



Reference

Cloud Manager 3.6

NetApp
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Reference

Frequently asked questions: Integrating Cloud Manager with NetApp Cloud Central

When upgrading to Cloud Manager 3.5, NetApp will choose specific Cloud Manager systems to integrate with NetApp Cloud Central, if they are not already integrated. This FAQ can answer questions that you might have about the process.

What is NetApp Cloud Central?

NetApp Cloud Central provides a centralized location to access and manage NetApp cloud data services. These services enable you to run critical applications in the cloud, create automated DR sites, back up your SaaS data, and effectively migrate and control data across multiple clouds.

Why is NetApp integrating my Cloud Manager system with Cloud Central?

Cloud Manager's integration with NetApp Cloud Central provides several benefits, including a simplified deployment experience, a single location to view and manage multiple Cloud Manager systems, and centralized user authentication.

What happens during the integration process?

NetApp migrates all local user accounts in your Cloud Manager system to the centralized user authentication available in Cloud Central.

How does centralized user authentication work?

With centralized user authentication, you can use the same set of credentials across Cloud Manager systems and between Cloud Manager and other data services, such as Cloud Sync. It's also easy to reset your password if you forget it.

Do I need to sign up for a Cloud Central user account?

NetApp will create a Cloud Central user account for you when we integrate your Cloud Manager system with Cloud Central. You simply need to reset your password to complete the registration process.

What if I already have a Cloud Central user account?

If the email address that you use to log in to Cloud Manager matches the email address for a Cloud Central user account, then you can log right in to your Cloud Manager system.

What if my Cloud Manager system has multiple user accounts?

NetApp migrates all local user accounts to Cloud Central user accounts. Every user needs to reset his or her password.

What if I have a user account that uses the same email address across multiple Cloud Manager systems?

You just need to reset your password once and then you can use the same Cloud Central user account to log in to each Cloud Manager system.

What if my local user account uses an invalid email address?

Resetting your password requires a valid email address. Contact us through the chat icon that is available in the lower right of the Cloud Manager interface.

What if I have automation scripts for Cloud Manager APIs?

All APIs are backwards compatible. You will need to update scripts that use passwords, if you change your password when you reset it.

What if my Cloud Manager system uses LDAP?

If your system uses LDAP, NetApp cannot automatically integrate the system with Cloud Central. You need to manually perform the following steps:

1. Deploy a new Cloud Manager system from [NetApp Cloud Central](#).
2. [Set up LDAP with the new system](#).
3. [Discover existing Cloud Volumes ONTAP systems](#) from the new Cloud Manager system.
4. Delete the old Cloud Manager system.

Does it matter where I installed my Cloud Manager system?

No. NetApp will integrate systems with Cloud Central no matter where they reside, whether that's in AWS, Azure, or on your premises.



The only exception is the AWS Commercial Cloud Services Environment.

Security group rules for AWS

Cloud Manager creates AWS security groups that include the inbound and outbound rules that Cloud Manager and Cloud Volumes ONTAP need to operate successfully. You might want to refer to the ports for testing purposes or if you prefer your to use own security groups.

Rules for Cloud Manager

The security group for Cloud Manager requires both inbound and outbound rules.

Inbound rules for Cloud Manager

The source for inbound rules in the predefined security group is 0.0.0.0/0.

Protocol	Port	Purpose
SSH	22	Provides SSH access to the Cloud Manager host
HTTP	80	Provides HTTP access from client web browsers to the Cloud Manager web console
HTTPS	443	Provides HTTPS access from client web browsers to the Cloud Manager web console

Outbound rules for Cloud Manager

The predefined security group for Cloud Manager 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 Cloud Manager 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 Cloud Manager.



The source IP address is the Cloud Manager host.

Service	Protocol	Port	Destination	Purpose
Active Directory	TCP	88	Active Directory forest	Kerberos V authentication
	TCP	139	Active Directory forest	NetBIOS service session
	TCP	389	Active Directory forest	LDAP
	TCP	445	Active Directory forest	Microsoft SMB/CIFS over TCP with NetBIOS framing
	TCP	464	Active Directory forest	Kerberos V change & set password (SET_CHANGE)
	TCP	749	Active Directory forest	Active Directory Kerberos V change & set password (RPCSEC_GSS)
	UDP	137	Active Directory forest	NetBIOS name service
	UDP	138	Active Directory forest	NetBIOS datagram service
	UDP	464	Active Directory forest	Kerberos key administration
API calls and AutoSupport	HTTPS	443	Outbound internet and ONTAP cluster management LIF	API calls to AWS and ONTAP, and sending AutoSupport messages to NetApp
API calls	TCP	3000	ONTAP cluster management LIF	API calls to ONTAP

Service	Protocol	Port	Destination	Purpose
DNS	UDP	53	DNS	Used for DNS resolve by Cloud Manager

Rules for Cloud Volumes ONTAP

The security group for Cloud Volumes ONTAP requires both inbound and outbound rules.

Inbound rules for Cloud Volumes ONTAP

The source for inbound rules in the predefined security group is 0.0.0.0/0.

Protocol	Port	Purpose
All ICMP	All	Pinging the instance
HTTP	80	HTTP access to the System Manager web console using the IP address of the cluster management LIF
HTTPS	443	HTTPS access to the System Manager web console using the IP address of the cluster management LIF
SSH	22	SSH access to the IP address of the cluster management LIF or a node management LIF
TCP	111	Remote procedure call for NFS
TCP	139	NetBIOS service session for CIFS
TCP	161-162	Simple network management protocol
TCP	445	Microsoft SMB/CIFS over TCP with NetBIOS framing
TCP	635	NFS mount
TCP	749	Kerberos
TCP	2049	NFS server daemon
TCP	3260	iSCSI access through the iSCSI data LIF
TCP	4045	NFS lock daemon
TCP	4046	Network status monitor for NFS
TCP	10000	Backup using NDMP
TCP	11104	Management of intercluster communication sessions for SnapMirror
TCP	11105	SnapMirror data transfer using intercluster LIFs
UDP	111	Remote procedure call for NFS
UDP	161-162	Simple network management protocol
UDP	635	NFS mount
UDP	2049	NFS server daemon
UDP	4045	NFS lock daemon
UDP	4046	Network status monitor for NFS

Protocol	Port	Purpose
UDP	4049	NFS rquotad protocol

Outbound rules for Cloud Volumes ONTAP

The predefined security group for Cloud Volumes ONTAP 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 Cloud Volumes ONTAP includes the following outbound rules.

Protocol	Port	Purpose
All ICMP	All	All outbound traffic
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 Cloud Volumes ONTAP.



The source is the interface (IP address) on the Cloud Volumes ONTAP system.

Service	Protocol	Port	Source	Destination	Purpose
Active Directory	TCP	88	Node management LIF	Active Directory forest	Kerberos V authentication
	UDP	137	Node management LIF	Active Directory forest	NetBIOS name service
	UDP	138	Node management LIF	Active Directory forest	NetBIOS datagram service
	TCP	139	Node management LIF	Active Directory forest	NetBIOS service session
	TCP	389	Node management LIF	Active Directory forest	LDAP
	TCP	445	Node management LIF	Active Directory forest	Microsoft SMB/CIFS over TCP with NetBIOS framing
	TCP	464	Node management LIF	Active Directory forest	Kerberos V change & set password (SET_CHANGE)
	UDP	464	Node management LIF	Active Directory forest	Kerberos key administration
	TCP	749	Node management LIF	Active Directory forest	Kerberos V change & set Password (RPCSEC_GSS)
	TCP	88	Data LIF (NFS, CIFS)	Active Directory forest	Kerberos V authentication
	UDP	137	Data LIF (NFS, CIFS)	Active Directory forest	NetBIOS name service
	UDP	138	Data LIF (NFS, CIFS)	Active Directory forest	NetBIOS datagram service
	TCP	139	Data LIF (NFS, CIFS)	Active Directory forest	NetBIOS service session
	TCP	389	Data LIF (NFS, CIFS)	Active Directory forest	LDAP
	TCP	445	Data LIF (NFS, CIFS)	Active Directory forest	Microsoft SMB/CIFS over TCP with NetBIOS framing
	TCP	464	Data LIF (NFS, CIFS)	Active Directory forest	Kerberos V change & set password (SET_CHANGE)
	UDP	464	Data LIF (NFS, CIFS)	Active Directory forest	Kerberos key administration
	TCP	749	Data LIF (NFS, CIFS)	Active Directory forest	Kerberos V change & set password (RPCSEC_GSS)

Service	Protocol	Port	Source	Destination	Purpose
Cluster	All traffic	All traffic	All LIFs on one node	All LIFs on the other node	Intercluster communications (Cloud Volumes ONTAP HA only)
	TCP	3000	Node management LIF	HA mediator	ZAPI calls (Cloud Volumes ONTAP HA only)
	ICMP	1	Node management LIF	HA mediator	Keep alive (Cloud Volumes ONTAP HA only)
DHCP	UDP	68	Node management LIF	DHCP	DHCP client for first-time setup
DHCPS	UDP	67	Node management LIF	DHCP	DHCP server
DNS	UDP	53	Node management LIF and data LIF (NFS, CIFS)	DNS	DNS
NDMP	TCP	18600–18699	Node management LIF	Destination servers	NDMP copy
SMTP	TCP	25	Node management LIF	Mail server	SMTP alerts, can be used for AutoSupport
SNMP	TCP	161	Node management LIF	Monitor server	Monitoring by SNMP traps
	UDP	161	Node management LIF	Monitor server	Monitoring by SNMP traps
	TCP	162	Node management LIF	Monitor server	Monitoring by SNMP traps
	UDP	162	Node management LIF	Monitor server	Monitoring by SNMP traps
SnapMirror	TCP	11104	Intercluster LIF	ONTAP intercluster LIFs	Management of intercluster communication sessions for SnapMirror
	TCP	11105	Intercluster LIF	ONTAP intercluster LIFs	SnapMirror data transfer
Syslog	UDP	514	Node management LIF	Syslog server	Syslog forward messages

Rules for the HA mediator external security group

The predefined external security group for the Cloud Volumes ONTAP HA mediator includes the following inbound and outbound rules.

Inbound rules

The source for inbound rules is 0.0.0.0/0.

Protocol	Port	Purpose
SSH	22	SSH connections to the HA mediator
TCP	3000	RESTful API access from Cloud Manager

Outbound rules

The predefined security group for the HA mediator 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 HA mediator 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 HA mediator.

Protocol	Port	Destination	Purpose
HTTP	80	Cloud Manager IP address	Download upgrades for the mediator
HTTPS	443	AWS API services	Assist with storage failover
UDP	53	AWS API services	Assist with storage failover



Rather than open ports 443 and 53, you can create an interface VPC endpoint from the target subnet to the AWS EC2 service.

Rules for the HA mediator internal security group

The predefined internal security group for the Cloud Volumes ONTAP HA mediator includes the following rules. Cloud Manager always creates this security group. You do not have the option to use your own.

Inbound rules

The predefined security group includes the following inbound rules.

Protocol	Port	Purpose
All traffic	All	Communication between the HA mediator and HA nodes

Outbound rules

The predefined security group includes the following outbound rules.

Protocol	Port	Purpose
All traffic	All	Communication between the HA mediator and HA nodes

Security group rules for Azure

Cloud Manager creates Azure security groups that include the inbound and outbound rules that Cloud Manager and Cloud Volumes ONTAP need to operate successfully. You might want to refer to the ports for testing purposes or if you prefer your to use own security groups.

Rules for Cloud Manager

The security group for Cloud Manager requires both inbound and outbound rules.

Inbound rules for Cloud Manager

The source for inbound rules in the predefined security group is 0.0.0.0/0.

Protocol	Port	Purpose
SSH	22	Provides SSH access to the Cloud Manager host
HTTP	80	Provides HTTP access from client web browsers to the Cloud Manager web console
HTTPS	443	Provides HTTPS access from client web browsers to the Cloud Manager web console

Outbound rules for Cloud Manager

The predefined security group for Cloud Manager 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 Cloud Manager 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 Cloud Manager.



The source IP address is the Cloud Manager host.

Service	Protocol	Port	Destination	Purpose
Active Directory	TCP	88	Active Directory forest	Kerberos V authentication
	TCP	139	Active Directory forest	NetBIOS service session
	TCP	389	Active Directory forest	LDAP
	TCP	445	Active Directory forest	Microsoft SMB/CIFS over TCP with NetBIOS framing
	TCP	464	Active Directory forest	Kerberos V change & set password (SET_CHANGE)
	TCP	749	Active Directory forest	Active Directory Kerberos V change & set password (RPCSEC_GSS)
	UDP	137	Active Directory forest	NetBIOS name service
	UDP	138	Active Directory forest	NetBIOS datagram service
	UDP	464	Active Directory forest	Kerberos key administration
API calls and AutoSupport	HTTPS	443	Outbound internet and ONTAP cluster management LIF	API calls to AWS and ONTAP, and sending AutoSupport messages to NetApp
API calls	TCP	3000	ONTAP cluster management LIF	API calls to ONTAP
DNS	UDP	53	DNS	Used for DNS resolve by Cloud Manager

Rules for Cloud Volumes ONTAP

The security group for Cloud Volumes ONTAP requires both inbound and outbound rules.

Inbound rules for single node systems

Priority	Name	Port	Protocol	Source	Destination	Action	Description
1000	inbound_ssh	22	TCP	Any	Any	Allow	SSH access to the IP address of the cluster management LIF or a node management LIF
1001	inbound_http	80	TCP	Any	Any	Allow	HTTP access to the System Manager web console using the IP address of the cluster management LIF
1002	inbound_111_tcp	111	TCP	Any	Any	Allow	Remote procedure call for NFS
1003	inbound_111_udp	111	UDP	Any	Any	Allow	Remote procedure call for NFS
1004	inbound_139	139	TCP	Any	Any	Allow	NetBIOS service session for CIFS

Priority	Name	Port	Protocol	Source	Destination	Action	Description
1005	inbound_161-162_tcp	161-162	TCP	Any	Any	Allow	Simple network management protocol
1006	inbound_161-162_udp	161-162	UDP	Any	Any	Allow	Simple network management protocol
1007	inbound_443	443	TCP	Any	Any	Allow	HTTPS access to the System Manager web console using the IP address of the cluster management LIF
1008	inbound_445	445	TCP	Any	Any	Allow	Microsoft SMB/CIFS over TCP with NetBIOS framing
1009	inbound_635_tcp	635	TCP	Any	Any	Allow	NFS mount
1010	inbound_635_udp	635	TCP	Any	Any	Allow	NFS mount
1011	inbound_749	749	TCP	Any	Any	Allow	Kerberos
1012	inbound_2049_tcp	2049	TCP	Any	Any	Allow	NFS server daemon
1013	inbound_2049_udp	2049	UDP	Any	Any	Allow	NFS server daemon
1014	inbound_3260	3260	TCP	Any	Any	Allow	iSCSI access through the iSCSI data LIF
1015	inbound_4045-4046_tcp	4045-4046	TCP	Any	Any	Allow	NFS lock daemon and network status monitor
1016	inbound_4045-4046_udp	4045-4046	UDP	Any	Any	Allow	NFS lock daemon and network status monitor
1017	inbound_10000	10000	TCP	Any	Any	Allow	Backup using NDMP
1018	inbound_11104-11105	11104-11105	TCP	Any	Any	Allow	SnapMirror data transfer
3000	inbound_deny_all_tcp	Any	TCP	Any	Any	Deny	Block all other TCP inbound traffic
3001	inbound_deny_all_udp	Any	UDP	Any	Any	Deny	Block all other UDP inbound traffic
65000	AllowVnetInBound	Any	Any	VirtualNetwork	VirtualNetwork	Allow	Inbound traffic from within the VNet
65001	AllowAzureLoadBalancerInBound	Any	Any	AzureLoadBalancer	Any	Allow	Data traffic from the Azure Standard Load Balancer
65500	DenyAllInBound	Any	Any	Any	Any	Deny	Block all other inbound traffic

Inbound rules for HA systems



HA systems have less inbound rules than single node systems because inbound data traffic goes through the Azure Standard Load Balancer. Because of this, traffic from the Load Balancer should be open, as shown in the "AllowAzureLoadBalancerInBound" rule.

Priority	Name	Port	Protocol	Source	Destination	Action	Description
100	inbound_443	443	Any	Any	Any	Allow	HTTPS access to the System Manager web console using the IP address of the cluster management LIF
101	inbound_111_tcp	111	Any	Any	Any	Allow	Remote procedure call for NFS
102	inbound_2049_tcp	2049	Any	Any	Any	Allow	NFS server daemon
111	inbound_ssh	22	Any	Any	Any	Allow	SSH access to the IP address of the cluster management LIF or a node management LIF
121	inbound_53	53	Any	Any	Any	Allow	DNS and CIFS
65000	AllowVnetInBound	Any	Any	VirtualNetwork	VirtualNetwork	Allow	Inbound traffic from within the VNet
65001	AllowAzureLoadBalancerInBound	Any	Any	AzureLoadBalancer	Any	Allow	Data traffic from the Azure Standard Load Balancer
65500	DenyAllInBound	Any	Any	Any	Any	Deny	Block all other inbound traffic

Outbound rules for Cloud Volumes ONTAP

The predefined security group for Cloud Volumes ONTAP 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 Cloud Volumes ONTAP 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 Cloud Volumes ONTAP.



The source is the interface (IP address) on the Cloud Volumes ONTAP system.

Service	Protocol	Port	Source	Destination	Purpose
Active Directory	TCP	88	Node management LIF	Active Directory forest	Kerberos V authentication
	UDP	137	Node management LIF	Active Directory forest	NetBIOS name service
	UDP	138	Node management LIF	Active Directory forest	NetBIOS datagram service
	TCP	139	Node management LIF	Active Directory forest	NetBIOS service session
	TCP	389	Node management LIF	Active Directory forest	LDAP
	TCP	445	Node management LIF	Active Directory forest	Microsoft SMB/CIFS over TCP with NetBIOS framing
	TCP	464	Node management LIF	Active Directory forest	Kerberos V change & set password (SET_CHANGE)
	UDP	464	Node management LIF	Active Directory forest	Kerberos key administration
	TCP	749	Node management LIF	Active Directory forest	Kerberos V change & set Password (RPCSEC_GSS)
	TCP	88	Data LIF (NFS, CIFS)	Active Directory forest	Kerberos V authentication
	UDP	137	Data LIF (NFS, CIFS)	Active Directory forest	NetBIOS name service
	UDP	138	Data LIF (NFS, CIFS)	Active Directory forest	NetBIOS datagram service
	TCP	139	Data LIF (NFS, CIFS)	Active Directory forest	NetBIOS service session
	TCP	389	Data LIF (NFS, CIFS)	Active Directory forest	LDAP
	TCP	445	Data LIF (NFS, CIFS)	Active Directory forest	Microsoft SMB/CIFS over TCP with NetBIOS framing
	TCP	464	Data LIF (NFS, CIFS)	Active Directory forest	Kerberos V change & set password (SET_CHANGE)
	UDP	464	Data LIF (NFS, CIFS)	Active Directory forest	Kerberos key administration
TCP	749	Data LIF (NFS, CIFS)	Active Directory forest	Kerberos V change & set password (RPCSEC_GSS)	
DHCP	UDP	68	Node management LIF	DHCP	DHCP client for first-time setup

Service	Protocol	Port	Source	Destination	Purpose
DHCPS	UDP	67	Node management LIF	DHCP	DHCP server
DNS	UDP	53	Node management LIF and data LIF (NFS, CIFS)	DNS	DNS
NDMP	TCP	18600–18699	Node management LIF	Destination servers	NDMP copy
SMTP	TCP	25	Node management LIF	Mail server	SMTP alerts, can be used for AutoSupport
SNMP	TCP	161	Node management LIF	Monitor server	Monitoring by SNMP traps
	UDP	161	Node management LIF	Monitor server	Monitoring by SNMP traps
	TCP	162	Node management LIF	Monitor server	Monitoring by SNMP traps
	UDP	162	Node management LIF	Monitor server	Monitoring by SNMP traps
SnapMirror	TCP	11104	Intercluster LIF	ONTAP intercluster LIFs	Management of intercluster communication sessions for SnapMirror
	TCP	11105	Intercluster LIF	ONTAP intercluster LIFs	SnapMirror data transfer
Syslog	UDP	514	Node management LIF	Syslog server	Syslog forward messages

AWS and Azure permissions for Cloud Manager

Cloud Manager requires permissions to perform actions in AWS and Azure on your behalf. These permissions are included in [the policies provided by NetApp](#). You might want to understand what Cloud Manager does with these permissions.

What Cloud Manager does with AWS permissions

Cloud Manager uses an AWS account to make API calls to several AWS services, including EC2, S3, CloudFormation, IAM, the Security Token Service (STS), and the Key Management Service (KMS).

Actions	Purpose
"ec2:StartInstances", "ec2:StopInstances", "ec2:DescribeInstances", "ec2:DescribeInstanceStatus", "ec2:RunInstances", "ec2:TerminateInstances", "ec2:ModifyInstanceAttribute",	Launches a Cloud Volumes ONTAP instance and stops, starts, and monitors the instance.
"ec2:DescribeInstanceAttribute",	Verifies that enhanced networking is enabled for supported instance types.
"ec2:DescribeRouteTables", "ec2:DescribeImages",	Launches a Cloud Volumes ONTAP HA configuration.
"ec2:CreateTags",	Tags every resource that Cloud Manager creates with the "WorkingEnvironment" and "WorkingEnvironmentId" tags. Cloud Manager uses these tags for maintenance and cost allocation.
"ec2:CreateVolume", "ec2:DescribeVolumes", "ec2:ModifyVolumeAttribute", "ec2:AttachVolume", "ec2>DeleteVolume", "ec2:DetachVolume",	Manages the EBS volumes that Cloud Volumes ONTAP uses as back-end storage.
"ec2:CreateSecurityGroup", "ec2>DeleteSecurityGroup", "ec2:DescribeSecurityGroups", "ec2:RevokeSecurityGroupEgress", "ec2:AuthorizeSecurityGroupEgress", "ec2:AuthorizeSecurityGroupIngress", "ec2:RevokeSecurityGroupIngress",	Creates predefined security groups for Cloud Volumes ONTAP.
"ec2:CreateNetworkInterface", "ec2:DescribeNetworkInterfaces", "ec2>DeleteNetworkInterface", "ec2:ModifyNetworkInterfaceAttribute",	Creates and manages network interfaces for Cloud Volumes ONTAP in the target subnet.
"ec2:DescribeSubnets", "ec2:DescribeVpcs",	Gets the list of destination subnets and security groups, which is needed when creating a new working environment for Cloud Volumes ONTAP.
"ec2:DescribeDhcpOptions",	Determines DNS servers and the default domain name when launching Cloud Volumes ONTAP instances.
"ec2:CreateSnapshot", "ec2>DeleteSnapshot", "ec2:DescribeSnapshots",	Takes snapshots of EBS volumes during initial setup and whenever a Cloud Volumes ONTAP instance is stopped.
"ec2:GetConsoleOutput",	Captures the Cloud Volumes ONTAP console, which is attached to AutoSupport messages.
"ec2:DescribeKeyPairs",	Obtains the list of available key pairs when launching instances.

Actions	Purpose
"ec2:DescribeRegions",	Gets a list of available AWS regions.
"ec2:DeleteTags", "ec2:DescribeTags",	Manages tags for resources associated with Cloud Volumes ONTAP instances.
"cloudformation:CreateStack", "cloudformation>DeleteStack", "cloudformation:DescribeStacks", "cloudformation:DescribeStackEvents", "cloudformation:ValidateTemplate",	Launches Cloud Volumes ONTAP instances.
"iam:PassRole", "iam:CreateRole", "iam>DeleteRole", "iam:PutRolePolicy", "iam:CreateInstanceProfile", "iam>DeleteRolePolicy", "iam:AddRoleToInstanceProfile", "iam:RemoveRoleFromInstanceProfile", "iam:DeleteInstanceProfile",	Launches a Cloud Volumes ONTAP HA configuration.
"iam:ListInstanceProfiles", "sts:DecodeAuthorizationMessage", "ec2:AssociateIamInstanceProfile", "ec2:DescribeIamInstanceProfileAssociations", "ec2:DisassociateIamInstanceProfile",	Manages instance profiles for Cloud Volumes ONTAP instances.
"s3:GetBucketTagging", "s3:GetBucketLocation", "s3:ListAllMyBuckets", "s3:ListBucket"	Obtains information about AWS S3 buckets so Cloud Manager can integrate with the NetApp Data Fabric Cloud Sync service.
"s3:CreateBucket", "s3>DeleteBucket", "s3:GetLifecycleConfiguration", "s3:PutLifecycleConfiguration", "s3:PutBucketTagging", "s3:ListBucketVersions",	Manages the S3 bucket that a Cloud Volumes ONTAP system uses as a capacity tier.
"kms:List*", "kms:Describe*"	Obtains information about keys from the AWS Key Management Service.
"ce:GetReservationUtilization", "ce:GetDimensionValues", "ce:GetCostAndUsage", "ce:GetTags"	Obtains AWS cost data for Cloud Volumes ONTAP.
"ec2:CreatePlacementGroup", "ec2>DeletePlacementGroup"	When you deploy an HA configuration in a single AWS Availability Zone, Cloud Manager launches the two HA nodes and the mediator in an AWS spread placement group.

What Cloud Manager does with Azure permissions

The Cloud Manager Azure policy includes the permissions that Cloud Manager needs to deploy and manage Cloud Volumes ONTAP in Azure.

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.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/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.

Default configurations

Details about how Cloud Manager and Cloud Volumes ONTAP are configured by default can help you administer the systems.

Default configuration for Cloud Manager on Linux

If you need to troubleshoot Cloud Manager or your Linux host, it might help to understand how Cloud Manager is configured.

- If you deployed Cloud Manager from NetApp Cloud Central (or directly from the AWS Marketplace or Azure Marketplace), note the following:
 - In AWS, the user name for the EC2 Linux instance is ec2-user.
 - For both AWS and Azure, the operating system for the Cloud Manager image is Red Hat Enterprise Linux 7.4 (HVM).

The operating system does not include a GUI. You must use a terminal to access the system.

- The Cloud Manager installation folder resides in the following location:

```
/opt/application/netapp/cloudmanager
```

- Log files are contained in the following folder:

```
/opt/application/netapp/cloudmanager/log
```

- The Cloud Manager service is named occm.
- The occm service is dependent on the MySQL service.

If the MySQL service is down, then the occm service is down too.

- Cloud Manager installs the following packages on the Linux host, if they are not already installed:
 - 7Zip
 - AWSCLI
 - Java
 - Kubectl
 - MySQL
 - Tridentctl
 - Wget

Default configuration for Cloud Volumes ONTAP

Understanding how Cloud Volumes ONTAP is configured by default can help you set up and administer your systems, especially if you are familiar with ONTAP because the default setup for Cloud Volumes ONTAP is different than ONTAP.


- Cloud Volumes ONTAP is available as a single-node system and as an HA pair in both AWS and Azure.
- Cloud Manager creates one data-serving SVM when it deploys Cloud Volumes ONTAP. While you can create another data-serving SVM from System Manager or the CLI, using multiple data-serving SVMs is not supported.
- Several network interfaces are created by default:
 - A cluster management LIF
 - An intercluster LIF
 - A node management LIF
 - An iSCSI data LIF
 - A CIFS and NFS data LIF



LIF failover is disabled by default for Cloud Volumes ONTAP due to EC2 requirements. Migrating a LIF to a different port breaks the external mapping between IP addresses and network interfaces on the instance, making the LIF inaccessible.

- Cloud Volumes ONTAP sends configuration backups to Cloud Manager using HTTPS.
- When logged in to Cloud Manager, the backups are accessible from <https://ipaddress/occm/offboxconfig/>
- Cloud Manager sets a few volume attributes differently than other management tools (System Manager or the CLI, for example).

The following table lists the volume attributes that Cloud Manager sets differently from the defaults:

Attribute	Value set by Cloud Manager
Autosize mode	grow
Maximum autosize	1,000 percent  The Cloud Manager Admin can modify this value from the Settings page.

Attribute	Value set by Cloud Manager
Security style	NTFS for CIFS volumes UNIX for NFS volumes
Space guarantee style	none
UNIX permissions (NFS only)	777

See the *volume create* man page for information about these attributes.

Boot and root data for Cloud Volumes ONTAP

In addition to the storage for user data, Cloud Manager also purchases cloud storage for boot and root data on each Cloud Volumes ONTAP system.

AWS

- One Provisioned IOPS SSD disk for Cloud Volumes ONTAP boot data, which is approximately 45 GB and 1,250 PIOPS
- One General Purpose SSD disk for Cloud Volumes ONTAP root data, which is approximately 140 GB
- One EBS snapshot for each boot disk and root disk

In an HA pair, both Cloud Volumes ONTAP nodes replicate its root disk to the partner node.

Azure

- One Premium Storage SSD disk for Cloud Volumes ONTAP boot data, which is approximately 73 GB
- One Premium Storage SSD disk for Cloud Volumes ONTAP root data, which is approximately 140 GB
- One Azure snapshot for each boot disk and root disk

Where the disks reside

Cloud Manager lays out the storage from AWS and Azure as follows:

- Boot data resides on a disk attached to the EC2 instance or Azure virtual machine.
This disk, which contains the boot image, is not available to Cloud Volumes ONTAP.
- Root data, which contains the system configuration and logs, resides in aggr0.
- The storage virtual machine (SVM) root volume resides in aggr1.
- Data volumes also reside in aggr1.

User roles

Each Cloud Manager user account is assigned a role that defines permissions.

Task	Cloud Manager Admin	Tenant Admin	Working Environment Admin
Manage tenants	Yes	No	No
Manage working environments	Yes	Yes, for the assigned tenant	Yes, for assigned working environments
Integrate a working environment with Cloud Sync	Yes	Yes	No
View data replication status	Yes	Yes, for the assigned tenant	Yes, for assigned working environments
View the timeline	Yes	Yes	Yes
Create and delete user accounts	Yes	Yes, for the assigned tenant	No
Modify user accounts	Yes	Yes, for the assigned tenant	Yes, for their own account
Manage account settings	Yes	No	No
Setup Kubernetes	Yes	No	No
Switch between the Storage System View and the Volume View	Yes	No	No
Modify settings	Yes	No	No
View and manage the Support Dashboard	Yes	No	No
Back up and restore Cloud Manager	Yes	No	No
Remove a working environment	Yes	No	No
Update Cloud Manager	Yes	No	No
Install an HTTPS certificate	Yes	No	No
Set up Active Directory	Yes	No	No
Enable the Cloud Storage Automation Report	Yes	No	No

Where to get help and find more information

You can get help and find more information about Cloud Manager and Cloud Volumes ONTAP through various resources, including videos, forums, and support.

- [Videos for Cloud Manager and Cloud Volumes ONTAP](#)

Watch videos that show you how to deploy and manage Cloud Volumes ONTAP in AWS and Azure and

how to replicate data across your hybrid cloud.

- [Policies for Cloud Manager](#)

Download JSON files that include the permissions that Cloud Manager needs to perform actions in AWS and Azure.

- [Cloud Manager API Developer Guide](#)

Read an overview of the APIs, examples of how to use them, and an API reference.

- Training for Cloud Volumes ONTAP

- [Cloud Volumes ONTAP Fundamentals](#)
- [Cloud Volumes ONTAP Deployment and Management for Azure](#)

- Technical reports

- [NetApp Technical Report 4383: Performance Characterization of Cloud Volumes ONTAP in Amazon Web Services with Application Workloads](#)
- [NetApp Technical Report 4671: Performance Characterization of Cloud Volumes ONTAP in Azure with Application Workloads](#)

- [Cloud Volumes ONTAP 9 SVM Disaster Recovery Preparation Express Guide](#)

Describes how to quickly configure a destination SVM in preparation for disaster recovery.

- [Cloud Volumes ONTAP 9 SVM Disaster Recovery Express Guide](#)

Describes how to quickly activate a destination SVM after a disaster, and then reactivate the source SVM.

- [ONTAP 9 Documentation Center](#)

Access product documentation for ONTAP, which can help you as you use Cloud Volumes ONTAP.

- [NetApp Cloud Volumes ONTAP Support](#)

Access support resources to get help and troubleshoot issues with Cloud Volumes ONTAP.

- [NetApp Community: Cloud Data Services](#)

Connect with peers, ask questions, exchange ideas, find resources, and share best practices.

- [NetApp Cloud Central](#)

Find information about additional NetApp products and solutions for the cloud.

- [NetApp Product Documentation](#)

Search NetApp product documentation for instructions, resources, and answers.

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