CONTENTS

Overview  1-1
  Product Description  1-1
    Gateway Function  1-1
    Feature Summary  1-1

Deployment  2-1
  Hardware Prerequisites  2-1
  Software Prerequisites  2-1
  Deploy the FSGW OVA  2-2
  Configure FSGW on the COS PAM and Tenant PAM  2-3
  Adding a Cache and Log to a Zpool (Optional)  2-4

Operation and Routine Maintenance  3-1
  Configuration Using the Tenant PAM GUI  3-1
    Creating or Updating a COS Device Pool  3-2
  Checking Statistics on the Tenant PAM  3-5
  Configuration Using the CLI  3-7
  Recommended Routine Maintenance  3-8
    Daily Tasks  3-8
    Weekly Tasks  3-8
  File Locations  3-8

Troubleshooting  4-1
  Modules are Loaded Properly  4-1
  Configuring Support to Add or Delete a Container  4-1
  Reading or Writing to a Pool  4-2
Preface

This preface describes who should read the *Cisco COS Filesystem Gateway Release 1.2 User Guide*, how it is organized, and its document conventions. It contains the following sections:

- **Audience**, page v
- **Document Organization**, page v
- **Document Conventions**, page vi
- **Related Publications**, page vii
- **Obtaining Documentation and Submitting a Service Request**, page vii

Audience

This guide is for networking professionals managing the Cloud Object Storage (COS) product and its Filesystem Gateway (FSGW) option. Before using this guide, you should have experience working with Linux platforms and be familiar with the concepts and terminology of Ethernet, local area networking, clustering and high-availability, and network services such as DNS and NTP.

Document Organization

This document contains the following chapters and appendices:

<table>
<thead>
<tr>
<th>Chapters or Appendices</th>
<th>Descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter 1, “Overview”</td>
<td>Briefly describes the FSGW product, its function, and its key features.</td>
</tr>
<tr>
<td>Chapter 2, “Deployment”</td>
<td>Provides deployment prerequisites and describes the steps to install and configure the FSGW.</td>
</tr>
<tr>
<td>Chapter 3, “Operation and Routine Maintenance”</td>
<td>Gives procedures for updating the FSGW configuration, checking FSGW statistics using the GUI or the CLI, performing routine maintenance, and checking logs.</td>
</tr>
<tr>
<td>Chapter 4, “Troubleshooting”</td>
<td>Provides tips for resolving common issues during FSGW installation and operation.</td>
</tr>
</tbody>
</table>
Document Conventions

This document uses the following conventions:

<table>
<thead>
<tr>
<th>Convention</th>
<th>Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>bold</strong> font</td>
<td>Commands and keywords and user-entered text appear in <strong>bold</strong> font.</td>
</tr>
<tr>
<td><em>italic</em> font</td>
<td>Document titles, new or emphasized terms, and arguments for which you supply values are in <em>italic</em> font.</td>
</tr>
<tr>
<td>[ ]</td>
<td>Elements in square brackets are optional.</td>
</tr>
<tr>
<td>{ x</td>
<td>y</td>
</tr>
<tr>
<td>[ x</td>
<td>y</td>
</tr>
<tr>
<td>string</td>
<td>A nonquoted set of characters. Do not use quotation marks around the string or the string will include the quotation marks.</td>
</tr>
<tr>
<td><strong>courier</strong> font</td>
<td>Terminal sessions and information the system displays appear in <strong>courier</strong> font.</td>
</tr>
<tr>
<td>&lt; &gt;</td>
<td>Nonprinting characters such as passwords are in angle brackets.</td>
</tr>
<tr>
<td>[ ]</td>
<td>Default responses to system prompts are in square brackets.</td>
</tr>
<tr>
<td>!, #</td>
<td>An exclamation point (!) or a pound sign (#) at the beginning of a line of code indicates a comment line.</td>
</tr>
</tbody>
</table>

- **Note** Means *reader take note*. Notes contain helpful suggestions or references to material not covered in the manual.

- **Tip** Means *the following information will help you solve a problem*. The tips information might not be troubleshooting or even an action, but could be useful information, similar to a Timesaver.

- **Caution** Means *reader be careful*. In this situation, you might perform an action that could result in equipment damage or loss of data.

- **Timesaver** Means *the described action saves time*. You can save time by performing the action described in the paragraph.

- **Warning** IMPORTANT SAFETY INSTRUCTIONS

  This warning symbol means danger. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. Use the statement number provided at the end of
each warning to locate its translation in the translated safety warnings that accompanied this device.

SAVE THESE INSTRUCTIONS

---

Warning

Statements using this symbol are provided for additional information and to comply with regulatory and customer requirements.

---

Related Publications

Refer to the following documents for additional information about COS 1.2:

- Release Notes for Filesystem Gateway 1.2
- Cisco Cloud Object Storage Release 3.8.1 User Guide
- Cisco Cloud Object Storage Release 3.8.1 API Guide
- Cisco Cloud Object Storage Release 3.5.1 Troubleshooting Guide
- Cisco Media Origination System Release 2.7 User Guide
- Open Source Used in Filesystem Gateway 1.2

Obtaining Documentation and Submitting a Service Request

For information on obtaining documentation, using the Cisco Bug Search Tool (BST), submitting a service request, and gathering additional information, see What’s New in Cisco Product Documentation. To receive new and revised Cisco technical content directly to your desktop, you can subscribe to the What’s New in Cisco Product Documentation RSS feed. The RSS feeds are a free service.
Overview

Product Description

Cisco Filesystem Gateway (FSGW) for Cisco Cloud Object Storage (COS) is an available option for COS 3.8.1 and later releases. While earlier COS releases allowed access only to object storage, the FSGW option gives COS the ability to access files using Network File System (NFS) or Common Internet File System (CIFS), the two main file systems used by network attached storage (NAS).

NFS and CIFS are the client-server file systems used by the Linux and Windows operating systems, respectively. Adding FSGW enables COS to manage storage for existing Linux or Windows NAS media libraries directly, without the need to first convert these libraries to object data. For service providers with large existing media libraries, adding FGSW greatly improves COS utility and deployment speed.

Gateway Function

NAS filesystem access does not directly allow the ability to perform the random writes and rewrites that occur routinely with object storage access. Enabling COS to access NAS files means that some logical intermediation must occur to allow the NAS filesystem to perform random writes and rewrites.

FSGW serves this intermediation (gateway) function. FSGW uses the ZFS file system to perform file integrity checks, compression, per-user and per-group quotas and reporting, and construction of virtual device pools to provide resiliency. Additionally, by associating a virtual device to a COS container, FSGW can provide secure multi-tenancy using multiple filesystem gateways and COS containers.

Feature Summary

The FSGW option adds the following features and enhancements to compatible COS releases:

- NFS and CIFS access for varying workloads, including small files and media objects
- Storage throughput between 1 to 6 Gbps
- Multi-tenancy and security features including administration of tenants, with the administrator having rights to only configure and administer tenant storage without access to the actual storage data, and tenants only having access to their own data
- Data resiliency with options for number of copies and choice of mirroring or erasure coding (software RAID) for storage savings, and multi-site resiliency where the number of copies is less than or equal than the number of sites
- Per-user and per-group quotas and reporting
- Ability to compress filesystem data
- Integrity checks on data retrieval
- Active Directory integration
- Ability to work with anti-virus engines
Deployment

This section provides instructions for installing and configuring FSGW Release 1.2 software:

- **Hardware Prerequisites, page 2-1**
- **Software Prerequisites, page 2-1**
- **Deploy the FSGW OVA, page 2-2**
- **Configure FSGW on the COS PAM and Tenant PAM, page 2-3**
- **Adding a Cache and Log to a Zpool (Optional), page 2-4**

### Hardware Prerequisites

FSGW Release 1.2 supports installation on any server hardware meeting the following minimum requirements:

- 8 x vCPU
- vmxnet3
- 64 GB memory
- 40 GB system disk (including log)
- 2 x 100 GB SSDs for log and cache (optional but recommended):
  - 20 GB total allocated for ZIL log
  - 180 GB total allocated for L2ARC cache
- 1 x 1G NIC for management
- 1 x 10G NIC for SMB/NFS clients
- 1 x 10G NIC for COS internal

**Note**

FSGW Release 1.2 was tested on a Cisco UCS-C Series Rack Server with 10G network adapters or a Cisco UCS-B Series Blade Server with 10G network adapters.

### Software Prerequisites

FSGW Release 1.2 has the following software prerequisites:
Deploy the FSGW OVA

The FSGW OVA is an archive file containing the FSGW virtual machine. Confirm that you have the latest OVA file (for example, cisco_cos_dev_fs_7-26.ova) before proceeding.

**Step 1** Confirm that the COS cluster, COS-PAM, Tenant-PAM, Windows AD server, NTP server, and DNS server are installed and configured correctly.

**Step 2** Log in to the ESXi host using vCenter.

**Step 3** Check the ESXi host hardware and software for the following:

- Storage – At least 300 GB free space
- Network – Three vSwitch virtual switches:
  - vSwitch0(1G) for management network
  - vSwitch1(10G) for COS data network
  - vSwitch2(10G) for client (NFS and Samba) network
- Host NTP setting

---

VMware vSphere Hypervisor 5.5.0 installed on UCS server
- Three vSwitch virtual switches vSwitch0(1G) for management network, vSwitch1 (10G) for COS data network, and vSwitch2 (10G) for client (NFS and Samba) network
- 250 GB minimum free space in Storage Datastore

**DNS server for PAM**
- Named **dns-1**
  - See the *Cisco Cloud Object Storage Release 3.8.1 User Guide* for installation instructions

**COS PAM and Tenant PAM**
- Configure COS PAM as described in Configure FSGW on the COS PAM
- Configure Tenant PAM as described in Configure FSGW on Tenant PAM
- See the *Cisco Cloud Object Storage Release 3.8.1 User Guide* for installation instructions

**COS cluster**
- See the *Cisco Cloud Object Storage Release 3.8.1 User Guide* for installation instructions

**NTP server**

**Win2008R2** for AD authentication and DNS service
- For DNS service, named as **dns-2**
- Set AD server as DNS server on FSGW to use AD authentication.
- Set AD server as DNS server in gateway resolv.conf file.
- For DNS setting, add dns forwarder as **dns-1**.

---

**Note**
The dns-2 server can resolve all dns-1 hosts.
Step 4  Deploy the FSGW OVA file and complete the following steps in the installation wizard:

a. Accept the license agreement, then click **Next**.

b. On the Name and Location page, enter the name of the VM and select its installation location, then click **Next**.

c. On the Storage page, select the storage to be used (at least 280 GB free space required), then click **Next**.

d. On the Disk Format page, choose **Thin Provision** as the disk format option, then click **Next**.

e. On the Network Mapping page, choose the corresponding network from the drop-down list, then click **Next**.

f. On the Properties page, enter the following parameters:
   - Hostname
   - System Password (enter twice to confirm)
   - COS PAM Server IP address
   - Network Time Server IP address
   - Domain Name Server IP addresses (separated by commas or spaces)

   Recheck your entries, then click **Next**.

g. On the Ready to Complete page, recheck all settings, then click **Finish**.

   **Note**  If you check **Power on after deployment**, the VM starts after you click Finish.

Step 5  Start the FSGW VM, if not started automatically through the wizard.

Step 6  Confirm that the VM is registered to the COS PAM as follows:

a. Log in to the COS Service Manager GUI as described in the *Cisco Cloud Object Storage Release 3.8.1 User Guide*.

b. Choose **Infrastructure > Storage > FSG Tenant** in the GUI navigation panel.

c. On the FSG Tenant page, open the **Filesystem Gateway Nodes** drop-down list and confirm that the name of the deployment just deployed appears in the list.

d. In the GUI navigation panel, choose **Service Domain Object > Profiles > Auth Profiles**.

e. On the Auth Profiles page, create a user account using the default name `auth-1`.

   ```
   ```

   Create a user with the default name `jdoe` and the default key `a86850deb2742ec3cb41518e26aa2d89`

   ```
   ```

---

## Configure FSGW on the COS PAM and Tenant PAM

To configure the FSG tenant on the COS and Tenant PAMs:
Step 1 Log on to the COS PAM as described in the Cisco Cloud Object Storage 3.8.1 User Guide.
Step 2 In the Service Manager GUI navigation panel, select Panel Infrastructure > Storage > FSG Tenant.
Step 3 On the FSG Tenant page, create a new tenant (or update an existing one) with the following parameters:
- **Tenant Name** – use the Tenant PAM GUI user name
- **Auth Profile** – Tenant PAM authorization profile
- **Tenant Domain** – Tenant PAM domain FQDN or IP address
- **Initial Password** – Current password for the Tenant PAM GUI
- **COS Cluster** – Cluster to which the Tenant PAM is assigned
- **FSG Nodes** – FSGW nodes of the Tenant PAM
Step 4 Find your FSG VM host, select its COS cluster, and save the configuration.
Step 5 Log in to the Tenant PAM, edit the FSGW VM configuration as described in Configuration Using the Tenant PAM GUI, page 3-1, and save the changes.
Step 6 Log in to the FSGW VM via SSH and confirm that all of these configuration settings are in effect:
- `zpool status` or `zpool list`
- `cat /etc/samba/smb.conf`
- `cat /etc/exports`
- `realm list`
Step 7 Access the FSGW shared folder using the NFS or SMB client.

---

Adding a Cache and Log to a Zpool (Optional)

FSGW Release 1.2 supports adding a Level 2 Adjustable Replacement Cache (L2ARC) virtual drive and a ZFS Intent Log (ZIL) virtual drive to a Linux Z file system (ZFS) virtual storage pool (zpool). If the node on which you install FSGW uses SSD drives, we recommend adding both a cache and a log to a zpool, as they will greatly improve performance.

To add a cache and log to a zpool:

---

Step 1 Confirm that the FSGW VM was deployed on SSD storage. See step 4c of Deploy the FSGW OVA, page 2-2.
Step 2 Confirm that the FSGW includes three virtual disks (vDisks):
- One 40 GB disk (sda) for system use
- Two 100 GB disks (sdb, sdc) for cache and logging
Step 3 Format the sdb and sdc virtual disks into two partitions, one 10 GB and the other 90 GB, to create four virtual disks total: `sdb1` and `sdc1` at 10 GB each, and `sdb2` and `sdc2` at 90 GB each.

```bash
[root@cosgateway186 ~]# fdisk -1 /dev/sdb
WARNING: fdisk support is currently new, and therefore in an experimental phase. Use at your own discretion.

Disk /dev/sdb: 107.4 GB, 107374182400 bytes, 209715200 sectors
Units = sectors of 1 * 512 = 512 bytes
```

---

Cisco COS Filesystem Gateway Release 1.2 User Guide
Adding a Cache and Log to a Zpool (Optional)

Step 4  
Use the `zpool status` command to check the current zpool status.

```
[root@cosgateway186 ~]# zpool status

pool: test
state: online
scan: none requested
config:

<table>
<thead>
<tr>
<th>NAME</th>
<th>STATE</th>
<th>READ</th>
<th>WRITE</th>
<th>CKSUM</th>
</tr>
</thead>
<tbody>
<tr>
<td>test</td>
<td>ONLINE</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>/root/mount/auth05.fsgw.com#container6</td>
<td>ONLINE</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>logs</td>
<td>ONLINE</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>mirror-1</td>
<td>ONLINE</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>sdb1</td>
<td>ONLINE</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>sdc1</td>
<td>ONLINE</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>cache</td>
<td>ONLINE</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>sdb2</td>
<td>ONLINE</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>sdc2</td>
<td>ONLINE</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

errors: No known data errors
```

Step 5  
Run the command:

```
zpool add <zpool_name> log mirror /dev/sdb1 /dev/sdc1 cache /dev/sdb2 /dev/sdc2
```

This defines sdb1 as the log mirror for sdc1, and sdb2 as the cache mirror for sdc2.
Operation and Routine Maintenance

FSGW operation and routine maintenance consists mainly of updating the FSGW node configuration as needed through the Tenant PAM GUI, and periodically monitoring FSGW node status by reviewing statistics and log files through the GUI or the FSGW CLI. This section describes both GUI and CLI operations.

- Configuration Using the Tenant PAM GUI, page 3-1
- Checking Statistics on the Tenant PAM, page 3-2
- Configuration Using the CLI, page 3-7
- Recommended Routine Maintenance, page 3-8
- File Locations, page 3-8

Configuration Using the Tenant PAM GUI

To update the FSGW node configuration, log in to the Tenant PAM GUI and navigate to Infrastructure > File System Gateway to open the File System Gateway page.

Figure 3-1 Tenant PAM GUI - File System Gateway Page

Use this page to check the configuration of the FSGW node and update the configuration as needed.
Creating or Updating a COS Device Pool

You can use the File System Gateway page to create a new COS device pool (zpool) or update an existing device pool as needed.

- To create a new device pool, click the **Add** button.
- To edit an existing device pool, highlight the pool in the list and click the **Edit** button.

The COS Device Pool(s) dialog opens as shown in the following example.

![Creating or Updating a COS Device Pool](image)

When creating a new device pool, you supply basic parameters such as pool name, pool type, pool size, and whether compression is used. When assigning a pool name, be sure to observe the following naming conventions:

- A device pool name can only contain alphanumeric characters and the following special characters:
  - Underscore
  - Hyphen
  - Colon
  - Period
- Dev pool names must begin with a letter, but with the following restrictions:
  - The beginning sequence c[0-9] is not allowed.
  - The name log is reserved.
  - A name that begins with mirror, raidz, raidz1, raidz2, raidz3, or spare is not allowed because these names are reserved.
  - Pool names must not contain a percent sign (%).

**Note**

The compression option is a zpool configuration parameter, and is set to Disabled by default. To check the current status of this option via the FSGW CLI, use the command `zfs get compression <poolname>`. 
Adding a Cluster

To add a cluster the device pool, click the **Cluster** button that is active with the device pool in Edit mode. The Cluster dialog opens as shown in the following example.

**Figure 3-3 Adding a Cluster**

Select a cluster from the drop-down list, and then click the **Add** button to add the cluster to the pool.

Updating NFS Options

To update the NFS options for the device pool, click the **NFS** button that is active with the device pool in Edit mode. The NFS Options dialog opens as shown in the following example.

**Figure 3-4 Updating NFS Options**

Change the configuration as needed, and then click **Save**.
Updating SMB Options

To update the SMB options for the device pool, click the *SMB* button that is active with the device pool in Edit mode. The SMB Options dialog opens as shown in the following example.

*Figure 3-5  Updating SMB Options*

![SMB Options Dialog](image)

Change the configuration as needed, and then click *Save*.

Updating Quotas

To update the Quotas for the device pool, click the *Quotas* button that is active with the device pool in Edit mode. The Quotas dialog opens as shown in the following example.

*Figure 3-6  Updating Quotas*

![Quotas Dialog](image)

Change the configuration as needed, and then click *Save*.

Updating Device Pool Resiliency

You can configure resiliency at the level of the device pool (via the FSGW node) or the COS cluster, or both, as best meets the needs of the deployment. Resiliency at the device pool level applies across COS clusters, while resiliency at the COS cluster level applies to the nodes in that particular COS cluster.
Note

See the *Cisco Cloud Object Storage Release 3.8.1 User Guide* for details on configuring resiliency within a COS cluster.

The Pool Resiliency section of the COS Device Pool(s) dialog lets you choose the desired type of resiliency for the device pool as well as the maximum number of failures permitted.

**Figure 3-7 Updating Device Pool Resiliency**

Choose one of the following resiliency methods:
- Mirroring – Each COS cluster has an identical copy of the data in the device pool.
- Erasure Coding – Data and parity are distributed across COS clusters using dynamic stripe width to guarantee the ability to recover both data and resiliency for up to the specified maximum failures.

Note

- With either Mirroring or Erasure Coding resiliency, the device pool must have at least two associated COS clusters.
- The number of associated COS clusters must be at least one greater than the specified Max Failures.

### Checking Statistics on the Tenant PAM

The FSG Statistics page of the FSGW SM GUI lists all existing FSGW nodes and displays a wealth of information about the Tenant PAM, including:
- Storage usage
- Bandwidth
- Operations
- COS cluster containers
Checking Statistics on the Tenant PAM

- FSG services
- Zpool status

In addition, this page displays any active alarms and their severity levels to help identify any issues with the FGSW.

To access the FSG Statistics page, open the FSGW Service Manager GUI navigation panel and choose Infrastructure > FSG Statistics. The page appears as shown in the example of Figure 3-8.

**Figure 3-8   FSG Statistics Page, Top**

The bottom of the page provides details on Cluster, Service, and Device pools, as shown in the example of Figure 3-9.

**Figure 3-9   FSG Statistics Page, Bottom**
Configuration Using the CLI

The FSGW CLI lets you check services and configuration manually. To access the CLI, log into the FSGW node of interest via SSH using the following credentials:

- Username: root
- Password: rootroot

To check the FSGW network, use `ifconfig`. For example:

```
ifconfig ens35, ens160, ens192
```

There are three network adapters on the FSGW VM: Management network, COS data network, and Client data network. Be sure that each NIC is up and running and has a valid IP address.

To test each network, use `ping <gateway>`.

To check each FSGW service, use `lsmod | grep` as follows:

```
lsmod | grep zfs
lsmod | grep cosdevfs
lsmod | grep dns_resolver
```

To check FSGW communication and configuration services:

```
systemctl status cosfsgw
systemctl status cosfsgwpam
```

To check and then test the DNS service:

```
cat /etc/resolv.conf
nslookup <cos_auth_fqdn>
```

To check the NTP configuration and status:

```
cat /etc/chrony.conf
chronyc sources
```

To check the COS container mount status:

```
ls /var/cisco/cosfsgw/mnt
cat /sys/cosdevfs/gateway_config
```

To check the zpool status:

```
zpool scrub <zpool_name>
zpool status -v
```

To check the SMB configuration and services:

```
cat /etc/samba/smb.conf
systemctl status smb
```

To check the NFS configuration and services:

```
cat /etc/exports
systemctl status nfs
```

To check the AD status:

```
realm list
```
Recommended Routine Maintenance

Daily Tasks

- Check the Tenant PAM GUI to be sure that there are no major alarms or errors displayed.
- Check the COS PAM to be sure that there are no major issues on the COS side.

Weekly Tasks

- Run the `zpool scrub <zpool_name>` CLI command on FSGW to be sure that zpool is in good state after running for a week.

File Locations

The FSGW logs are at the following locations:
- `/var/log/`
- `/var/log/cisco/cosfsgw/`

The configuration files are at the following location:
- `/etc/cisco/cosfsgw/`

Usage Example

```
[root@cosgateway_4_720 ~]# cd /etc/cisco/cosfsgw/
[root@cosgateway_4_720 cosfsgw]# ll
total 20
-rw-r--r-- 1 root root  239 Jul 20 22:03 announce.json
-rw-r--r-- 1 root root 2912 May 19 15:04 current.pam.json
-rw-r--r-- 1 root root 111 Jul 20 19:59 events_monitoring.json
-rw-r--r-- 1 root root  107 Jul 21 00:32 init.json
-rw-r--r-- 1 root root  190 Jul 18 21:03 stats_monitoring.json
```

To check the FSGW version, check the FSGW rpm as follows:

```
[root@cosgateway_4_720 ~]# rpm -qa | grep cosfsgw-aic
cosfsgw-aic-client-1.2.1-164.el7.centos.x86_64
[root@cosgateway_4_720 ~]#
```
Troubleshooting

This section identifies some common issues you may encounter with FSGW and provides suggestions for diagnosing and resolving these issues.

- Modules are Loaded Properly, page 4-1
- Configuring Support to Add or Delete a Container, page 4-1
- Reading or Writing to a Pool, page 4-2

Modules are Loaded Properly

The `zpool list` command should list the pool created. If the pool is not listed:

- Check to see if the zfs, cosdevfs, and dns_resolver modules are loaded.

  ```
  [root@cosgateway1 cosdevfs]# lsmod | grep "zfs\| dns_resolver\|cosdevfs"
  tmpfs on /run/user/0 type tmpfs (rw,nosuid,nodev,relatime,size=800768k,mode=700)
  ```

- Check to see if the cosdevfs is mounted.

  ```
  [root@cosgateway1 cosdevfs]# mount | grep cosdevfs
  cosdevfs on /home/dinesh/queue_metaslab/fs_gateway/cosdevfs/mount type cosdevfs
  (rw,relatime)
  ```

  Or, check to see if the default mount point have the following file:

  ```
  [root@cosgateway1 cosdevfs]# ls -lh ./mount/ total 0
c--x--x--x 1 root root 0, 0 Jul 19 07:28 cosdev_data
  ```

- The following message in the cosdevfs log indicates that the cosdevfs module is loaded.

  ```
  ```

Configuring Support to Add or Delete a Container

A command to add or delete a container object may result in an error message like that shown in the following example.

```
[root@cosgateway1 cosdevfs]# zpool create -f -O recordsize=2M raidtst /home/dinesh/queue_metaslab/fs_gateway/cosdevfs/mount/auth02.p2.cisco.com#donald
Cannot resolve path /home/dinesh/queue_metaslab/fs_gateway/cosdevfs/mount/auth02.p2.cisco.com#donald
```
In the example above, the error message indicates that the configuration is not added and that vdev is not available in the mount path.

A command to create or delete a container object also may result in an error message like that shown in the following example:

```
[root@cosgateway1 -]# echo "cmd:add,cluster:auth02.p2.cisco.com,container:donald,size:300,account:test:eric,key:eric" > /sys/cosdevfs/gateway_config
-bash: /sys/cosdevfs/gateway_config: No such file or directory
```

In this case, the error message indicates that the cosdevfs module is not loaded.

The following sample error message in the cosdevfs log indicates that the cosdevfs module is not mounted:

```
```

The following sample error message indicates that the authentication failed due to an invalid user account in the configuration `add` command:

```
```

The following sample error message indicates that the cluster (auth07.p7.com) is either not available or is an invalid cluster name.

```
```

The following sample error message indicates that the `add` configuration failed due to either an invalid user account, an unavailable cluster, or an invalid cluster name.

```
```

The following sample error message indicates that the add configuration was successful.

```
Jul 20 05:30:35 cosgateway1 kernel: app-name: kern.cosdevfs, thread: conf_3, desc: completed config update successfully
```

In this successful case, the mount directory will contain a file similar to the one listed below.

```
[root@cosgateway1 cosdevfs]# ls -lh ./mount/ total 0
-rwxr-xr-x 1 root root 300G Jul 20 05:30 auth02.p2.cisco.com#donald -> Container Name
```

### Reading or Writing to a Pool

For every Read or Write transaction, each thread having a BEGIN status should be associated with a COMPLETE status, as shown in the following examples.

```
Jul 20 06:00:37 cosgateway1 kernel: app-name: kern.cosdevfs, txn: WRITE, thread: IO_3_10, object: cosdevfs-obj-399360-1024, status: BEGIN, desc: Write begining
```

```
Jul 20 06:00:37 cosgateway1 kernel: app-name: kern.cosdevfs, txn: WRITE, thread: IO_3_10, object: cosdevfs-obj-399360-1024, status: COMPLETE,desc: Write completed
```

After writing data to the container, running `zpool scrub` and checking `zpool status` should result in a report of no data errors returned, as shown in the following example.
[root@cosgateway1 raidtst]# zpool status pool: raidtst
state: ONLINE
scan: scrub repaired 0 in 0h0m with 0 errors on Wed Jul 20 06:09:27 2016

Note: All of the log examples shown above are from /var/log/cisco/cosfsgw/cosdevfs.log. In general, you can use the Linux `grep` command to search for the status string ERROR as a way to track down errors.