Networking requirements for Cloud Volumes ONTAP in Azure

Cloud Manager

Ben Cammett
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Set up your Azure networking so Cloud Volumes ONTAP systems can operate properly. This includes networking for the Connector and Cloud Volumes ONTAP.

Requirements for Cloud Volumes ONTAP

The following networking requirements must be met in Azure.

Outbound internet access for Cloud Volumes ONTAP

Cloud Volumes ONTAP requires outbound internet access to send messages to NetApp AutoSupport, which proactively monitors the health of your storage.

Routing and firewall policies must allow HTTP/HTTPS traffic to the following endpoints so Cloud Volumes ONTAP can send AutoSupport messages:

- https://support.netapp.com/aods/asupmessage
- https://support.netapp.com/asupprod/post/1.0/postAsup

Learn how to configure AutoSupport.

Security groups

You do not need to create security groups because Cloud Manager does that for you. If you need to use your own, refer to the security group rules listed below.

Number of IP addresses

Cloud Manager allocates the following number of IP addresses to Cloud Volumes ONTAP in Azure:

- Single node: 5 IP addresses
- HA pair: 16 IP addresses

Note that Cloud Manager creates an SVM management LIF on HA pairs, but not on single node systems in Azure.

A LIF is an IP address associated with a physical port. An SVM management LIF is required for management tools like SnapCenter.

Connection from Cloud Volumes ONTAP to Azure Blob storage for data tiering

If you want to tier cold data to Azure Blob storage, you don't need to set up a connection between the performance tier and the capacity tier as long as Cloud Manager has the required permissions. Cloud Manager enables a VNet service endpoint for you if the Cloud Manager policy has these permissions:

```
"Microsoft.Network/virtualNetworks/subnets/write",
"Microsoft.Network/routeTables/join/action",
```

These permissions are included in the latest Cloud Manager policy.

For details about setting up data tiering, see Tiering cold data to low-cost object storage.

Connections to ONTAP systems in other networks

To replicate data between a Cloud Volumes ONTAP system in Azure and ONTAP systems in other networks, you must have a VPN connection between the Azure VNet and the other network—for example, an AWS VPC or your corporate network.

For instructions, refer to Microsoft Azure Documentation: Create a Site-to-Site connection in the Azure portal.

Requirements for the Connector

Set up your networking so that the Connector can manage resources and processes within your public cloud environment. The most important step is ensuring outbound internet access to various endpoints.

If your network uses a proxy server for all communication to the internet, you can specify the proxy server from the Settings page. Refer to Configuring the Connector to use a proxy server.

Connections to target networks

A Connector requires a network connection to the VPCs and VNets in which you want to deploy Cloud Volumes ONTAP.

For example, if you install a Connector in your corporate network, then you must set up a VPN connection to the VPC or VNet in which you launch Cloud Volumes ONTAP.

Outbound internet access

The Connector requires outbound internet access to manage resources and processes within your public cloud environment. A Connector contacts the following endpoints when managing resources in Azure:

Endpoints	Purpose
https://management.azure.com https://login.microsoftonline.com	Enables Cloud Manager to deploy and manage Cloud Volumes ONTAP in most Azure regions.
https://management.microsoftazure.de https://login.microsoftonline.de	Enables Cloud Manager to deploy and manage Cloud Volumes ONTAP in the Azure Germany regions.
https://management.usgovcloudapi.net https://login.microsoftonline.com	Enables Cloud Manager to deploy and manage Cloud Volumes ONTAP in the Azure US Gov regions.
https://api.services.cloud.netapp.com:443	API requests to NetApp Cloud Central.
https://cloud.support.netapp.com.s3.us-west-1.amazonaws.com	Provides access to software images, manifests, and templates.
https://cognito-idp.us-east-1.amazonaws.com https://cognito-identity.us-east-1.amazonaws.com https://sts.amazonaws.com https://cloud-support-netapp-com-accelerated.s3.amazonaws.com	Enables the Connector to access and download manifests, templates, and Cloud Volumes ONTAP upgrade images.

Endpoints	Purpose
https://cloudmanagerinfraprod.azurecr.io *.blob.core.windows.net	Access to software images of container components for an infrastructure that's running Docker and provides a solution for service integrations with Cloud Manager.
https://kinesis.us-east-1.amazonaws.com	Enables NetApp to stream data from audit records.
https://cloudmanager.cloud.netapp.com	Communication with the Cloud Manager service, which includes Cloud Central accounts.
https://netapp-cloud-account.auth0.com	Communication with NetApp Cloud Central for centralized user authentication.
support.netapp.com:443 https://mysupport.netapp.com	Communication with NetApp AutoSupport. Note that the Connector communicates with support.netapp.com:443, which redirects to https://mysupport.netapp.com.
https://support.netapp.com/svcgw https://support.netapp.com/ServiceGW/entitlement https://eval.lic.netapp.com.s3.us-west-1.amazonaws.com https://cloud-support-netapp-com.s3.us-west-1.amazonaws.com	Communication with NetApp for system licensing and support registration.
https://client.infra.support.netapp.com.s3.us-west-1.amazonaws.com https://cloud-support-netapp-com-accelerated.s3.us-west-1.amazonaws.com https://trigger.asup.netapp.com.s3.us-west-1.amazonaws.com	Enables NetApp to collect information needed to troubleshoot support issues.
https://ipa-signer.cloudmanager.netapp.com	Enables Cloud Manager to generate licenses (for example, a FlexCache license for Cloud Volumes ONTAP)
*.blob.core.windows.net	Required for HA pairs when using a proxy.
Various third-party locations, for example: • https://repo1.maven.org/maven2 • https://oss.sonatype.org/content/repositories • https://repo.typesafe.com Third-party locations are subject to change.	During upgrades, Cloud Manager downloads the latest packages for third-party dependencies.

While you should perform almost all tasks from the SaaS user interface, a local user interface is still available on the Connector. The machine running the web browser must have connections to the following endpoints:

Endpoints	Purpose
The Connector host	You must enter the host's IP address from a web browser to load the Cloud Manager console. Depending on your connectivity to your cloud provider, you can use the private IP or a public IP assigned to the host: • A private IP works if you have a VPN and direct connect access to your virtual network • A public IP works in any networking scenario In any case, you should secure network access by ensuring that security group rules allow access from only authorized IPs or subnets.
https://auth0.com https://cdn.auth0.com https://netapp-cloud-account.auth0.com https://services.cloud.netapp.com	Your web browser connects to these endpoints for centralized user authentication through NetApp Cloud Central.
https://widget.intercom.io	For in-product chat that enables you to talk to NetApp cloud experts.

Security group rules for Cloud Volumes ONTAP

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

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

Inbound rules for single node systems

The rules listed below allow traffic, unless the description notes that it blocks specific inbound traffic.

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

Priority and name	Port and protocol	Source and destination	Description
1005 inbound_161-162 _tcp	161-162 TCP	Any to Any	Simple network management protocol
1006 inbound_161-162 _udp	161-162 UDP	Any to Any	Simple network management protocol
1007 inbound_443	443 TCP	Any to Any	HTTPS access to the System Manager web console using the IP address of the cluster management LIF
1008 inbound_445	445 TCP	Any to Any	Microsoft SMB/CIFS over TCP with NetBIOS framing
1009 inbound_635_tcp	635 TCP	Any to Any	NFS mount
1010 inbound_635_udp	635 UDP	Any to Any	NFS mount
1011 inbound_749	749 TCP	Any to Any	Kerberos
1012 inbound_2049_tcp	2049 TCP	Any to Any	NFS server daemon
1013 inbound_2049_udp	2049 UDP	Any to Any	NFS server daemon
1014 inbound_3260	3260 TCP	Any to Any	iSCSI access through the iSCSI data LIF
1015 inbound_4045-4046_tcp	4045-4046 TCP	Any to Any	NFS lock daemon and network status monitor
1016 inbound_4045-4046_udp	4045-4046 UDP	Any to Any	NFS lock daemon and network status monitor
1017 inbound_10000	10000 TCP	Any to Any	Backup using NDMP
1018 inbound_11104-11105	11104-11105 TCP	Any to Any	SnapMirror data transfer
3000 inbound_deny _all_tcp	Any port TCP	Any to Any	Block all other TCP inbound traffic
3001 inbound_deny _all_udp	Any port UDP	Any to Any	Block all other UDP inbound traffic

Priority and name	Port and protocol	Source and destination	Description
65000 AllowVnetInBound	Any port Any protocol	VirtualNetwork to VirtualNetwork	Inbound traffic from within the VNet
65001 AllowAzureLoad BalancerInBound	Any port Any protocol	AzureLoadBalancer to Any	Data traffic from the Azure Standard Load Balancer
65500 DenyAllInBound	Any port Any protocol	Any to Any	Block all other inbound traffic

Inbound rules for HA systems

The rules listed below allow traffic, unless the description notes that it blocks specific inbound traffic.

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 and name	Port and protocol	Source and destination	Description
100 inbound_443	443 Any protocol	Any to Any	HTTPS access to the System Manager web console using the IP address of the cluster management LIF
101 inbound_111_tcp	111 Any protocol	Any to Any	Remote procedure call for NFS
102 inbound_2049_tcp	2049 Any protocol	Any to Any	NFS server daemon
111 inbound_ssh	22 Any protocol	Any to Any	SSH access to the IP address of the cluster management LIF or a node management LIF
121 inbound_53	53 Any protocol	Any to Any	DNS and CIFS
65000 AllowVnetInBound	Any port Any protocol	VirtualNetwork to VirtualNetwork	Inbound traffic from within the VNet
65001 AllowAzureLoad BalancerInBound	Any port Any protocol	AzureLoadBalancer to Any	Data traffic from the Azure Standard Load Balancer

Priority and name	Port and protocol	Source and destination	Description
65500 DenyAllInBound	Any port Any protocol	Any to Any	Block all other inbound traffic

Outbound rules

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.

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

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

Security group rules for the Connector

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

Inbound rules

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

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.

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