
Network Administrator's Guide to Actifio VDP

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Preface

This guide provides step-by-step instructions on how to configure your Actifio Appliance into your network. It assumes you have read ***Introducing Actifio Copy Data Management***, are familiar with the components of the Actifio Global Manager (AGM) and the Actifio Desktop, and have a grasp of the basic concepts associated with an Actifio Appliance.

Your Actifio Appliance's Documentation Library contains detailed, step-by-step, application-specific instructions on how to protect and access your data. Each guide may be viewed online, downloaded, or printed on demand. The following guides will be of particular interest:

- ***Configuring Resources and Settings With the Domain Manager***
- ***Connecting Hosts to Actifio Appliances***

Actifio Appliances

Unless otherwise specified, all features and functions described in this document apply to all Actifio appliances.

The ActifioNOW Customer Portal

During the configuration and initialization of your Actifio appliance your Actifio representative provided you with a user name and password for the ActifioNOW customer portal.

From the ActifioNOW customer portal you can obtain detailed reports about your Actifio appliance, access the Actifio product documentation, including release notes, and search the knowledge base for answers to specific questions.

To log into the ActifioNOW customer portal:

1. Go to: <https://now.actifio.com>.
2. When prompted, enter the user name and password provided by your Actifio representative.

Actifio Support Centers

To contact an Actifio support representative, you can:

- Send email to: support@actifio.com
- Call:

From anywhere: +1.315.261.7501

US Toll-Free: +1.855.392.6810

Australia: 0011 800-16165656

Germany: 00 800-16165656

New Zealand: 00 800-16165656

UK: 0 800-0155019

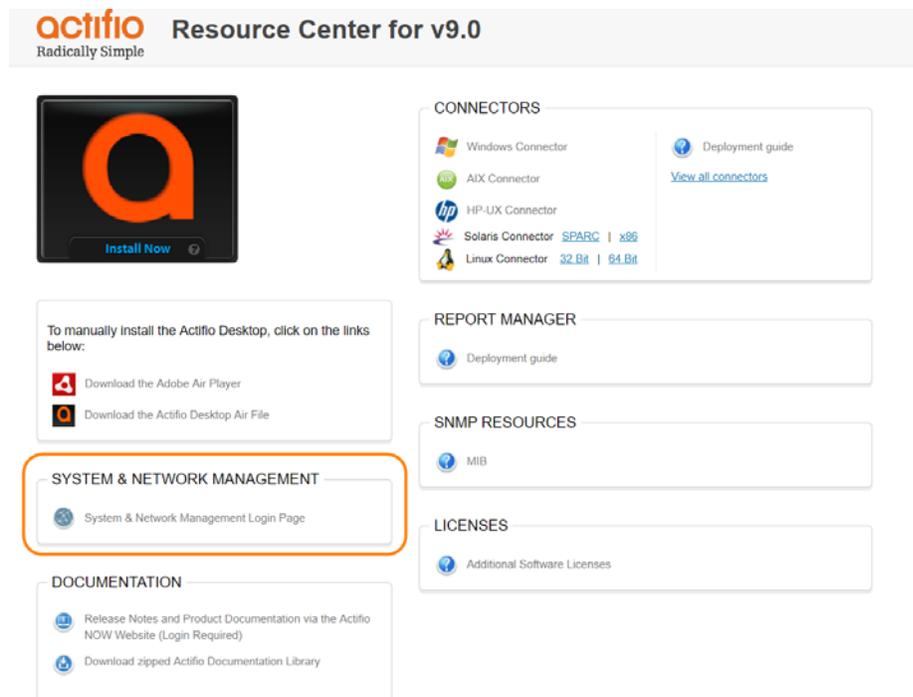
1 Modifying Your Network Configuration Settings

Your Actifio Appliance includes a self-service network configuration feature. This document describes how to use it to:

- Modify [DNS, and NTP](#) on page 2
- Modify [IPs and Interfaces](#) on page 3
- Create and modify [Outbound Policies](#) on page 6
- Perform [Network Troubleshooting](#) on page 8
- Create and modify [Host Resolution](#) on page 9
- [Configure Self Service Network for Actifio Sky Appliances in the Cloud](#) on page 10

Accessing the Appliance System Management Tools

1. Open a browser to the Actifio Resource Center **HTTP://<appliance IP address>/**.
2. Click System & Network Management Login Page.
3. Log in using the appliance credentials. The Network Settings page opens. If your Sky Appliance is in a public cloud platform, such as AWS, GCP, or Azure, see [Configure Self Service Network for Actifio Sky Appliances in the Cloud](#) on page 10.



Accessing the System & Network Management Tools

DNS, and NTP

Enter this information:

DNS Domain: Enter the domain of the hosts connected to this appliance.

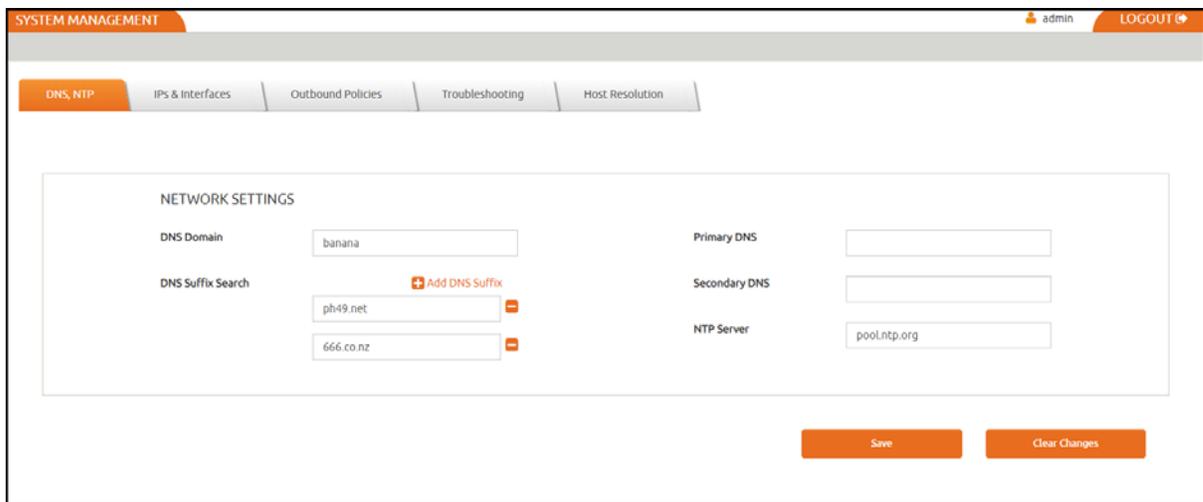
If you have additional hosts on other domains, you can set up a **DNS Suffix Search** to ensure the Actifio Appliance can find them by their short names.

Note: *If you set any entries in DNS Suffix Search, then the DNS Domain will NOT be searched. To search both the manual entries AND the DNS domain, include the DNS domain in the DNS Suffix Search.*

Primary DNS: Enter the IP address of your primary DNS server.

Secondary DNS: Enter the IP address of your secondary DNS server (optional).

NTP Server: Enter the IP address or hostname of your NTP server.



The screenshot displays the 'SYSTEM MANAGEMENT' interface for 'DNS, NTP'. The navigation menu includes 'DNS, NTP', 'IPS & Interfaces', 'Outbound Policies', 'Troubleshooting', and 'Host Resolution'. The 'DNS, NTP' section is active, showing 'NETWORK SETTINGS'. The 'DNS Domain' field contains 'banana'. The 'DNS Suffix Search' section has a '+ Add DNS Suffix' button and two entries: 'ph49.net' and '666.co.nz', each with a minus sign icon. The 'Primary DNS' field is empty. The 'Secondary DNS' field is empty. The 'NTP Server' field contains 'pool.ntp.org'. At the bottom right, there are 'Save' and 'Clear Changes' buttons.

DNS, and NTP

IPs and Interfaces

The IPs & Interfaces tab shows a list of configured IP addresses. You can modify these if necessary, and configure new interfaces added to the Sky Appliance in vCenter. The list is sorted by node first, then by interface, then by type in order (Node, iSCSI). appliance IPs are listed at the end since they are not associated with a single node. DHCP is not supported.

SYSTEM MANAGEMENT admin LOGOUT

Hostname, DNS, NTP | **IPs & Interfaces** | Outbound Policies | Troubleshooting | Host Resolution

Default Interface: eth0 Save ?

Add Modify Delete

Configured IPs							
	Type	Node	Interface	IP Address	Network Mask	Gateway	MTU
<input type="checkbox"/>	node	node0	eth0	172.17.134.50	255.255.0.0	172.17.1.1	1500
<input type="checkbox"/>	iscsi	node0	eth0	172.17.134.52	255.255.0.0	172.17.1.1	1500
<input type="checkbox"/>	node	node0	eth1	172.17.134.56	255.255.0.0	172.17.1.1	1500
<input type="checkbox"/>	node	node1	eth0	172.17.134.60	255.255.0.0	172.17.1.1	1500
<input type="checkbox"/>	node	node1	eth1	172.17.134.66	255.255.0.0	172.17.1.1	1500
<input type="checkbox"/>	cluster	cluster	eth0	172.17.134.51	255.255.0.0	172.17.1.1	1500

IPs and Interfaces

Configuring a Default Interface

The **Default Interface** specifies which interface is used to reach arbitrary remote hosts:

- If you specify a Default Interface on a CDS Appliance, then that interface's Node IP address is used.
- If none is specified for a CDS Appliance, then the eth0 cluster IP address is used.
- Sky Appliances have no cluster IP address. Sky Appliances always use a Node IP address.
- If no Default Interface is specified for a Sky Appliance, then the first valid Node IP address is used.

Modifying IP Address Settings

To modify a setting:

1. Check its box and click **Modify**.
2. Make your changes and click **Update**. Changes take effect immediately.

CONFIGURE IP

Type: node
Node: node1
Interface: eth0
IP Address *: 172.17.134.60
Network Mask *: 255.255.0.0
Gateway: 172.17.1.1
MTU: 1000

Update Cancel

Modifying the MTU for eth0 of Node1

NIC Usage for Each Actifio Appliance Type

Actifio Appliances can be configured for different levels of security and availability depending on network resources. For best results, configure appliances according to the following tables:

[Actifio Sky Appliance NIC Usage](#) on page 4

[Actifio CDS Appliance Generation-3 NIC Usage](#) on page 4

[Actifio CDS Appliance Generation-4 and Generation 5 NIC Usage](#) on page 5

[Actifio CDX Appliance NIC Usage](#) on page 5

Actifio Sky Appliance NIC Usage

Network	Security Requirement	Use
1G only virtual network	Low	Eth0 (1G) for all traffic
1/10G mixed virtual network	Medium	Eth0 (1G) for management Eth1 (1/10G) for backup/restore/replication
1/10G mixed virtual network	High	Eth0 (1G) for management Eth1 (10G) for backup Eth2 (1/10G) for replication More Eth* for backups only if required.

Each Sky appliance can support up to 100 iSCSI sessions. You can support an additional 100 sessions by adding a NIC card to the Sky appliance.

Actifio CDS Appliance Generation-3 NIC Usage

Network	Security Requirement	Use
1G only	Low	Eth0 (1G) for all traffic
1G only	Medium	Eth0 (1G) for management Eth1 (1G) for backup/restore/replication
1/10G mixed	Medium	Eth0 (1G) for management Eth2 (10G) for backup/restore/replication
1/10G mixed	High	Eth0 (1G) for management Eth2 (10G) for backup Eth3 (10G) replication
1/10G mixed	High, with improved availability	Eth0 (1G) for management Eth1 (1G) for replication Eth2/3 (10G & HA) for backup

Actifio CDS Appliance Generation-4 and Generation 5 NIC Usage

Network	Security Requirement	Use
1G only	Low	Eth0 (1G) for all traffic
1G only	Medium	Eth0 (1G) for management Eth1 (1G) for backup/restore/replication
1G only	Medium	Eth0 (1G) for management Eth1 (1G) for backup/restore Eth2 (1G) for replication
1/10G mixed	Medium	Eth0 (1G) for management Eth2 (10G) for backup/restore/replication
1/10G mixed	High	Eth0 (1G) for management Eth3 (10G) for backup Eth5 (10G) replication
1/10G mixed	High, with improved availability	Eth0 (1G) for management Eth1 (1G) for replication Eth3/4 (10G & HA) for backup
1/10G mixed	High, with improved availability	Eth0 (1G) for management Eth3/4 (10G & HA) for backup Eth5 (10G) for replication
1/10G mixed	High, with improved availability	Eth0 (1G) for management Eth3/4 (10G & HA) for backup Eth5/6 (10G & HA) for replication

Actifio CDX Appliance NIC Usage

Ethernet NIC	Number of Ports	Comments
10Gb DA/SFP+ Ethernet	4	Quad port adapter. General use
10Gb DA/SFP+ Ethernet	2	Dual port adapter. Dedicated interconnect
1GbE Ethernet	4	DO NOT USE - Quad port adapter. Reserved.
1GbE Ethernet	1	Dedicated BMC management port

Outbound Policies

Outbound policies define how the Actifio Appliance will reach specific remote networks for outbound connections. Any remote network not addressed by an outbound policy will be governed by the Default Interface configured in [IPs and Interfaces](#) on page 3.

You can also use this page to set a static route. An outbound policy is essentially a group of static routes that are automatically tailored to each of your specific interfaces.

	Source Interface	Destination Network	Network Mask	Gateway
<input type="checkbox"/>	eth1	1.2.3.0	255.255.255.0	

Outbound Policies

To modify an outbound policy:

1. Check its box and click **Modify**.
2. Make your changes and click **Update**. Changes take effect immediately.

To add a new outbound policy:

1. Click **Add**.
2. Enter your information and click **Add**. Changes take effect immediately.

A Gateway setting is optional. If you do not assign a gateway, then the default gateway for the interface is used. If your traffic must traverse a non-default gateway, then assign that gateway here. This gateway will be installed on every interface where it fits the netmask.

ADD OUTBOUND POLICY

Source Interface * eth0

Destination Network * 172.19.34.0

Network Mask * 255.255.255.0

Gateway

Add Cancel

Adding an Outbound Policy

Outbound Policies and Custom Configurations

If this system has some custom networking configured by Actifio Support, then the View and Delete Custom Configuration buttons appear on this page. You can view the text of the custom networking configuration file here.

Note: These buttons are not visible if your appliance has never had a custom configuration. A custom configuration can be created/modified only by Actifio Support. If you cannot make modifications to this page, it means that this system has some custom networking configured by Actifio Support. Contact Actifio Support for guidance.

If the appliance has an active custom configuration, then you see a Delete option. This disables the custom part of the configuration, allowing you to proceed with the formerly disabled management functions.

Note: Disabling a custom configuration may make the appliance unreachable.

SYSTEM MANAGEMENT admin LOGOUT

Hostname, DNS, NTP | IPs & Interfaces | **Outbound Policies** | Troubleshooting | Host Resolution

This appliance has customized routing rules that cannot be managed via this interface.

[View custom Configuration](#) [Delete custom Configuration](#)

This Appliance has a Custom Configuration

If you want to reactivate your custom configuration, use the **Restore Custom Configuration** button.

SYSTEM MANAGEMENT admin LOGOUT

Hostname, DNS, NTP | IPs & Interfaces | **Outbound Policies** | Troubleshooting | Host Resolution

[Add](#) [Modify](#) [Delete](#)

User Defined Outbound Policies				
	Source Interface	Destination Network	Network Mask	Gateway
<input type="checkbox"/>	eth1	1.2.3.0	255.255.255.0	

[View custom Configuration](#) [Restore custom Configuration](#)

/bin/false this line will display in the UI

Restoring a Custom Configuration

Network Troubleshooting

Use this page to troubleshoot problematic network connections. Under **Utility**, select the troubleshooting tool to use, enter the necessary parameters, and then click **Run Test**. The results appear in the Test Results box.

Ping: Runs a ping to determine reachability of a target host, returning the output as a plain text stream. This command sends 3 ICMP echo packets.

Enter:

- o **Source IP:** Select the IP address of the appliance to test. This tests the behavior of a reply packet. If you do not enter a value here, then the Outbound Policy rules are used. This tests the behavior of outbound connections.
- o **Destination IP:** A valid IPv4 or IPv6 address.

Example Ping result:

```
PING 1.2.3.4 (1.2.3.4) 56(84) bytes of data.  
--- 1.2.3.4 ping statistics ---  
3 packets transmitted, 0 received, 100% packet loss, time 3001ms
```

IP route get: Queries the routing tables for the selected Destination IP address without sending any packets. Enter:

- o **Source IP:** Select the IP address of the appliance to test. This tests the behavior of a reply packet. If enter no value, then Outbound Policy rules are used to test the behavior of outbound connections.
- o **Destination IP:** The IP address of a target host.

Example IP route get result:

```
test/routeget 1.2.3.4  
1.2.3.4 via 172.17.1.2 dev eth0 src 172.17.134.80  
cache mtu 1500 advmss 1460 hoplimit 64
```

Traceroute: Runs a traceroute to the given IP address by sending a series of UDP probes, returning the output as a plain text stream. This can take 30 or more seconds to run. Use Traceroute to identify intervening networks on the path. Traceroute cannot accept a source IP parameter, so it is not useful for testing the behavior of reply packets. Only outgoing connections can be diagnosed with this tool.

- o **Destination IP:** The IP address of a target host.
- o **UDP Port:** See [Chapter 3, Firewall Rules](#)

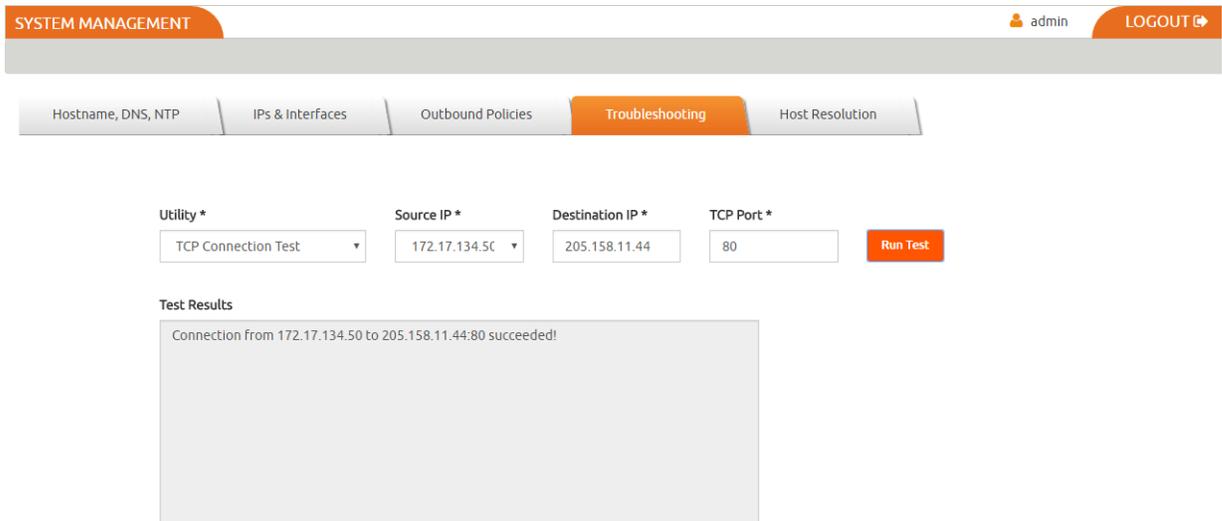
Example Traceroute result:

```
test/traceroute 8.8.8.8  
1: dev134-86.dev.acme.com (172.17.134.86) 0.092ms pmtu 1500  
1: devgw-waln5k02.dev.acme.com (172.17.0.3) 4.287ms  
1: devgw-waln5k02.dev.acme.com (172.17.0.3) 1.287ms  
2: e-1-20-walpallo.core.acme.com (192.168.255.21) 2.805ms  
3: ge-0-0-1-walasr.edge.acme.com (192.43.242.209) 2.769ms  
4: 205.158.44.81.ptr.us.xo.net (205.158.44.81) 9.247ms asymm 14  
5: vb1020.rar3.nyc-ny.us.xo.net (216.156.0.25) 10.080ms asymm 12  
6: 207.88.12.104.ptr.us.xo.net (207.88.12.104) 8.537ms asymm 12  
7: 207.88.13.35.ptr.us.xo.net (207.88.13.35) 8.175ms asymm 11  
8: no reply  
9: no reply  
.br/>.br/>.br/>31: no reply  
Too many hops: pmtu 1500  
Resume: pmtu 1500
```

TCP Connection Test: Attempts a TCP connection to the target IP and port. If successful, the connection is closed immediately without transferring any data. If not successful it returns a failure message.

- o **Source IP:** Select the IP address of the appliance to test. This tests the behavior of a reply packet. If you do not enter a value here, then the Outbound Policy rules are used. This tests the behavior of outbound connections.
- o **Destination IP:** The IP address of a target host.
- o **TCP Port:** See [Chapter 3, Firewall Rules](#).

Example TCP Connection Test result:

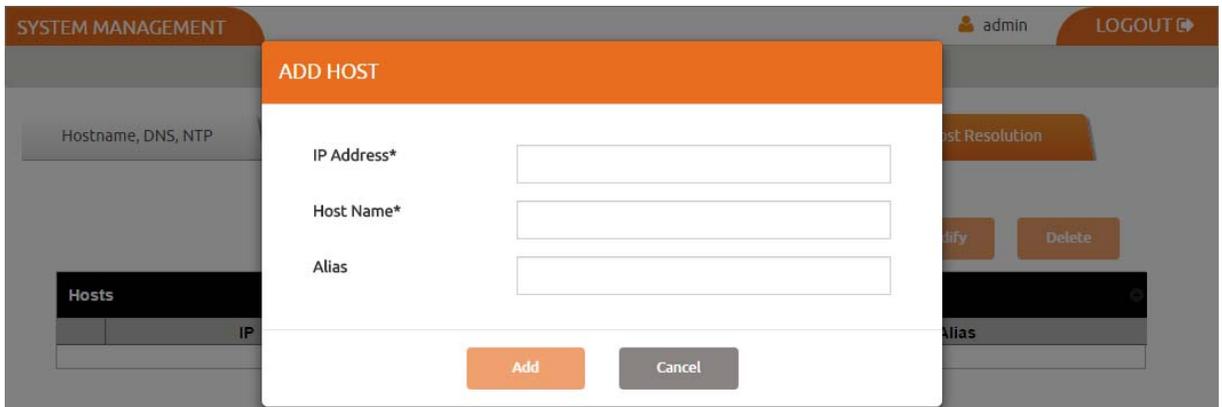


Troubleshooting: TCP Connection Test

Host Resolution

A host that has both management and production IP addresses may be configured with only the IP address for the management NIC in DNS. Use this page to add the NIC used for production communications. The information that you enter here becomes the contents of `/etc/hosts`.

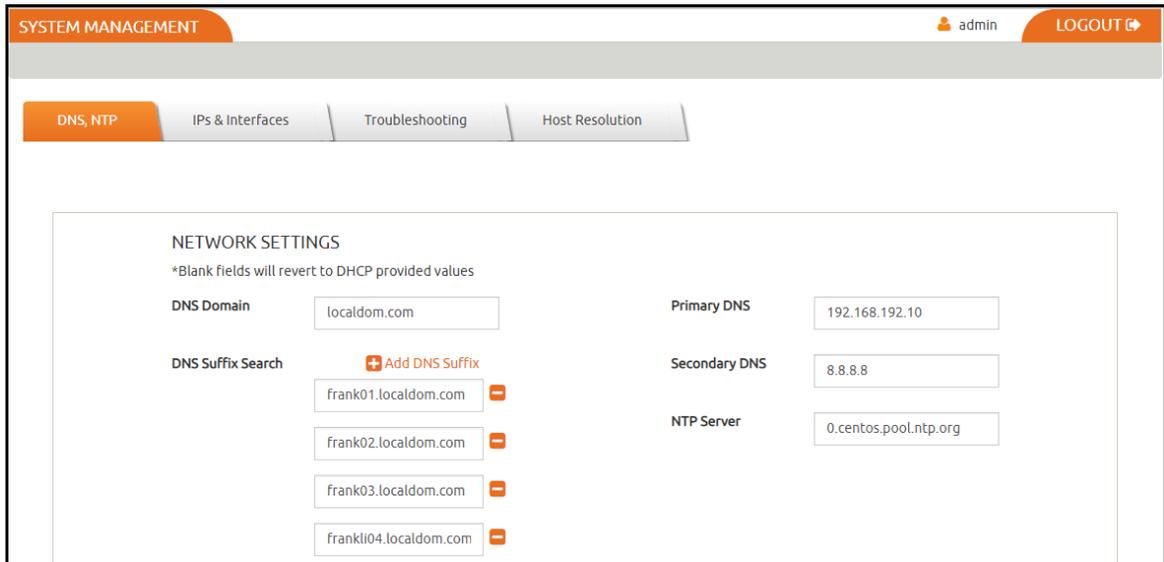
Note you cannot define a single hostname with multiple IP addresses, as the Management Panel will not allow you to do this. Even if it allowed more than one IP address to be added for the same hostname, only the first IP address would ever be used as this how name resolution with the `/etc/hosts` file works (which is the reason the panel blocks attempts to add the same hostname). For the scenario where a single hostname needs to resolve to more than IP, you must rely on an external DNS to do this resolution.



Host Resolution

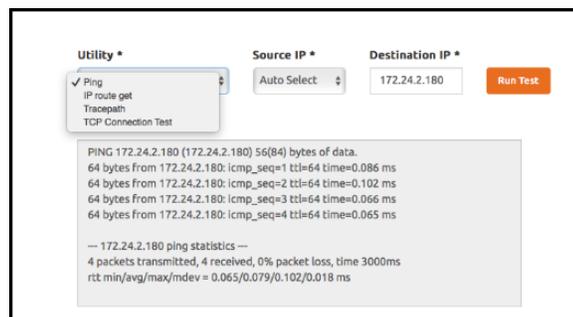
Configure Self Service Network for Actifio Sky Appliances in the Cloud

For Actifio Appliances on the Cloud, once you login to the System Management you will see the **DNS, NTP** tab.



System Management Tool for Actifio Appliance on Cloud

3. Enter or modify the network settings using information in [DNS, and NTP](#) on page 2. Any field you leave empty will revert to DHCP provided values.
4. Click the **IP & Interfaces** tab to view the a list of configured IP addresses. You cannot edit any information, it is view only. For more information, see [IPs and Interfaces](#) on page 3.
5. Click the **Troubleshooting** tab and troubleshoot problematic network connections using information in [Network Troubleshooting](#) on page 8.



Network Troubleshooting

6. Click the **Host Resolution** tab to override DNS resolution for specific hosts. For more information, see [Host Resolution](#) on page 9.

Note: For appliances on the Cloud, you will not see the **Outbound Policies** tab.

2 Reference Architectures for Actifio Appliances

Actifio Appliances can be configured for different levels of security and high availability depending on available network resources. For best results, appliances should be configured according to the following tables:

[Actifio Sky Appliance Reference Architectures](#) on page 11

[Actifio CDX Appliance Reference Architecture](#) on page 11

[Actifio CDS Appliance Generation-3 Reference Architectures](#) on page 12

[Actifio CDS Appliance Generation-4 Reference Architectures](#) on page 13

[Actifio CDS Appliance Generation-5 Reference Architectures](#) on page 14

Actifio Sky Appliances

Actifio Sky Appliance Reference Architectures

Sky	Using	Network	Security	High Availability
Sky-1	Eth0 (1G) for all traffic	1G only virtual network	Low	The Sky Appliance uses the hypervisor's High Availability features.
Sky-2	Eth0 (1G) for management Eth1 (1/10G) for backup/restore/replication	1/10G mixed virtual network	Medium	
Sky-4	Eth0 (1G) for management Eth1 (10G) for backup Eth2 (1/10G) for replication More Eth* for backups only if required.	1/10G mixed virtual network	High	

Actifio CDX Appliances

Actifio CDX Appliance Reference Architecture

CDX	Using	Network	Security	High Availability
CDX-1	eth0, eth1 for management eth2, eth3 for backup	10G only 10G only	High	Ports bonded for HA

Actifio CDS Appliance: Generation-3

The Actifio CDS Appliance Generation-3 includes the two nodes in the middle and the batteries above and below.



An Actifio CDS Appliance Generation-3

These are the most reliable network architectures for a CDS Appliance Generation-3:

Actifio CDS Appliance Generation-3 Reference Architectures

Type	Using	Network	Security	High Availability
3CDS-1	Eth0 (1G) for all traffic	1G only	Low	No
3CDS-2	Eth0 (1G) for management Eth1 (1G) for backup/restore/replication	1G only	Medium	No
3CDS-3	Eth0 (1G) for management Eth2 (10G) for backup/restore/replication	1/10G mixed	Medium	No
3CDS-4	Eth0 (1G) for management Eth2 (10G) for backup Eth3 (10G) replication	1/10G mixed	High	No
3CDS-5	Eth0 (1G) for management Eth1 (1G) for replication Eth2/3 (10G & HA) for backup	1/10G mixed	High	Yes

Actifio CDS Appliance: Generation-4

The Actifio CDS Appliance Generation-4 looks like this:



These are the most reliable network architectures for a CDS Appliance Generation-4:

Actifio CDS Appliance Generation-4 Reference Architectures

Type	Using	Network	Security	High Availability
4CDS-1	Eth0 (1G) for all traffic	1G only	Low	No
4CDS-2	Eth0 (1G) for management Eth1 (1G) for backup/restore/replication	1G only	Medium	No
4CDS-3	Eth0 (1G) for management Eth1 (1G) for backup/restore Eth2 (1G) for replication	1G only	Medium	No
4CDS-4	Eth0 (1G) for management Eth2 (10G) for backup/restore/replication	1/10G mixed	Medium	No
4CDS-5	Eth0 (1G) for management Eth3 (10G) for backup Eth5 (10G) replication	1/10G mixed	High	No
4CDS-6	Eth0 (1G) for management Eth1 (1G) for replication Eth3/4 (10G & HA) for backup	1/10G mixed	High	Yes
4CDS-7	Eth0 (1G) for management Eth3/4 (10G & HA) for backup Eth5 (10G) for replication	1/10G mixed	High	Yes
4CDS-8	Eth0 (1G) for management Eth3/4 (10G & HA) for backup Eth5/6 (10G & HA) for replication	1/10G mixed	High	Yes

Actifio CDS Appliance: Generation-5

The Actifio CDS Appliance Generation-5 looks like this:



These are the most reliable network architectures for a CDS Appliance Generation-5:

Actifio CDS Appliance Generation-5 Reference Architectures

Type	Using	Network	Security	High Availability
5CDS-1	Eth0 (1G) for all traffic	1G only	Low	No
5CDS-2	Eth0 (1G) for management Eth1 (1G) for backup/restore/replication	1G only	Medium	No
5CDS-3	Eth0 (1G) for management Eth1 (1G) for backup/restore Eth2 (1G) for replication	1G only	Medium	No
5CDS-4	Eth0 (1G) for management Eth2 (10G) for backup/restore/replication	1/10G mixed	Medium	No
5CDS-5	Eth0 (1G) for management Eth3 (10G) for backup Eth5 (10G) replication	1/10G mixed	High	No
5CDS-6	Eth0 (1G) for management Eth1 (1G) for replication Eth3/4 (10G & HA) for backup	1/10G mixed	High	Yes
5CDS-7	Eth0 (1G) for management Eth3/4 (10G & HA) for backup Eth5 (10G) for replication	1/10G mixed	High	Yes
5CDS-8	Eth0 (1G) for management Eth3/4 (10G & HA) for backup Eth5/6 (10G & HA) for replication	1/10G mixed	High	Yes

3 Firewall Rules

This section opens with an overview of [Internet Protocol \(IP\) Network Security in an Actifio Environment](#).

Then it details the network ports employed within a fully functional Actifio copy data management environment:

[Actifio Local Management from Administrator Workstation](#) on page 16

[Actifio Appliance Local Services](#) on page 16

[Management Traffic to and from the Actifio Appliance](#) on page 17

[Backup Traffic from the Actifio Appliance and Replication Traffic Between Appliances](#) on page 17

[Actifio Remote Support](#) on page 18

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Internet Protocol (IP) Network Security in an Actifio Environment

All components of Actifio Virtual Data Pipeline have been designed from the ground up with security in mind and the IP interfaces as traditional attack vectors have been given particular focus in hardening efforts.

Appliance Outbound Connections

The appliance may make outbound connections to the following services, but does not listen on or run a service for these ports unless listed in [Actifio Local Management from Administrator Workstation](#) on page 16.

SNMP

For the most part SNMP code on an Actifio Appliance is outgoing only, sending traps to a configured receiver to notify of events and failures. The exception is when integrated with Actifio Optimized Storage or SAN Fabric, a CDS Appliance will listen on UDP 162 for SNMP traps from specified IPs that are whitelisted for Actifio CDS Integrated Storage components.

A list of whitelisted IPs can be viewed with the commands `udsinfo lsmonitoreddevice`. SNMP v1 and v2 are supported.

No Actifio configuration can accept any SNMP walk or write (e.g. GetRequest, SetRequest, GetNextRequest, GetBulkRequest) and this configuration of community names is not required or supported.

Cross Appliance Communication and Replication

All Actifio Appliances utilize strong mutual authentication of the partner appliance with verification of 2048-bit RSA public keys.

Once authenticated, data in flight between appliances is encrypted using 256-bit AES encryption with session keys protected by Diffie-Hellman algorithms affording Perfect Forward Secrecy (PFS) over a TLS v1.2 channel.

Actifio Local Management from Administrator Workstation

Destination Port	Protocol(s)	Source IP Address	Destination IP Address	Description
22 (TCP)	SSH	Admin workstation	Actifio Appliance IP Actifio IMM Addresses	CLI access for management and backup commands. Hosts may also need to connect to Actifio. Node IMM Ports for installation and service
26 (TCP)	SSH	Admin workstation	Actifio Appliance IP	Service CLI access.
80 (TCP) or 443 (TCP)	HTTP HTTPS	Admin workstation	Actifio IMM Addresses	Node IMM Ports for installation and service. Enables local download of the Actifio Desktop and Connector. No appliance control or data access is possible on this port.
443 (TCP)	HTTPS	Admin workstation	Actifio Appliance IP	TLS-encrypted communication between Actifio Desktop and the appliance, and some appliance-to-appliance communication. SSL certificates may be replaced.
3900 (TCP)	HTTP	Admin workstation	Actifio IMM addresses	Node IMM ports for remote access
ICMP		Admin workstation	Target Host	System & Network Mgmt ping

Actifio Appliance Local Services

Destination Port	Protocol(s)	Source IP Address	Destination IP Address	Description
25 (TCP) or 465 (TCP)	SMTP SMTPS	Actifio Appliance IP	Client email server	Event notification via your SMTP email relay server.
53 (UDP)	DNS	Actifio Appliance IP	Client DNS server	DNS
123 (UDP)	NTP	Actifio Appliance IP	Client NTP server	NTP
162 (UDP)	SNMP	Actifio Appliance IP	Client SNMP server	SNMP trap notification
389 (TCP) or 636 (TCP)	LDAP LDAPS	Actifio Appliance IP	Client AD server and LDAP	Authentication of user accounts against a central Microsoft AD/LDAP directory if configured.

Management Traffic to and from the Actifio Appliance

Destination Port	Protocol(s)	Source IP Address	Destination IP Address	Description
26 (TCP)	SSH	Actifio Appliance IP	Actifio Appliance IP	Appliance to appliance cross-node management. Node addresses should also be allowed.
427 (TCP)	SLP	Actifio Appliance IP	“any”	Service location for WBEM (CDS only)
443 (TCP)	HTTPS	Actifio Appliance IP	vCenter Server IP	Required to communicate with vCenter servers and ESX hosts for snapshot and image management during backup and mounts over an encrypted link. Used for joining Actifio Appliances and sharing certificates.
623	UDP	Actifio Appliance IP	idrac	CDX appliance (only) installation Used for STONITH.
5106 (TCP)	Actifio API	Actifio Appliance IP	Host Servers, including Hyper-V Host Servers	Encrypted control channel between Actifio Appliance and hosts running the Actifio Connector.
5989 (TCP)	CIMOM	VMware SRM server	Actifio Appliance IP	SSL encrypted WBEM (CDS only, used for VMware SRM integration).

Backup Traffic from the Actifio Appliance and Replication Traffic Between Appliances

Destination Port	Protocol(s)	Source IP Address	Destination IP Address	Description
443 (TCP)	HTTPS	Actifio Appliance IP	Other Actifio Appliance, Amazon S3 endpoint or other OnVault cloud.	Appliance-to-appliance traffic, appliance-to-Actifio OnVault cloud data transfer, StreamSnap traffic
902 (TCP)	VMware	Actifio Appliance IP	ESX Server VMKernel IPs	Encrypted connectivity to VMware ESXi hosts for data movement operations.
3205 and 3260 (TCP)	iSCSI	Host servers	Actifio iSCSI Addresses	iSCSI target

Backup Traffic from the Actifio Appliance and Replication Traffic Between Appliances

Destination Port	Protocol(s)	Source IP Address	Destination IP Address	Description
111	tcp/udp	Actifio Appliance IP	Actifio Appliance IP	An RPC service used to map other RPC services
756	tcp/udp			Network status monitor daemon
4045	tcp/udp			Network lock daemon
5103	Actifio API	Actifio Appliance IP	Actifio Appliance IP	Encrypted bidirectional appliance-to-appliance data replication traffic. Both sides use strong mutual authentication of the partner appliance.
5107 (TCP)	Actifio API	Actifio Appliance IP	Actifio Appliance IP	Actifio Appliance to appliance data transfer for cross-site mirroring and for Actifio StreamSnap data replication. Must be bidirectional.

Actifio Remote Support

Destination Port	Protocol	Source IP Address	Destination IP Address	Description
443 (TCP)	HTTPS	Actifio Appliance IP	callhome.actifio.net	Call Home Alerting
25 (TCP)	SMTP	Actifio Appliance IP	callhome.actifio.net	Call Home Alerting (legacy)
443 (TCP)	OpenVPN/HTTPS	Actifio Appliance IP	secureconnect2.actifio.com	SecureConnect proxy mode (optional)
1194 (UDP)	OpenVPN	Sky Appliance: Sky Appliance IP CDX Appliance: node 0 CDS Appliance: CDS node	secureconnect2.actifio.com	SecureConnect. Encrypted remote support access to Actifio data centers. As the connection is mutually authenticated with strong cryptography, it is recommended that the destination not be limited by a firewall.

Local Storage Management

Destination Port	Protocol(s)	Source IP Address	Destination IP Address	Description
Actifio SAN Switch				
TCP-22, 23	SSH	Admin workstation	Actifio SAN switch	CLI access for installation and service
TCP-80 TCP-443	HTTP HTTPS	Admin workstation	Actifio SAN switch	Management web GUI for installation and service
UDP-162	SNMP	SAN Switch Management IP	Actifio Appliance IP	Optional delivery of events in the form of SNMP traps to a trap receiver
UDP-123	NTP	SAN Switch Management IP	Client NTP server	NTP
Actifio Storage V3700				
TCP-22	SSH	Actifio Appliance IP	Actifio Storage V3700 (Node1/2)	CLI access for installation and service
UDP-162	SNMP	Actifio Storage V3700 (Node1/2)	Actifio Appliance IP	Internal SNMP Notification
UDP-123	NTP	Actifio Storage V3700 (Node1/2)	Client NTP server	NTP
TCP-25	SMTP	Actifio Storage V3700 (Node1/2)	Client Email Server	SMTP Email Notification
TCP-22	SSH	Admin workstation	Actifio Storage V3700 (Node1/2)	CLI access for installation and service
Actifio Storage DS3512				
TCP-2463	Management	Admin workstation	Actifio Storage DS3512 (Ctrl A/B)	DS Storage Manager installation and service

Actifio Report Manager

Destination Port	Protocol	Source IP Address	Destination IP Address	Description
443 (TCP)	HTTPS	Administrator workstation	Report Manager server	Actifio Report Manager (reports & setup/admin)
5103 (TCP) Use 443 if the firewall blocks outbound traffic	SSH	Report Manager server	Actifio Appliance IP	Actifio Report Manager (data collection)

Actifio Global Manager (AGM)

Destination Port	Protocol(s)	Source IP Address	Destination IP Address	Description
5103 (TCP) Use 443 if the firewall blocks outbound traffic	SSH	AGM server	Actifio Appliance IP	Outbound connection from AGM to all managed Actifio Appliances. Once the connection is established, data flow is bidirectional.
443 (TCP)	SSH	AGM server	Actifio Appliance IP	Outbound connection from AGM to Sky Appliances. Once the connection is established, data flow is bidirectional.
443 (TCP)	HTTPS	Workstation or laptop	AGM server	Web browser access to AGM for inbound connection to AGM server.
TCP-389 (TCP) or TCP-636 (TCP)	LDAP LDAPS	AGM server	Client AD server	Microsoft AD/LDAP Active Directory Authentication

Resiliency Director

Destination Port	Protocol	Source IP Address	Destination IP Address	Description
TCP-443	HTTPS	Resiliency Director Collector	Actifio Appliance IP	Data Collection/Recovery Orchestration at source site
		Resiliency Director Collector	vCenter Server IP	Data Collection/Recovery Orchestration at source site
		Resiliency Director Server	Actifio Appliance IP	Data Collection/Recovery Orchestration at DR site
		Resiliency Director Server	vCenter Server IP	Data Collection/Recovery Orchestration at DR site
		Resiliency Director Server	Resiliency Director Collector	Partnership setup
		Resiliency Director Collector	Resiliency Director Server	Replication of configuration data
		Administrator workstation	Resiliency Director Collector	Resiliency Director Collector configuration/administration
		Administrator workstation	Resiliency Director Server	Resiliency Director Server configuration/administration
TCP-5103	HTTPS	Resiliency Director Collector	Actifio Appliance IP	Used to establish secure session ID
		Resiliency Director Server	Actifio Appliance IP	Used to establish secure session ID
ICMP		Resiliency Director Collector	Resiliency Director Server	ping
		Resiliency Director Server	Resiliency Director Collector	ping

Actifio Appliance IP

Actifio Appliance IP Address depends on the type of appliance:

Actifio Sky Appliance: the Actifio Appliance IP is the IP address of the Sky Appliance.

Actifio CDX Appliance: the Actifio Appliance IP must include the IP addresses for Node 0, Node 1, and the cluster IP address.

Actifio CDS Appliance: the Actifio Appliance IP must include the IP addresses for Node 0, Node 1, and for the cluster.

4 iSCSI Connectivity

This includes:

- [Ensuring iSCSI Connectivity from ESX to Storage](#) on page 23
- [Ensuring iSCSI Connectivity with an ESX Server](#) on page 24
- [Ensuring iSCSI Connectivity on a Linux Host](#) on page 26
- [Ensuring iSCSI Connectivity on an IBM AIX Host](#) on page 27
- [Ensuring vSCSI Connectivity on an IBM HMC Host](#) on page 27
- [Ensuring iSCSI Connectivity on an Oracle Sun Solaris Host](#) on page 28
- [Ensuring iSCSI Connectivity on an HP-UX Host \(Actifio Sky only\)](#) on page 28
- [Ensuring iSCSI Connectivity on a Windows Physical Host](#) on page 29

Note: For best iSCSI network traffic results, see [NIC Usage for Each Actifio Appliance Type](#) on page 4.

Each Sky and CDX appliance can support up to 100 iSCSI sessions. A CDS appliance can support 275 sessions. You can support an additional 100 sessions by adding a NIC card to a Sky appliance.

Ensuring iSCSI Connectivity from ESX to Storage

To test the iSCSI connection from an ESXi server to a V3700 or V7000 storage array or to an Actifio CDS Appliance:

1. Enable ESXi Shell and connect to ESXi as root.
2. Use `netcat` (`nc`) command to confirm connectivity.
If the iSCSI IP address is 123.45.67.89 then issue a command like this:
(Shown is the response if the device is listening on that port. This is a good result.)

```
~ # nc -z 123.45.67.89 3260
Connection to 123.45.67.89 3260 port [tcp/*] succeeded!
```

If a port is unreachable then you will simply return to the prompt with no output.

Note: ESXi does not have `telnet`, so issuing a `ping` does not prove that connectivity for iSCSI is available.

Ensuring SAN transport of data to an external storage pool

A newly created vCenter will default to Transport Type NFS. This is incompatible with ESP, and should be changed to SAN. This setting is visible in AGM and from the Command Line, but is not displayed in the Actifio Desktop. You can also do this from the CLI:

```
[root@sky812-900-RC2 ~]# udsinfo lshost 207823
udstask chhost -transport san <id>\'
```

The `-transport` parameter is detailed in the **Actifio CLI Reference**.

Ensuring iSCSI Connectivity with an ESX Server

This has two parts:

1. [Adding the iSCSI Actifio Definition to the ESX server](#) on page 24
2. [Configuring AGM to See the ESX Host](#) on page 25

Before You Begin

In order to ensure connectivity to ESX servers reached via iSCSI:

- Check that the NICs are as described in [NIC Usage for Each Actifio Appliance Type](#) on page 4.
- Check that the network ports are as described in [Chapter 3, Firewall Rules](#).
- Check each ESX server to be sure that these are set to the following recommended values:

Setting	Recom. Value	Description
LoginTimeout	60	When iSCSI establishes a session between initiator and target, it must log into the target. It will try to log in for a period of LoginTimeout. If the login attempt exceeds LoginTimeout, then the login fails.
Noopinterval	30	iSCSI uses the noop timeout to passively discover if this path is dead when it is not the active path.
Nooptimeout	30	This is tested on non-active paths every NoopInterval. If no response is received by NoopTimeout, the path is marked dead.

This procedure is for a single Actifio Ethernet iSCSI connection to a single iSCSI Ethernet connection on the ESX server. Actifio Professional Services can help you with any other configuration.

For CDX Appliance cluster (which is high availability), these parameters are different to ensure the iSCSI connection survives a failover event.

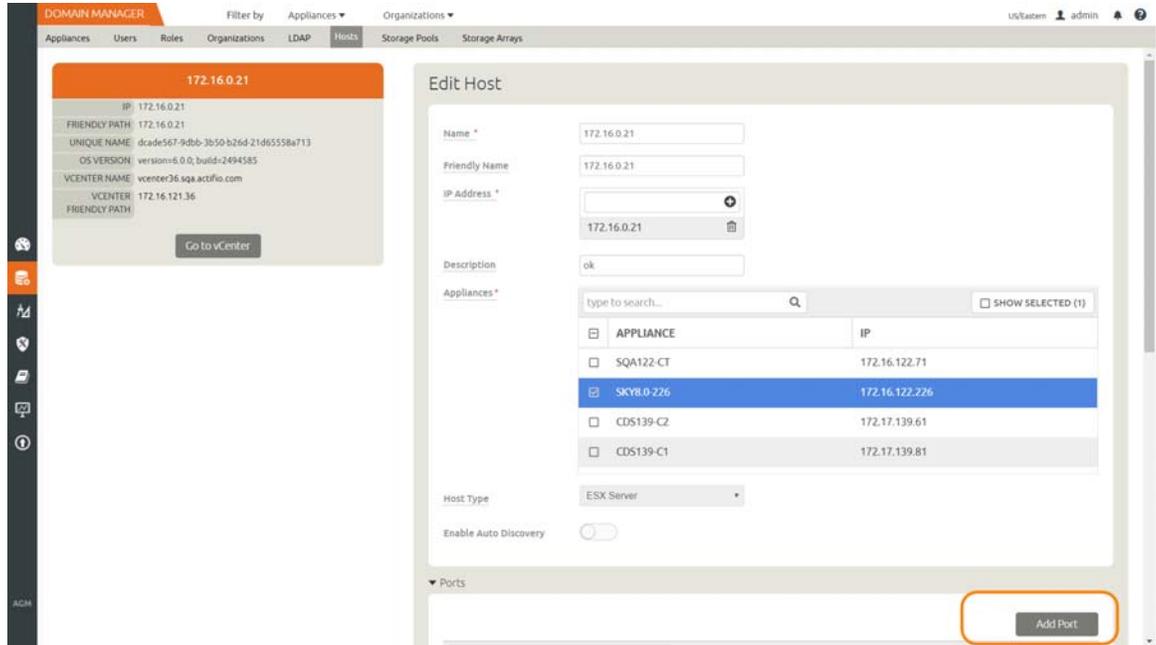
Adding the iSCSI Actifio Definition to the ESX server

1. Highlight the ESX server in vCenter and select the **Configuration** tab.
2. Select the iSCSI Software Adapter and then **Properties**. A pop up window appears to discover the Actifio iSCSI connection.
3. Select Dynamic Discovery tab and click **Add** to add the iSCSI IP of the Actifio Appliance.
4. Enter the IP address of the Actifio iSCSI port and click **OK**. It is added to the target listing.
5. Right click on the iSCSI software adapter and click **Rescan**.

Continue to [Configuring AGM to See the ESX Host](#) on page 25.

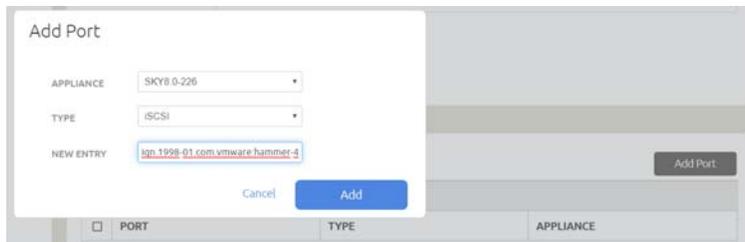
Configuring AGM to See the ESX Host

1. Open AGM to the **Domain Manager**, Hosts page.
2. Right-click the ESX server and select **Edit**.
3. Scroll down the right side to the Ports section and click **Add Port**



Configuring AGM to Recognize an ESX Server

4. From the Type menu, select **iSCSI**.
5. At New Entry, enter the iSCSI iqname, and click **Add**. This will configure the iSCSI relationship on Actifio to the ESX server.



Adding the Port

Specifying the NIC for NFS mounts

Specify the NIC for an NFS mount at the ESX level:

```
udtask chost -nfsoption server:serverip=1.1.1.1 <hostid>
```

The -nfsoption parameter is detailed in the **Actifio CLI Reference**.

Ensuring iSCSI Connectivity on a Linux Host

When the Actifio Connector manages data movement over iSCSI, VDP uses a staging disk to create a copy of application data during each Snapshot or Dedup Async job.

Learning iSCSI information from a Linux Host

An Actifio-approved iSCSI initiator must be installed on the host. To learn if the initiator is installed, use this command:

```
[root@psa-611 ~]# grep -v ^# /etc/iscsi/initiatorname.iscsi | cut -d "=" -f 2
iqn.1994-05.com.redhat:6d11e98139fb
[root@psa-611 ~]# iscsiadm -m discovery
172.25.128.200:3260 via sendtargets
```

Installing the iSCSI Initiator on a Red Hat RHEL 6 or CentOS Linux Host

To install the iSCSI initiator on a Linux host:

Make sure you have the `iscsiadm` package installed.

Run: `# rpm -qa | grep iscsi`

This should show something similar to: `iscsi-initiator-utils-6.2.0.865-6.el5.x86_64.rpm`

If you see nothing, then you must install the package: `# yum install iscsi-initiator-utils`

Installing the iSCSI Initiator on a SLES Linux Host

Use YaST to install the iSCSI initiator package.

Make sure you have the `open-iscsi` package installed.

Run: `# rpm -qa | grep iscsi`

This should show something similar to:

`open-iscsi-x.x.x.x`

`yast2-iscsi-client-x.x.x.x`

If you do not see both of these packages, then you must install `open-iscsi`:

1. `# yast2 sw_single`
2. In the search, enter `iscsi`
3. Select `open-iscsi` and click **Accept**.

Note: If Linux is running on a PowerPC system, then `largesend` must be enabled.

Linux iSCSI Multipathing Requirements on Actifio CDX Appliances

CentOS 6.x

```
devices {
    device {
        vendor "ACTIFIO"
        product "LUN0|CDX"
        path_selector "round-robin 0"
        path_grouping_policy failover
        path_checker tur
        rr_min_io 100
        failback immediate
        no_path_retry "5"
        dev_loss_tmo 180
    }
}
```

Ensuring iSCSI Connectivity on an IBM AIX Host

The Actifio Appliance must be able to communicate with the Actifio Connector running on the new host over a Fibre Channel or iSCSI network.

When Fibre Channel is not available, you can use iSCSI. If iSCSI is used, then an Actifio-approved iSCSI initiator must be installed on the host. While it is possible to also present the staging disk to a VM using an iSCSI initiator running in the VM, this is normally not necessary.

To Learn the iSCSI Initiator Name from an AIX Host

To learn the name of the iSCSI initiator already installed on a host:

```
bash-4.2# lsattr -El iscsi0 | grep -i "initiator_name" | awk '{print $2;}'
iqn.localhost.hostid.7f000001
```

Validating that the iSCSI Initiator is Installed on an IBM AIX Host

To determine if the iSCSI initiator is installed on an AIX host:

```
[ablue4:root] / > lspp -l | grep iscsi
devices.common.IBM.iscsi.rte
devices.iscsi.disk.rte 7.1.0.15 COMMITTED iSCSI Disk Software
devices.iscsi.tape.rte 7.1.0.0 COMMITTED iSCSI Tape Software
devices.iscsi_sw.rte 7.1.1.15 COMMITTED iSCSI Software Device Driver
devices.common.IBM.iscsi.rte
devices.iscsi_sw.rte 7.1.1.15 COMMITTED iSCSI Software Device Driver
[ablue4:root] / >
```

Note: Inband devices (VDisks) presented to the AIX host via iSCSI must have the `rw_timeout` attribute set to 120 seconds.

Ensuring vSCSI Connectivity on an IBM HMC Host

Limitations

IBM HMC hosts can be added to an Actifio Sky Appliance for LPAR discovery, but Sky Appliances do not support Fibre Channel connectivity, so the LPARs must be presented to their staging disks over an iSCSI connection.

Ensuring Connectivity

LPAR hosts with vSCSI mapping are virtual hosts that rely on VIO servers for vSCSI connectivity. They do not have direct FC connectivity and FC is not an option for them. If they are discovered as regular physical hosts, then the only option to back them up is using iSCSI, which is inferior to vSCSI. For enabling vSCSI connectivity with this class of LPARs:

- They must be discovered indirectly through HMC discovery, not directly as regular physical hosts.
- The Actifio Appliance should have Fibre Channel connectivity to VIO servers catering storage to these LPARs.

If either of these two conditions are not met, the appliance will use iSCSI connectivity.

Resources such as RAM and CPU are still managed by the HMC but I/O such as network and fibre are managed through the VIO server. This is more scalable than earlier technologies. LUN presentation is done through the HBA cards on the VIO server(s). The VIO server presents the LUNs in a virtual SCSI mapping manner to the LPAR or vhost.

Because the Actifio Connector has direct ties with the HMC of the environment, VDP can protect and recover vSCSI VIO mapped LPARS from an environment including the rootvg in a bootable state.

When the Actifio Connector manages data movement over vSCSI, VDP uses a staging disk to create a copy of application data during each Snapshot or Dedup Async job.

Ensuring iSCSI Connectivity on an Oracle Sun Solaris Host

The Actifio Appliance must be able to communicate with the Actifio Connector running on the new host over a Fibre Channel or iSCSI network.

Note: *The Actifio CDS Appliance does not support iSCSI for Solaris SPARC hosts but the Actifio Sky Appliance does support it.*

When the Actifio Connector manages data movement over iSCSI, VDP uses a staging disk to create a copy of application data during each Snapshot or Dedup Async job.

Connecting to Solaris x86 Hosts over iSCSI

To learn the iSCSI initiator Name from a Solaris x86 Host, use this command:

```
root@solaris5531:~# iscsiadm list initiator-node | grep -i "Initiator node name" | cut -d
":" -f 2,3
iqn.2015-02.com.actifio:solaris5531
```

Make sure you have the iSCSI package installed:

```
# pkginfo |grep SUNWiscsi
system      SUNWiscsir      Sun iSCSI Device Driver (root)
system      SUNWiscsiu      Sun iSCSI Management Utilities (usr)
```

Installing the pkg File

To install the iSCSI Initiator package on a Solaris Host:

```
# pkgadd -d <path_to_pkg_file> all
```

Solaris iSCSI Initiator Limitations

Here are the current limitations or restrictions of using the Solaris iSCSI initiator software:

- Support for iSCSI devices that use SLP is not currently available.
- Boot support for iSCSI devices is not currently available.
- iSCSI targets cannot be configured as dump devices.
- iSCSI supports multiple connections per session, but the current Solaris implementation only supports a single connection per session. For more information, see RFC 3720.
- Transferring large amounts of data over your existing network can have an impact on performance.

Ensuring iSCSI Connectivity on an HP-UX Host (Actifio Sky only)

When the Actifio Connector manages data movement over iSCSI, VDP uses a staging disk to create a copy of application data during each Snapshot or Dedup Async job.

If iSCSI is used, then an Actifio-approved iSCSI initiator must be installed on the host. While it is possible to also present the staging disk to a VM using an iSCSI initiator running in the VM, this is normally not necessary.

Note: *After the iSCSI initiator is configured, the HP-UX native multipathing is statically linked with the kernel, so no setup is required to use the multipathing support.*

Ensuring iSCSI Connectivity on a Windows Physical Host

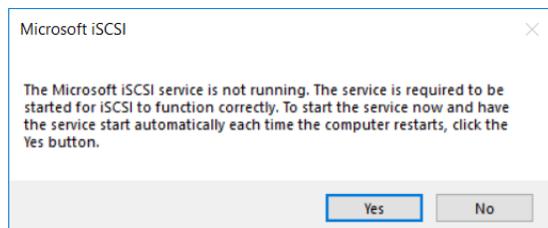
Windows Server hosts include Microsoft SQL Server, SharePoint, and Exchange hosts, as well as Active Directory, CIFS, and other file systems.

When the Actifio Connector manages data movement over iSCSI, VDP uses a staging disk to create a copy of application data during each Snapshot or Dedup Async job.

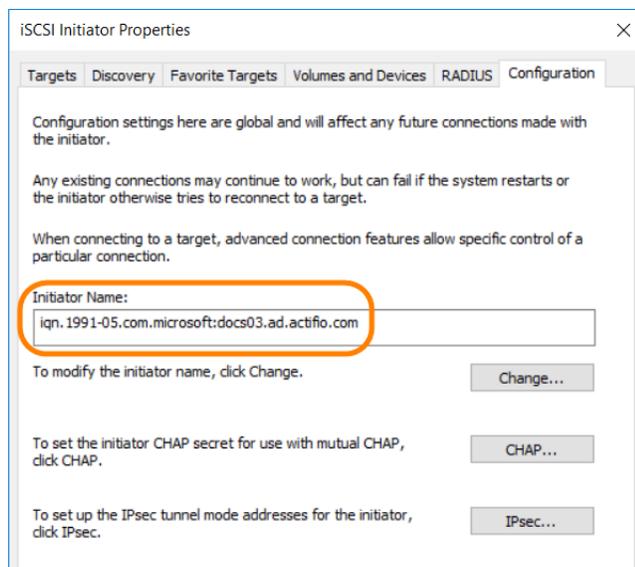
An Actifio-approved iSCSI initiator must be installed on the host. While it is possible to also present the staging disk to a VM using an iSCSI initiator running in the VM, this is normally not necessary.

Learn the iSCSI Initiator Name from a Physical Windows Host via Server Manager

1. On Windows Server 2012, 2012 R2, or 2016, open up Server Manager.
2. Click Tools and select iSCSI Initiator to start the MSiSCSI Initiator Service.
3. The Microsoft iSCSI dialog will open indicating that the service is not running. Click Yes to start the service and to set it to start automatically when the server reboots.



4. After the MSiSCSI Initiator Service has started the Properties dialog will be opened. Click the Configuration tab to retrieve the iSCSI Qualified Name (IQN).
5. Write down or copy the Initiator Name.



Learn the iSCSI Initiator Name from a Physical Windows Host via the CLI

To learn the iSCSI initiator name from a physical Windows host, use the iscsicli command:

```
C:\Users\Administrator>iscsicli
Microsoft iSCSI Initiator Version 6.0 Build 6000
[iqn.1991-05.com.microsoft:winsql2016-1.sqa.actifio.com] Enter command or ^C to exit
```

You will need this value when you add the host to the Actifio Appliance.

5 Fibre Channel Connectivity

This includes:

- [Ensuring Fibre Channel Connectivity to Storage \(CDS only\) on page 31](#)
- [Fibre Channel Zoning between ESX Servers and CDS Appliances on page 31](#)
- [Ensuring Fibre Channel Connectivity to a Linux Host on page 32](#)
- [Ensuring Fibre Channel Connectivity on an IBM AIX Host on page 36](#)
- [Ensuring Connectivity on a Solaris Host over Fibre Channel SAN on page 39](#)
- [Ensuring Fibre Channel Connectivity on an HP-UX Host on page 39](#)
- [Ensuring Fibre Channel Connectivity on a Windows Physical Host on page 40](#)

Ensuring Fibre Channel Connectivity to Storage (CDS only)

To check the Fibre Channel connectivity to storage:

1. Use the Actifio SARG `reportfabric` command to ensure the appliance sees switches and target ports.
2. Use the Actifio SARG `reportmdiskspace` command to check that the appliance sees LUNs.

Note: The **SARG User Guide** is in your Actifio Documentation Library and online at ActifioNOW.

Fibre Channel Zoning between ESX Servers and CDS Appliances

When performing a mount to a VM, VDP can present the disks for the mount either over iSCSI to the VMkernel port of the ESX Server, or over Fibre Channel to the Fibre Channel ports of an ESX Server(s). If your ESX Servers have Fibre Channel adapters, it makes sense to allow mount traffic to travel over the Fibre Channel SAN.

To achieve this you must pre-zone your ESX HBA ports to the Actifio Appliance HBA ports:

1. Zone every ESX FC port to every Actifio Fibre Channel port.
2. Define the vCenter server to the Actifio Appliance and perform discovery. VDP will match the ESX ports zoned over FC to the ESX Servers learned through VMware discovery.

If you zone the ESX servers to VDP *after* VMware discovery has been performed, you may need to manually add the WWPNs to each ESX host listed in the Hosts section of Domain Manager. Find the HBA ports for each server from the WWPN dropdown and select the correct WWPNs for that server.

When VDP performs a VMware snapshot, traffic will either flow over the LAN (from the ESX Server VMkernel port to VDP) or over the SAN (from the backend storage hosting the datastores to the CDS Appliances). This means that snapshots will run even if no zoning exists between Actifio CDS Appliance and the ESX Servers.

VMware Multipathing

VDP Fibre Channel ports are automatically assigned the correct VMware multipathing options (known as a Storage Array Type Plugin or SATP). No manual configuration is required.

Ensuring Fibre Channel Connectivity to a Linux Host

If an application is running on a physical server where Fibre Channel is used, then zoning must exist between the appliance and the host, and an Actifio-approved multipath driver must be in use.

Zoning for CDX Appliances

For best results, use single-initiator, single-target zoning for all CDX appliances, their hosts, and their storage.

Host Zoning

When adding a new host that is accessed via Fibre Channel SAN, the new host must be zoned to the Actifio Appliance by your storage administrator. The storage administrator will need to know the host WWN.

To find the WWN of a Linux host on a Fibre Channel SAN:

```
[root@cs003-u34 ~]# cat /sys/class/scsi_host/host*/device/fc_host/host*/node_name
0x200000e08b127a8e
0x200100e08b327a8e
```

Multipathing

Proper multipathing is especially important for maintaining application-aware mounts over a system restart. These are the currently supported multipathing options:

- IBM System Storage Multipath Subsystem Device Driver (SDD)
- Symantec/Veritas Volume Manager 5.1, 6.0, 6.0.1, 6.1
- PVLinks for HP-UX (pre 11.31 v1), HP-UX native
- MPIO for Windows and IBM AIX
- MPxIO for Solaris
- Native VMware multipathing driver for VMware ESX 4.X and later
- Native multipathing drivers for OpenVMS and Linux(DM-MPIO)

If the Linux host has two HBA ports (two WWPNs) and each is zoned to one port on Actifio Node 1 and one port on Actifio Node 2, then that host will have four paths; the recommended configuration. Don't use more than eight paths.

Linux systems employ a multipath.conf file at `/etc/multipath.conf`. For each Linux distribution and releases within a distribution, refer to the default settings:

- Red Hat Linux: `/usr/share/doc/device-mapper-multipath.*`
- Novell SuSE Linux: `/usr/share/doc/packages/multipath-tools`

Include in `/etc/multipath.conf` the information in the tables below that corresponds to the Linux version on the host that you are configuring. Ensure that the entries added to multipath.conf match the format and syntax for the required Linux distribution. Use the multipath.conf only from your related distribution and release. Do not copy the multipath.conf file from one distribution or release to another.

[Linux Multipathing Requirements on Actifio CDS Firmware 7.3.0](#) on page 33

[Linux Multipathing Requirements on Actifio CDS Firmware 7.8.1](#) on page 34

[Linux Multipathing Requirements for an Actifio CDX Appliance](#) on page 35

Linux Multipathing Requirements on Actifio CDS Firmware 7.3.0

Red Hat Linux	SuSE Linux
<p>RHEL Versions 5.x, 6.0 and 6.1</p> <pre> vendor "IBM" product "2145" path_grouping_policy "group_by_prio" path_selector "round-robin 0" prio "alua" path_checker "tur" failback "immediate" no_path_retry 5 rr_weight uniform rr_min_io 1000 dev_loss_tmo 120 </pre>	<p>SuSE Linux Versions 10.x, 11.0, and 11SP1</p> <pre> vendor "IBM" product "2145" path_grouping_policy "group_by_prio" path_selector "round-robin 0" prio "alua" path_checker "tur" failback "immediate" no_path_retry 5 rr_weight uniform rr_min_io 1000 dev_loss_tmo 120 </pre>
<p>RHEL Versions 6.2 and higher and 7.x</p> <pre> vendor "IBM" product "2145" path_grouping_policy "group_by_prio" path_selector "round-robin 0" # path_selector "service-time 0" # Used by RedHat 7.x prio "alua" path_checker "tur" failback "immediate" no_path_retry 5 rr_weight uniform rr_min_io_rq "1" dev_loss_tmo 120 </pre>	<p>SUSE Linux versions 11SP.2 and higher</p> <pre> vendor "IBM" product "2145" path_grouping_policy "group_by_prio" path_selector "round-robin 0" # Used by SLES 11 SP2 # path_selector "service-time 0" # Used by SLES 11 SP3+ prio "alua" path_checker "tur" failback "immediate" no_path_retry 5 rr_weight uniform rr_min_io_rq "1" dev_loss_tmo 120 </pre>

Linux Multipathing Requirements on Actifio CDS Firmware 7.8.1

Red Hat Linux	SuSE Linux
<p>RHEL Versions 5.x, 6.0 and 6.1</p> <pre> vendor "IBM" product "2145" path_grouping_policy "group_by_prio" path_selector "round-robin 0" prio_callout "/sbin/mpath_prio_alsa /dev/ %n" #Used by Red Hat 5.x prio "alsa" path_checker "tur" failback "immediate" no_path_retry 5 rr_weight uniform rr_min_io 1000 dev_loss_tmo 120 </pre>	<p>SUSE Linux Versions 10.x, 11.0, and 11SP1</p> <pre> vendor "IBM" product "2145" path_grouping_policy "group_by_prio" path_selector "round-robin 0" prio "alsa" path_checker "tur" failback "immediate" no_path_retry 5 rr_weight uniform rr_min_io 1000 dev_loss_tmo 120 </pre>
<p>RHEL Versions 6.2 and higher</p> <pre> vendor "IBM" product "2145" path_grouping_policy "group_by_prio" path_selector "round-robin 0" # Used by Red Hat 6.2 prio "alsa" path_checker "tur" failback "immediate" no_path_retry 5 rr_weight uniform rr_min_io_rq "1" dev_loss_tmo 120 </pre>	<p>SUSE Linux versions 11SP2</p> <pre> vendor "IBM" product "2145" path_grouping_policy "group_by_prio" path_selector "round-robin 0" # Used by SLES 11 SP2 prio "alsa" path_checker "tur" failback "immediate" no_path_retry 5 rr_weight uniform rr_min_io_rq "1" dev_loss_tmo 120 </pre>
<p>RHEL Versions 7.x</p> <pre> vendor "IBM" product "2145" path_grouping_policy "group_by_prio" path_selector "round-robin 0" prio "alsa" path_checker "tur" failback "immediate" no_path_retry 5 rr_weight uniform rr_min_io 1000 dev_loss_tmo 120 </pre>	<p>SUSE Linux Versions 11SP3+</p> <pre> vendor "IBM" product "2145" path_grouping_policy "group_by_prio" path_selector "service-time 0" # Used by SLES 11 SP3+ prio "alsa" path_checker "tur" failback "immediate" no_path_retry 5 rr_weight uniform rr_min_io_rq "1" dev_loss_tmo 120 </pre>

Linux Multipathing Requirements for an Actifio CDX Appliance

Red Hat Linux

CentOS 6.x

```
devices {
    device {
        vendor "ACTIFIO"
        product "LUN0"
        path_grouping_policy group_by_prio
        detect_prio yes
        path_checker tur
        failback immediate
        no_path_retry "5"
        dev_loss_tmo 180
    }
    device {
        vendor "ACTIFIO"
        product "CDX"
        path_grouping_policy group_by_prio
        features "1 queue_if_no_path"
        detect_prio yes
        hardware_handler "1 alua"
        path_checker tur
        failback immediate
        dev_loss_tmo 180
    }
}
```

CentOS 7.x

```
devices {
    device {
        vendor "ACTIFIO"
        product "LUN0"
        path_grouping_policy group_by_prio
        detect_prio yes
        path_checker tur
        failback immediate
        no_path_retry "5"
        dev_loss_tmo 180
    }
    device {
        vendor "ACTIFIO"
        product "CDX"
        path_grouping_policy group_by_prio
        features "1 queue_if_no_path"
        detect_prio yes
        hardware_handler "1 alua"
        path_checker tur
        failback immediate
        dev_loss_tmo 180
    }
}
```

Ensuring Fibre Channel Connectivity on an IBM AIX Host

The Actifio Appliance must be able to communicate with the Actifio Connector running on the host. This section includes:

[Supported AIX Fibre Channel Configurations](#) on page 36

[Connecting to an AIX Host over Fibre Channel SAN](#) on page 37

Supported AIX Fibre Channel Configurations

These common AIX configurations can be protected by VDP.

Physical Machine: All hardware on the server is dedicated to a single LPAR and no virtualization is involved. LUN presentation to this environment is directly to the HBAs in the physical machine (assuming storage is presented via Fibre Channel).

Note: VDP can protect and recover in-band physical machine configurations via Fibre Channel or iSCSI including the rootvg of the host in a bootable state. This can be accomplished in both a crash-consistent or application-consistent state.

LPAR with Dedicated FC HBAs: A physical server has multiple LPARs. Each LPAR has dedicated access to one or more physical HBAs while sharing other resources like CPU and memory with other LPARs. This provides better total use of your environment than physical machines with some virtualization. LUN presentation within this environment is typically directly through a dedicated HBA (assuming storage is presented via Fibre Channel).

Note: VDP can protect and recover in-band dedicated LPAR configurations both via Fibre Channel and iSCSI in a crash-consistent or application-consistent state. VDP can also protect the rootvg in a bootable state.

LPAR with NPIV mapping: The LPAR has one or more dedicated virtual HBAs assigned to it through a VIO server. The virtual HBAs have unique WWPNs through the mechanism of NPIV. With this methodology, all resources are managed by the HMC, by the VIO server, or by both. Each LPAR has a representation of WWPNs as if the host had physical HBAs.

Note: VDP can protect and recover in-band NPIV environments including the rootvg of an LPAR in a bootable state.

These hosts can be added as physical hosts, but storage ports need to be configured for them; see [Configuring Storage over Fibre Channel for AIX Hosts](#) on page 38.

LPAR with vSCSI mapping: You can also add LPARs with vSCSI mapping on VIO servers. These are described in [Ensuring vSCSI Connectivity on an IBM HMC Host](#) on page 27.

Connecting to an AIX Host over Fibre Channel SAN

Fibre Channel connectivity provides the best performance. It can be used by physical hosts, dedicated LPAR hosts, and LPAR hosts with NPIV mapping. Fibre channel is not available for LPAR hosts with vSCSI mapping.

AutoconfigSanports option would make the best possible attempts to automatically configure storage ports.

Note: *It is also possible to also present the staging disk to a VM using NPIV with Fibre Channel, but this is normally not necessary.*

Host Zoning and MPIO

A physical host connected via Fibre Channel requires zoning must between the CDS Appliance and the host, and the path control module (PCM) in use must be AIXPCM (preferred) or IBM SDDPCM.

Note: *IBM SDD is not supported. For best results, use a native host MPIO.*

Set the MPIO path health checker to `hcheck_mode = nonactive`.

Define a total of four paths (this is both the minimum and recommended number) or at most eight paths (absolute maximum) between the CDS Appliance and the AIX host.

If the AIX host has two HBA ports (two WWNs) and each is zoned to one port on Actifio Node 1 and one port on Actifio Node 2, then that host will have four paths; this is the recommended configuration. Do not use more than eight paths.

When adding a new host that is accessed via Fibre Channel SAN, the new host must be zoned to the Actifio Appliance by your storage administrator. The storage administrator will need to know the host WWN.

To find the WWN of an AIX host on a Fibre Channel SAN:

```
bash-4.2# lsdev -Cc adapter | grep -i Fibre|cut -d " " -f 1| while read fc;do lscfg -v spl
$fc |grep Z8;done
Device Specific.(Z8).....C050760782FD002E
Device Specific.(Z8).....C050760782FD0030
```

If you are using SDDPCM then you can validate:

- adapter status using `pcmpath query adapter`
- device status using `pcmpath query device`
- path count using `pcmpath query device` or the AIX MPIO command `lspath`

Time out policy

Recent technology levels of AIX include a `timeout_policy` attribute for some devices. This attribute indicates the action that the path control module should take when a command timeout occurs (when an I/O operation fails to complete within the `rw_timeout` value on the disk). There are three possible values for `timeout_policy`.

timeout_policy = retry_path: This represents the legacy behavior, where a command may be retried on the same path that just experienced a command timeout. This is likely to lead to delays in the I/O recovery, as it is likely that the command will continue to fail on this path. Only after several consecutive failures, will AIX fail the path and try the I/O on an alternate path.

timeout_policy = fail_path: This setting causes AIX to fail the path after a single command timeout, assuming that the device has at least one other path that is not in the failed state. Failing the path forces the I/O to be retried on a different path. This can lead to much quicker recovery from a command time out and also much quicker detection of situations where all paths to a device have failed. A path that is failed due to timeout policy can later be recovered by the AIX health check commands. However, AIX avoids using the path for user I/O for a period of time after it recovers to help ensure that the path is not experiencing repeated failures. (Other PCMs might not implement this grace period.) This is the recommended setting.

timeout_policy = disable_path: This setting causes the path to be disabled. A disabled path is only recovered by manual user intervention using the `chpath` command to re-enable the path.

Configuring Storage over Fibre Channel for AIX Hosts

To configure storage for AIX hosts accessed over Fibre Channel, see [Assigning VDisks for the Host Copy Data \(In-Band only\)](#) on page 2 of ***Connecting Hosts to Actifio Appliances***.

Ensuring Connectivity on a Solaris Host over Fibre Channel SAN

Define a total of four paths (this is both the recommended minimum and maximum) or at most eight paths (absolute maximum) between the CDS Appliance and the Solaris host. If the Solaris host has two HBA ports (two WWNs) each zoned to one port on Actifio Node 1 and one port on Actifio Node 2, then that host will have four paths; this is the recommended configuration. Do not use more than eight paths.

When adding a new host that is accessed via Fibre Channel SAN, the new host must be zoned to the Actifio Appliance by your storage administrator. The storage administrator will need to know the host WWN.

To find the WWN of a Solaris host on a Fibre Channel SAN:

```
-bash-4.1# fcinfo hba-port | grep HBA  
HBA Port WWN: 2100001b328179fe  
HBA Port WWN: 2101001b32a179fe
```

Note: *Proper multipathing is especially important for maintaining application-aware mounts over a system restart.*

Ensuring Fibre Channel Connectivity on an HP-UX Host

When adding a host that is accessed via Fibre Channel SAN, the new host must be zoned to the Actifio Appliance by your storage administrator. The storage administrator will need to know the host WWPN.

Define a total of four paths (this is both the minimum and recommended number) or at most eight paths (absolute maximum) between the CDS Appliance and the AIX host.

If the HP-UX host has two HBA ports (two WWPNs) and each is zoned to one port on Actifio Node 1 and one port on Actifio Node 2, then the host will have four paths; this is the recommended configuration.

Ensuring Fibre Channel Connectivity on a Windows Physical Host

Windows Server hosts include Microsoft SQL Server, SharePoint, and Exchange hosts, as well as Active Directory, CIFS, and other file systems.

When adding a new host that is accessed via Fibre Channel SAN, the new host must be zoned to the Actifio Appliance using an Actifio-approved multipath driver by your storage administrator. The storage administrator will need to know the host WWN; procedures to find WWN on three common Windows servers are below.

Zoning for CDX Appliances

For best results, use single-initiator, single-target zoning for all CDX appliances, their hosts, and their storage.

Multipathing

Define a total of four paths (this is both the recommended minimum and maximum) or at most eight paths (absolute maximum) between the CDS Appliance and the Windows host.

Note: Proper multipathing is especially important for maintaining application-aware mounts over a system restart. Multiple different multipathing systems on a single HBA can result in hard-to-identify conflicts.

If the Windows host has two HBA ports (two WWPNs) and each is zoned to one port on Actifio Node 1 and one port on Actifio Node 2, then that host has four paths; this is the recommended configuration. Do not use more than eight paths. When you discover the WWPN, make a note of it. You will use it when you add the host.

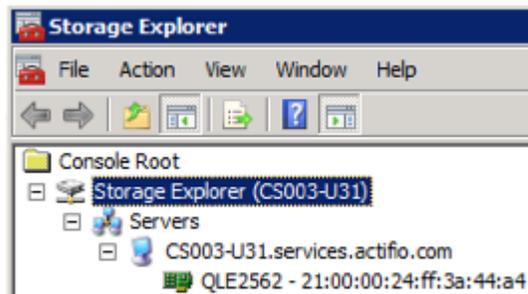
Connecting to a Windows Server 2003 Host over Fibre Channel SAN

To find the WWN of a Windows Server 2003 host, use Microsoft's fcinfo (Fibre Channel Information Tool) utility:

<http://www.microsoft.com/en-us/download/details.aspx?id=17530>

Connecting to a Windows Server 2008 Host over Fibre Channel SAN

To find the WWN of a Windows Server 2008 host on a Fibre Channel SAN, use Windows Storage Explorer:



Using Windows Storage Explorer

Connecting to a Windows Server 2012 Host over Fibre Channel SAN

To find the WWN of a Windows Server 2012 host, use PowerShell to perform `Get-InitiatorPort`.

Installing IBM SDDDSM for In-Band Storage

If you are using in-band storage, then multipathing requires IBM SDDDSM. To install SDDDSM:

1. Download SDDDSM from <http://www-01.ibm.com/support/docview.wss?uid=ssg1S4000350> and unzip it.
2. From a command prompt with Administrative privileges, run `setup.exe`.
3. Restart the machine.
4. Verify SDDDSM is installed successfully by running `datapath query version`.

6 NFS Connectivity (Sky only)

Network File System (NFS) is a distributed file system protocol originally developed by Sun Microsystems allowing a user on a client computer to access files over a computer network much like local storage is accessed. Actifio supports NFS protocol in VMware, Linux, and Solaris environments.

Limitations

- Only NFSv3 is supported.
- System state captured with staging disk preference set to NFS are ineligible for Actifio Cloud Mobility.
- Cross platform presentation of Oracle images captured over NFS is not supported. For example, Oracle data captured from a Solaris system cannot be presented on a Linux system.
- Oracle databases captured as ASM Disk over NFS cannot be mounted as Standalone ASM or as ASM RAC.

Before You Begin

Actifio supports NFS protocol for capturing and presenting data. There are three deployment configurations:

- Using NFS to present a staging disk as a NFS share to a Linux/Solaris host
- Presenting any backups to VMware hosts via a NFS datastore
- Presenting staging disk for connector based data capture within VMware virtual machine

In the first case, the staging disk is presented as a NFS file share directly to the production host.

In the other two cases, the mount disk/staging disk is presented as a VMDK to VMware virtual machine. Note that the data is not copied to the NFS datastore; a stub file is created that presents the underlying block disk from Sky to the VM as a vmdk via the NFS datastore.

Ensuring NFS Connectivity in a VMware Environment

Actifio supports data capture and presentation to VMware environments over NFS protocol. Please ensure IP connectivity exists between Sky and the ESX servers within your VMware environment.

NFS connectivity is supported on these and later ESXi versions:

- 5.5.0, 1331820
- 6.0.0, 3620759
- 5.1.0, 1483097
- 6.5.0, 10719125
- 6.5.0 Update 1 (Build 5969303)

Ensuring NFS Connectivity in a Linux Environment

The Actifio Appliance must be able to communicate with the Actifio Connector on the host over an IP network. See ***Connecting Hosts to Actifio Appliances*** for details.

Ensuring NFS Connectivity in an Oracle Sun Solaris Environment

The Actifio Appliance must be able to communicate with the Actifio Connector on the host over an IP network.

These two packages must be installed on each host:

- nfs-utils
- nfs-utils-lib

For Oracle Databases in a Solaris Environment, Local Zones, the Actifio Connector and an NFS client must be running in the Local Zones, and the local zone IP must be added as a physical host (Generic) to the appliance in the AGM Domain Manager.

Use the staging disk preference NFS from AGM, or set this using `udtask chost -diskpref "NFS" <hostid>` from the CLI. NFS staging disks get mounted on the appliance and exported as an NFS share to the Host/Zones.

For more information, refer to the ***Oracle DBA's Guide to Actifio Copy Data Management*** and ***Connecting Hosts to Actifio Appliances***.

7 Configuring External Snapshot Pools for a Sky Appliance

This chapter details:

[Prerequisites for an External Snapshot Pool Deployment](#) on page 44

[Adding an External Storage Array](#) on page 45

[Adding an External Snapshot Pool](#) on page 46

[Adding New Hosts](#) on page 46

About External Snapshot Pools

Actifio Sky appliances can use storage pools on IBM Storwize and Pure Storage FlashArray storage arrays, to store Snapshot images instead of within a Sky appliance's Snapshot pool. External Snapshot Pools (ESP) enable the Sky appliance to implement very high speed backup since ESPs leverage snapshot capabilities of modern arrays, especially flash-based arrays, which can handle a very large number of snapshots with high performance and very low operational overhead. VDP can work with any host that can connect to a supported Fibre Channel and iSCSI connected external storage array. This enables the hosts to have Fibre Channel connectivity to the storage array with Sky support, which then presents a number of options for storing the backups. The Sky appliance itself connects to the external storage array using an iSCSI connection.

Backed up data can be stored in the Dedup pool of the Sky appliance or in a remote Actifio appliance where data is sent using StreamSnap or Dedup-Async replication policies and stored in a regular or external snapshot pool. You can also send the data to an OnVault pool for object storage either on premise or in a Cloud.

When the production data is not on the same array as the ESP, use the Actifio Connector to perform a full copy, and subsequently, incremental forever copies of the changed production data. The copied data is sent to the storage array and the array manages snapshots of the copied data. The Actifio Connector on the host reads data from the production array and writes changed blocks to the ESP.

There is substantial savings in storage footprint if the production data can be in the same array as the ESP (Actifio recommends you keep a separate full copy backup). This configuration enables the fastest backup of data; the storage array takes only incremental snapshots and the snapshots are faster since no unchanged blocks are copied.

The backed up data can be recovered either locally or remotely. You can, for example, instantly mount images from storage array snapshots. You can also mount local and remote dedup images via the storage array, clone OnVault images to the storage array and then mount them, and mount OnVault images directly from the Sky appliance.

In addition, data can be available to Test and Dev environments with high performance and availability of mounted images, and SmartCopy backups perform better.

Prerequisites for an External Snapshot Pool Deployment

External Snapshot pools are used to store snapshot images in IBM Storwize and Pure Storage FlashArray storage arrays instead of within a Sky appliance's Snapshot pool.

For IBM Storwize Storage Arrays

Here are the pre-requisites for a successful IBM Storwize External Snapshot Pool deployment:

- An iSCSI port configured on the SVC that can be reachable from the Sky VM.
- A dedicated empty mdiskgrp. This can be a child mdiskgrp, but it must have no VDisks in it at the time you start using it.
- A Flashcopy license on the array/SVC.
- A log-in as a privileged (admin) user with a password.
- All hosts must be Fibre Channel enabled and able to connect to Storwize. The connectivity can actually be either FC or iSCSI. For FC, this means all host (source and target) must be able to be FC zoned to Storwize.
- Actifio VDP needs to connect to both Storwize cluster IP and iSCSI IP. The VDP to Storwize connection requires iSCSI because VDP is on VMware.
- The VDP connector must be installed in all host source and target.
- Hosts you intend to protect should be defined and connected as Hosts to the Storage Array.

For Pure Storage FlashArray Storage Arrays

Here are the pre-requisites for a successful Pure External Snapshot Pool deployment:

- An iSCSI port configured on the SVC that can be reachable from the Sky VM.
- A log-in as a privileged (admin) user with a password.
- System clocks on the Pure storage array and the Sky appliance should be in sync. If there is more than twenty five (25) minutes discrepancy between the two, connections from the Sky appliance to the Pure storage array may fail. For existing connections, jobs may fail with errors.
- The VDP connector must be installed in all host source and target.

Adding an External Storage Array

Before you add an external storage array, go through the following check list:

- AGM must be managing at least one Sky appliance. CDS appliances are not supported at this time.
- You need administrator credentials for the storage array and the IP Address or FQDN (fully qualified domain name) of the storage array.
- For an IBM Storwize (v3700, v5000, v7000, SVC) storage array:
 - o The storage array administrator has provisioned an empty mdiskpool for use by the Sky appliance.
 - o VDP needs to connect to both Storwize cluster IP and iSCSI IP

To add an external storage array:

1. In the AGM Domain Manager, click **Storage Arrays**. The Storage Array page opens.
2. Click **Add Storage Array**.
3. In **Name**, add a descriptive name for the external storage array. This is the name that will get used on both the AGM and the Sky appliance(s). It does not need to match any name on the storage array itself.
4. In **IP/FQDN**, add the IP address or the fully qualified domain name (array.thiscompany.com) of the external storage array.
5. From the **Storage Array Type** drop-down, select either Pure Storage FlashArray or IBM Storwize.
6. In **Username** and **Password**, enter login credentials of the administrator account on the storage array.

Note: The Pound Sterling character (£) is not supported for passwords.

7. In the **Select Appliance** section, select one or more Sky appliances.
8. Click **Test Connectivity** to check connection to the appliance(s). If the test succeeds but the pool is not created, see [If Test Connectivity succeeds but no pool is created](#) below.
9. Expand the Organizations menu and select the Users/Groups/Organizations to associate with this array. The Users/Groups/Organizations that you do not select will be restricted from using the array.

If you do not select any specific Users/Groups/Organizations, the storage array and its associated pools will be available to all AGM users.
10. Click **Save** to create the array.

The newly created array will be listed in the Storage Array page. You will see the array name and other properties.

Note: Future pool expansion on a Storwize ESP pool must be done on the Storwize array. VDP will detect this expansion automatically

Note: For an IBM Storwize storage array you will see a newly created username for each Sky appliance to use with the array. These have the pattern 'act' followed by a 10-digit number (for example: act1415066080). Manipulations of snapshots and images on the array by Sky will appear in the Storwize Audit Log using this act-<number> username.

If Test Connectivity succeeds but no pool is created

If Test Connectivity succeeds, but fails to create the storage pool for Pure Storage FlashArray, or fails to create either the storage array or the external snapshot pools for IBM Storwize, then check the iSCSI network connection between the Sky appliance and the storage array. Test Connectivity checks only the connectivity with the management IP(s) of the array and not the iSCSI network, which may be on a separate network.

Adding an External Snapshot Pool

Once you have created an external storage array, it is necessary to specify which pool on that array will be used as an External Snapshot Pool for an Sky appliance.

Adding an External Snapshot Pool to an IBM Storwize array

The pool that you choose on the IBM Storwize array must be empty. Each pool should be used with only one appliance, if you have more than one appliance using an IBM Storwize array, each appliance should have it's own pool.

To add an External Snapshot pool to an IBM Storwize array:

1. In the AGM Domain Manager, click **Storage Pools**. The Storage Pool page opens listing all storage pools on different appliances managed by AGM.
2. Click **Add External Snapshot Pool**. The Add External Pool page opens. This is visible only after you have created at least one IBM Storwize array.
3. From the **Choose Storage Array** drop-down, select an array. Only IBM Storwize arrays are listed in this drop-down.
4. In **Pool Name**, add a descriptive name for the External Snapshot Pool.
5. From the **Choose Appliance** drop-down, select the appliances that should use the External Snapshot Pool.
6. In the **Choose IBM Storwize Pool** section, select a pool. You can use the search box to look for a specific pool by name. (The pools listed in this section are empty pools.)
7. In the **Threshold Monitor** section:
 - o Use the slider to set the Warning level. The default Warning level is 80%. When this level is exceeded, you see warnings.
 - o Use the slider to set Safe Mode to an appropriate level of usage. The default value is 90%. When this value is exceeded, the Sky appliance stops writing to storage and jobs fail.
8. Expand the Organizations menu and select the Users/Groups/Organizations to associate with this pool. If you do not select any specific Users/Groups/Organizations, the pool will be available to all AGM users.
9. Click **Save** to create the External Snapshot Pool. The newly created pool will be listed in the Storage Pools page with Type *Ext Snapshot*.

Configuring an External Snapshot Pool on a Pure Storage FlashArray

The Pure Storage FlashArray doesn't have a Pool virtualization concept. Sky supports this by displaying the used and available space on the entire PureStorage Flasharray as it is presented to the Storage Administrator on the array itself. There is no need to provision a distinct pool within the array for use.

In the Threshold Monitor section:

- o Use the slider to set the Warning level. The default Warning level is 80%. When this level is exceeded, you see warnings.
- o Use the slider to set Safe Mode to an appropriate level of usage. The default value is 90%. When this value is exceeded, the Sky appliance stops writing to storage.

Adding New Hosts

If you create a host on the storage array after configuring the storage array as an ESP, the new hosts cannot complete snapshots until the next scan for new host data is complete.

Scanning the array for the host data is triggered:

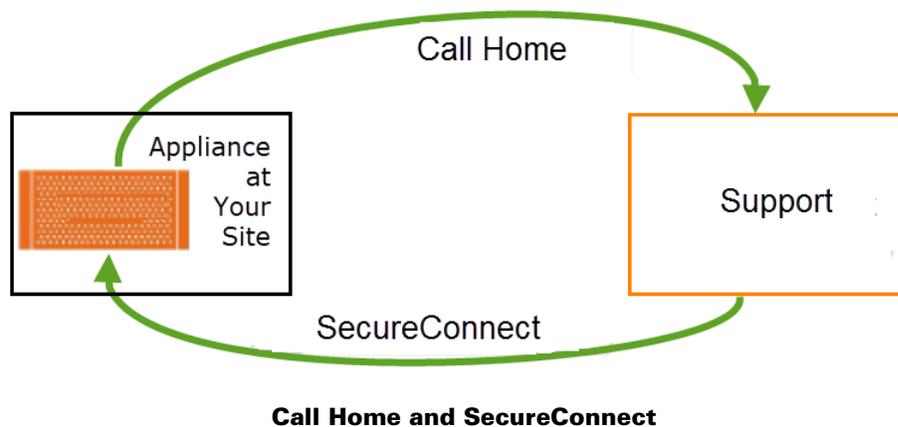
- When the array is added to the appliance
- When a host is created on the appliance
- Daily, at midnight.

8 Actifio Remote Support

Actifio offers two optional remote support features:

Call Home remote event notification: When you enable the Call Home feature, your Actifio Appliance sends alerts and other diagnostic data to Actifio. Actifio Customer Support engineers monitor system alerts and conduct impact assessments. Based upon the alert level, the system may even initiate a problem resolution case and an associated escalation plan for you. Actifio Call Home is detailed in [Actifio Call Home Remote Event Notification](#).

SecureConnect remote service access: When you enable SecureConnect, Actifio Customer Support engineers can access your system remotely on an as-needed basis. As a situation requires, they can manage major upgrades and service pack updates and hotfixes, phase out failing hardware, collect log data on history of failures, restart data and I/O modules, change the configuration of ports, and more. All actions are documented in the VDP audit log and in the Actifio installation/problem reporting databases for further review. Actifio SecureConnect is detailed in [Actifio SecureConnect](#) on page 49.



Actifio Call Home Remote Event Notification

Actifio Call Home sends an email to Actifio Customer Support every six hours. In the event of a problem, Actifio Support can refer to this information to minimize time to recovery. The email includes these statistics:

- VDP version information
- Uptime of the Actifio Appliance
- Status check of services
- Process summary
- Logs of various processes
- Failed jobs and total jobs
- Storage pool and deduplication statistics

Actifio Customer Support engineers monitor system alerts and conduct impact assessments. Based upon the alert level, the system may even initiate a problem resolution case and an associated escalation plan for you.

As of v9.0 release, Actifio is offering customers an optional HTTPS Call Home capability that enables the Customer Success team to proactively identify and remediate potential issues. It can also be used to generate the Insight reports available through ActifioNOW. In prior releases, the Actifio Call Home data could only be sent using email over SMTP. The HTTPS transport is often more reliable and simpler to configure than SMTP.

Can I Enable Call Home Without Enabling SecureConnect?

Yes. Call Home provides data, and SecureConnect provides access. Enabling Call Home without enabling SecureConnect ensures that Actifio Customer Support has excellent monitoring, alerting, and analytics data, without the access that might be needed to perform further diagnostics or remediation. The data lets Actifio Customer Support know when a problem has occurred and prepare a response if needed, but investigation and troubleshooting has to be performed via WebEx or conference call.

Most investigations require additional data to be gathered from the appliance, and without SecureConnect, the cycle of gather-analyze-followup-analyze can become cumbersome.

Call-Home Network Requirements

Actifio Call Home uses HTTPS or SMTP. The port numbers for these configurations will depend on your own network setup. The default port numbers are: 25 for SMTP, 443 for HTTPS.

Note: Access to the Call Home web site <https://callhome.actifio.net> should never be blocked by your firewall.

An Actifio Administrator must configure the Actifio Appliance to communicate with an SMTP/HTTPS/proxy server as detailed in **Configuring Actifio Event Alerting**.

Configuring Actifio Call Home

To send Actifio Appliance statistics to **Configuring Actifio Event Alerting** Support every 6 hours, refer to the AGM online help, reachable from the ? icon in the top right corner of the AGM.

Actifio SecureConnect

Actifio SecureConnect is a secure method for remote support that employs dedicated ports and encrypted data. These built-in security features greatly reduce the risks associated with a connection to an external network. The SecureConnect protocol allows Actifio Customer Support engineers to access your system on an as-needed basis to manage cases and updates while meeting your SLA requirements.

Your Actifio account team is kept up to date on a repair status as the case progresses. If hardware replacement is required, parts & local support are shipped to the site and an Actifio Services engineer is dispatched to handle the installation. When the incident is resolved to your satisfaction, the Actifio Customer Support engineer logs out of your Actifio Appliance, disconnects from the remote access line, and creates a summary report of problem root cause and repair actions that is delivered to your account team and to you.

Advantages to using Actifio SecureConnect include:

- **Accelerated problem solving:** By leveraging Actifio follow-the-sun support, you can resolve problems without extending the wait time that invariably gets generated by relying on log files, dumps, and traces being transmitted across the globe.
- **Fine-grained monitoring and collaboration:** You can monitor remote support activities and join in conference calls with Actifio Customer Support engineers as the problem determination process proceeds.
- **Real-time learning:** Remote Actifio Customer Support engineers provide you with ongoing assistance in the setup, configuration, and management of your Actifio Appliances.

Without SecureConnect enabled, you can still contact Actifio Customer Support. Actifio support engineers can work with you via WebEx and other remote support tools for log file gathering and other forensics to help resolve the issue.

Can I Enable SecureConnect Without Enabling Call Home?

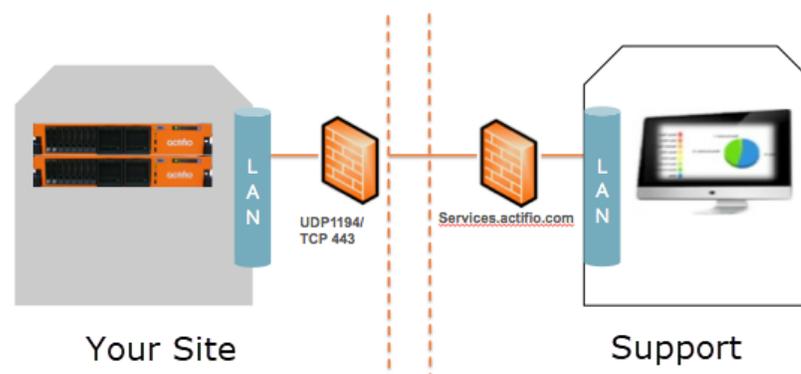
Yes. Call Home provides data, and SecureConnect provides access. Enabling SecureConnect without enabling Call Home allows Actifio Customer Support engineers to respond and investigate issues after you tell us a problem exists. Without Call Home, Actifio Customer Support has no way to know of problems with your system. There is no proactive data collection associated with activating SecureConnect.

How SecureConnect Works

SecureConnect uses client/server architecture. The SecureConnect client comes built into your Actifio Appliances, to be enabled and disabled by you.

After you enable the connection through the Actifio Desktop, your Actifio Appliance establishes a secure point-to-point connection to a secure server at the Actifio Global Support Center, enabling remote access from the Actifio Global Support Center to your Actifio Appliance. You must configure a firewall rule to allow the Actifio Appliance to connect over UDP on port 1194.

As a client connection, SecureConnect does not bridge networks or perform any form of routing. Connections initiated at the Actifio Global Support Center communicate with your Actifio Appliance and no other systems on your network.



How Secure Is Actifio SecureConnect?

SecureConnect utilizes 2048-bit RSA cryptography for strong mutual authentication and encryption, 256-bit AES for encryption of data in flight, and Diffie-Hellman for Perfect Forward Secrecy (PFS) key exchange. Each connection is a point-to-point link and none of your equipment can access another endpoint. Intrusion detection software continually monitors the connection for any anomalous activity. Authentication records are replicated in real-time to off-site locations. The SecureConnect servers are routinely monitored for emerging threats and vulnerabilities.

Only select users within the support and engineering organizations are authorized with this level of access. Actifio employees who have a business need to access your systems must pass a third-party background check and sign a security, compliance, and confidentiality agreement. Access is reviewed annually and terminated immediately in the event of separation or role change. Authorized employees authenticate to SecureConnect with a 2048-bit X.509 certificate stamped with the identity of the user. A two-factor challenge is required after cryptographic authentication in the form of a smart phone push or code-generating token. The certificate must be renewed annually. Issuance is logged to an audit log, and all activities on a system while logged in using the certificate are logged along with the identity of the user. The VPN connection is protected using NIST-approved strong cryptography including AES-256 data encryption.

No Access to Your Business Data

Appliance service credentials are completely independent from SecureConnect and are generated on entirely separate systems. To gain access to a customer system, an Actifio Support staff member generates a time-limited, passphrase-protected authentication token which is locked specifically to the machine they have been granted access to log into. The system generating these tokens is on a secure network separate from the SecureConnect network and itself authenticates against a robust corporate directory. The ability to generate authentication tokens is limited to Actifio Support staff members who have been approved by a rigorous screening process.

Actifio SecureConnect Network Requirements

Actifio SecureConnect is a strong 2048-bit RSA mutually authenticated service not subject to redirection or man-in-the-middle attacks. SecureConnect requires a UDP connection over port 1194 **from** the Actifio Appliance IP address **to** secureconnect2.actifio.com and a setting of "any" IP address. If you cannot use 'any', then contact Actifio Support.

Actifio Appliance IP Address depends on the type of appliance:

Actifio Sky Appliance: the Actifio Appliance IP is the IP address of the Sky Appliance.

Actifio CDX Appliance: the Actifio Appliance IP must include the IP addresses for Node 0 and Node 1.

Actifio CDS Appliance: the Actifio Appliance IP must include the IP addresses for the CDS node.

Enabling Actifio SecureConnect

To enable SecureConnect mode, refer to the AGM online help, reachable from the ? icon in the top right corner of the AGM.

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