supported using APIs.
"Microsoft.Resources/tags/read", "Microsoft.Resources/tags/write", "Microsoft.Resources/tags/delete"	Enables you to manage tags on your Azure resources using the Cloud Manager Tagging service.
"Microsoft.Network/applicationSecurityGroups/write", "Microsoft.Network/applicationSecurityGroups/read", "Microsoft.Network/applicationSecurityGroups/joinIpConfiguration/action", "Microsoft.Network/networkSecurityGroups/securityRules/write", "Microsoft.Network/applicationSecurityGroups/delete", "Microsoft.Network/networkSecurityGroups/securityRules/delete"	Enables Cloud Manager to configure an application security group for an HA pair, which isolates the HA interconnect and cluster network NICs.

Google Cloud permissions for the Connector

Cloud Manager requires permissions to perform actions in Google Cloud. These permissions are included in a custom role provided by NetApp. You might want to understand what Cloud Manager does with these permissions.

Service account permissions

The custom role shown below provides the permissions that a Connector needs to manage resources and processes within your Google Cloud network.

You'll need to apply this custom role to a service account that gets attached to the Connector VM. [View step-by-step instructions](#).

You also need to ensure that the role is up to date as new permissions are added in subsequent releases.

```
title: NetApp Cloud Manager
description: Permissions for the service account associated with the
Connector instance.
stage: GA
includedPermissions:
- iam.serviceAccounts.actAs
- compute.regionBackendServices.create
- compute.regionBackendServices.get
- compute.regionBackendServices.list
```

- `compute.networks.updatePolicy`
- `compute.backendServices.create`
- `compute.addresses.list`
- `compute.disks.create`
- `compute.disks.createSnapshot`
- `compute.disks.delete`
- `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.addAccessConfig`
- `compute.instances.attachDisk`
- `compute.instances.create`
- `compute.instances.delete`
- `compute.instances.detachDisk`
- `compute.instances.get`
- `compute.instances.getSerialPortOutput`
- `compute.instances.list`
- `compute.instances.setDeletionProtection`
- `compute.instances.setLabels`
- `compute.instances.setMachineType`
- `compute.instances.setMetadata`
- `compute.instances.setTags`
- `compute.instances.start`
- `compute.instances.stop`
- `compute.instances.updateDisplayDevice`
- `compute.machineTypes.get`
- `compute.networks.get`
- `compute.networks.list`
- `compute.projects.get`
- `compute.regions.get`
- `compute.regions.list`
- `compute.snapshots.create`
- `compute.snapshots.delete`
- `compute.snapshots.get`
- `compute.snapshots.list`
- `compute.snapshots.setLabels`

- `compute.subnetworks.get`
- `compute.subnetworks.list`
- `compute.subnetworks.use`
- `compute.subnetworks.useExternalIp`
- `compute.zoneOperations.get`
- `compute.zones.get`
- `compute.zones.list`
- `compute.instances.setServiceAccount`
- `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`
- `logging.logEntries.list`
- `logging.privateLogEntries.list`
- `resourcemanager.projects.get`
- `storage.buckets.create`
- `storage.buckets.delete`
- `storage.buckets.get`
- `storage.buckets.list`
- `cloudkms.cryptoKeyVersions.useToEncrypt`
- `cloudkms.cryptoKeys.get`
- `cloudkms.cryptoKeys.list`
- `cloudkms.keyRings.list`
- `storage.buckets.update`
- `iam.serviceAccounts.getIamPolicy`
- `iam.serviceAccounts.list`
- `storage.objects.get`
- `storage.objects.list`
- `monitoring.timeSeries.list`
- `storage.buckets.getIamPolicy`

How Google Cloud permissions are used

Actions	Purpose
<ul style="list-style-type: none"> - compute.disks.create - compute.disks.createSnapshot - compute.disks.delete - compute.disks.get - compute.disks.list - compute.disks.setLabels - compute.disks.use 	To create and manage disks for Cloud Volumes ONTAP.
<ul style="list-style-type: none"> - compute.firewalls.create - compute.firewalls.delete - compute.firewalls.get - compute.firewalls.list 	To create firewall rules for Cloud Volumes ONTAP.
<ul style="list-style-type: none"> - compute.globalOperations.get 	To get the status of operations.
<ul style="list-style-type: none"> - compute.images.get - compute.images.getFromFamily - compute.images.list - compute.images.useReadOnly 	To get images for VM instances.
<ul style="list-style-type: none"> - compute.instances.attachDisk - compute.instances.detachDisk 	To attach and detach disks to Cloud Volumes ONTAP.
<ul style="list-style-type: none"> - compute.instances.create - compute.instances.delete 	To create and delete Cloud Volumes ONTAP VM instances.
<ul style="list-style-type: none"> - compute.instances.get 	To list VM instances.
<ul style="list-style-type: none"> - compute.instances.getSerialPortOutput 	To get console logs.
<ul style="list-style-type: none"> - compute.instances.list 	To retrieve the list of instances in a zone.
<ul style="list-style-type: none"> - compute.instances.setDeletionProtection 	To set deletion protection on the instance.
<ul style="list-style-type: none"> - compute.instances.setLabels 	To add labels.
<ul style="list-style-type: none"> - compute.instances.setMachineType - compute.instances.setMinCpuPlatform 	To change the machine type for Cloud Volumes ONTAP.
<ul style="list-style-type: none"> - compute.instances.setMetadata 	To add metadata.
<ul style="list-style-type: none"> - compute.instances.setTags 	To add tags for firewall rules.
<ul style="list-style-type: none"> - compute.instances.start - compute.instances.stop - compute.instances.updateDisplayDevice 	To start and stop Cloud Volumes ONTAP.
<ul style="list-style-type: none"> - compute.machineTypes.get 	To get the numbers of cores to check quotas.
<ul style="list-style-type: none"> - compute.projects.get 	To support multi-projects.
<ul style="list-style-type: none"> - compute.snapshots.create - compute.snapshots.delete - compute.snapshots.get - compute.snapshots.list - compute.snapshots.setLabels 	To create and manage persistent disk snapshots.

Actions	Purpose
<ul style="list-style-type: none"> - compute.networks.get - compute.networks.list - compute.regions.get - compute.regions.list - compute.subnetworks.get - compute.subnetworks.list - compute.zoneOperations.get - compute.zones.get - compute.zones.list 	To get the networking information needed to create a new Cloud Volumes ONTAP virtual machine instance.
<ul style="list-style-type: none"> - 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 	To deploy the Cloud Volumes ONTAP virtual machine instance using Google Cloud Deployment Manager.
<ul style="list-style-type: none"> - logging.logEntries.list - logging.privateLogEntries.list 	To get stack log drives.
<ul style="list-style-type: none"> - resourcemanager.projects.get 	To support multi-projects.
<ul style="list-style-type: none"> - storage.buckets.create - storage.buckets.delete - storage.buckets.get - storage.buckets.list - storage.buckets.update 	To create and manage a Google Cloud Storage bucket for data tiering.
<ul style="list-style-type: none"> - cloudkms.cryptoKeyVersions.useToEncrypt - cloudkms.cryptoKeys.get - cloudkms.cryptoKeys.list - cloudkms.keyRings.list 	To use customer-managed encryption keys from the Cloud Key Management Service with Cloud Volumes ONTAP.
<ul style="list-style-type: none"> - compute.instances.setServiceAccount - iam.serviceAccounts.actAs - iam.serviceAccounts.getIamPolicy - iam.serviceAccounts.list - storage.objects.get - storage.objects.list 	To set a service account on the Cloud Volumes ONTAP instance. This service account provides permissions for data tiering to a Google Cloud Storage bucket.
<ul style="list-style-type: none"> - compute.addresses.list 	To retrieve the addresses in a region when deploying an HA pair.

Actions	Purpose
<ul style="list-style-type: none"> - compute.backendServices.create - compute.regionBackendServices.create - compute.regionBackendServices.get - compute.regionBackendServices.list 	To configure a backend service for distributing traffic in an HA pair.
<ul style="list-style-type: none"> - compute.networks.updatePolicy 	To apply firewall rules on the VPCs and subnets for an HA pair.
<ul style="list-style-type: none"> - compute.subnetworks.use - compute.subnetworks.useExternallp - compute.instances.addAccessConfig 	To enable Cloud Data Sense.
<ul style="list-style-type: none"> - container.clusters.get - container.clusters.list 	To discover Kubernetes clusters running in Google Kubernetes Engine.
<ul style="list-style-type: none"> - compute.instanceGroups.get - compute.addresses.get 	To create and manage storage VMs on HA pairs.
<ul style="list-style-type: none"> - monitoring.timeSeries.list - storage.buckets.getIamPolicy 	To discover information about Google Cloud Storage buckets.

Ports

Security group rules in AWS

The AWS security group for the Connector requires both inbound and outbound rules.

Inbound rules

Protocol	Port	Purpose
SSH	22	Provides SSH access to the Connector host
HTTP	80	Provides HTTP access from client web browsers to the local user interface
HTTPS	443	Provides HTTPS access from client web browsers to the local user interface, and connections from the Cloud Data Sense instance
TCP	3128	Provides Cloud Volumes ONTAP with internet access to send AutoSupport messages to NetApp Support. You must manually open this port after deployment. Learn more about the Connector's proxy server.
TCP	9060	Provides the ability to enable and use Cloud Data Sense and Cloud Backup in Government Cloud deployments. This port is also required for Cloud Backup if you disable the SaaS interface in your Cloud Manager account.

Outbound rules

The predefined security group for the Connector opens all outbound traffic. If that is acceptable, follow the basic outbound rules. If you need more rigid rules, use the advanced outbound rules.

Basic outbound rules

The predefined security group for the Connector includes the following outbound rules.

Protocol	Port	Purpose
All TCP	All	All outbound traffic
All UDP	All	All outbound traffic

Advanced outbound rules

If you need rigid rules for outbound traffic, you can use the following information to open only those ports that are required for outbound communication by the Connector.



The source IP address is the Connector host.

Service	Protocol	Port	Destination	Purpose
API calls and AutoSupport	HTTP	443	Outbound internet and ONTAP cluster management LIF	API calls to AWS and ONTAP, to Cloud Data Sense, to the Ransomware service, and sending AutoSupport messages to NetApp
API calls	TCP	3000	ONTAP HA mediator	Communication with the ONTAP HA mediator
	TCP	8088	Backup to S3	API calls to Backup to S3
DNS	UDP	53	DNS	Used for DNS resolve by Cloud Manager

Security group rules in Azure

The Azure security group for the Connector requires both inbound and outbound rules.

Inbound rules

Protocol	Port	Purpose
SSH	22	Provides SSH access to the Connector host
HTTP	80	Provides HTTP access from client web browsers to the local user interface
HTTPS	443	Provides HTTPS access from client web browsers to the local user interface, and connections from the Cloud Data Sense instance
TCP	3128	Provides Cloud Volumes ONTAP with internet access to send AutoSupport messages to NetApp Support. You must manually open this port after deployment. Learn more about the Connector's proxy server.
TCP	9060	Provides the ability to enable and use Cloud Data Sense and Cloud Backup in Government Cloud deployments. This port is also required for Cloud Backup if you disable the SaaS interface in your Cloud Manager account.

Outbound rules

The predefined security group for the Connector opens all outbound traffic. If that is acceptable, follow the basic outbound rules. If you need more rigid rules, use the advanced outbound rules.

Basic outbound rules

The predefined security group for the Connector includes the following outbound rules.

Protocol	Port	Purpose
All TCP	All	All outbound traffic
All UDP	All	All outbound traffic

Advanced outbound rules

If you need rigid rules for outbound traffic, you can use the following information to open only those ports that are required for outbound communication by the Connector.



The source IP address is the Connector host.

Service	Protocol	Port	Destination	Purpose
API calls and AutoSupport	HTTP	443	Outbound internet and ONTAP cluster management LIF	API calls to Azure and ONTAP, to Cloud Data Sense, to the Ransomware service, and sending AutoSupport messages to NetApp
DNS	UDP	53	DNS	Used for DNS resolve by Cloud Manager

Firewall rules in Google Cloud

The Google Cloud firewall rules for the Connector requires both inbound and outbound rules.

Inbound rules

Protocol	Port	Purpose
SSH	22	Provides SSH access to the Connector host
HTTP	80	Provides HTTP access from client web browsers to the local user interface
HTTPS	443	Provides HTTPS access from client web browsers to the local user interface
TCP	3128	Provides Cloud Volumes ONTAP with internet access to send AutoSupport messages to NetApp Support. You must manually open this port after deployment. Learn more about the Connector's proxy server.

Outbound rules

The predefined firewall rules for the Connector opens all outbound traffic. If that is acceptable, follow the basic outbound rules. If you need more rigid rules, use the advanced outbound rules.

Basic outbound rules

The predefined firewall rules for the Connector includes the following outbound rules.

Protocol	Port	Purpose
All TCP	All	All outbound traffic
All UDP	All	All outbound traffic

Advanced outbound rules

If you need rigid rules for outbound traffic, you can use the following information to open only those ports that are required for outbound communication by the Connector.



The source IP address is the Connector host.

Service	Protocol	Port	Destination	Purpose
API calls and AutoSupport	HTTP	443	Outbound internet and ONTAP cluster management LIF	API calls to GCP and ONTAP, to Cloud Data Sense, to the Ransomware service, and sending AutoSupport messages to NetApp
DNS	UDP	53	DNS	Used for DNS resolve by Cloud Manager

Ports for the on-prem Connector

The Connector uses the following *inbound* ports when installed manually on an on-premises Linux host.

These inbound rules apply to both deployment models for the on-prem Connector: installed with internet access or without internet access.

Protocol	Port	Purpose
HTTP	80	Provides HTTP access from client web browsers to the local user interface
HTTPS	443	Provides HTTPS access from client web browsers to the local user interface

Copyright Information

Copyright © 2022 NetApp, Inc. All rights reserved. Printed in the U.S. No part of this document covered by copyright may be reproduced in any form or by any means-graphic, electronic, or mechanical, including photocopying, recording, taping, or storage in an electronic retrieval system-without prior written permission of the copyright owner.

Software derived from copyrighted NetApp material is subject to the following license and disclaimer:

THIS SOFTWARE IS PROVIDED BY NETAPP "AS IS" AND WITHOUT ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, WHICH ARE HEREBY DISCLAIMED. IN NO EVENT SHALL NETAPP BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

NetApp reserves the right to change any products described herein at any time, and without notice. NetApp assumes no responsibility or liability arising from the use of products described herein, except as expressly agreed to in writing by NetApp. The use or purchase of this product does not convey a license under any patent rights, trademark rights, or any other intellectual property rights of NetApp.

The product described in this manual may be protected by one or more U.S. patents, foreign patents, or pending applications.

RESTRICTED RIGHTS LEGEND: Use, duplication, or disclosure by the government is subject to restrictions as set forth in subparagraph (c)(1)(ii) of the Rights in Technical Data and Computer Software clause at DFARS 252.277-7103 (October 1988) and FAR 52-227-19 (June 1987).

Trademark Information

NETAPP, the NETAPP logo, and the marks listed at <http://www.netapp.com/TM> are trademarks of NetApp, Inc. Other company and product names may be trademarks of their respective owners.