

# CA Cloud Storage for System z

## Linux Installation and Configuration Guide

Release 1.1.00



This Documentation, which includes embedded help systems and electronically distributed materials, (hereinafter referred to as the "Documentation") is for your informational purposes only and is subject to change or withdrawal by CA at any time. This Documentation is proprietary information of CA and may not be copied, transferred, reproduced, disclosed, modified or duplicated, in whole or in part, without the prior written consent of CA.

If you are a licensed user of the software product(s) addressed in the Documentation, you may print or otherwise make available a reasonable number of copies of the Documentation for internal use by you and your employees in connection with that software, provided that all CA copyright notices and legends are affixed to each reproduced copy.

The right to print or otherwise make available copies of the Documentation is limited to the period during which the applicable license for such software remains in full force and effect. Should the license terminate for any reason, it is your responsibility to certify in writing to CA that all copies and partial copies of the Documentation have been returned to CA or destroyed.

TO THE EXTENT PERMITTED BY APPLICABLE LAW, CA PROVIDES THIS DOCUMENTATION "AS IS" WITHOUT WARRANTY OF ANY KIND, INCLUDING WITHOUT LIMITATION, ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NONINFRINGEMENT. IN NO EVENT WILL CA BE LIABLE TO YOU OR ANY THIRD PARTY FOR ANY LOSS OR DAMAGE, DIRECT OR INDIRECT, FROM THE USE OF THIS DOCUMENTATION, INCLUDING WITHOUT LIMITATION, LOST PROFITS, LOST INVESTMENT, BUSINESS INTERRUPTION, GOODWILL, OR LOST DATA, EVEN IF CA IS EXPRESSLY ADVISED IN ADVANCE OF THE POSSIBILITY OF SUCH LOSS OR DAMAGE.

The use of any software product referenced in the Documentation is governed by the applicable license agreement and such license agreement is not modified in any way by the terms of this notice.

The manufacturer of this Documentation is CA.

Provided with "Restricted Rights." Use, duplication or disclosure by the United States Government is subject to the restrictions set forth in FAR Sections 12.212, 52.227-14, and 52.227-19(c)(1) - (2) and DFARS Section 252.227-7014(b)(3), as applicable, or their successors.

Copyright © 2014 CA. All rights reserved. All trademarks, trade names, service marks, and logos referenced herein belong to their respective companies.

## CA Technologies Product References

The CA Cloud Storage for System z guides refer to the following CA products and components:

- CA 1® Tape Management (CA 1)
- CA Allocate™ DASD Space and Placement (CA Allocate)
- CA Earl® (CA Earl)
- CA Chorus Software Manager™ (CA CSM)
- CA MIM™ Resource Sharing (CA MIM)
- CA Tape Encryption
- CA TLMS® Tape Management (CA TLMS)
- CA Vtape™ Virtual Tape System (CA Vtape)

## Contact CA Technologies

### Contact CA Support

For your convenience, CA Technologies provides one site where you can access the information that you need for your Home Office, Small Business, and Enterprise CA Technologies products. At <http://ca.com/support>, you can access the following resources:

- Online and telephone contact information for technical assistance and customer services
- Information about user communities and forums
- Product and documentation downloads
- CA Support policies and guidelines
- Other helpful resources appropriate for your product

### Providing Feedback About Product Documentation

If you have comments or questions about CA Technologies product documentation, you can send a message to [techpubs@ca.com](mailto:techpubs@ca.com).

To provide feedback about CA Technologies product documentation, complete our short customer survey which is available on the CA Support website at <http://ca.com/docs>.



# Contents

---

Chapter 1: About this Guide	7
Audience .....	7
Conventions .....	7
Chapter 2: Performing a Linux Preinstallation	9
CA Cloud Storage for System z Installation .....	9
How to Perform a Linux Preinstallation .....	9
Limited-Use CA Vtape License Requirement.....	9
System z Installation Resources .....	10
Public Cloud.....	10
Private Cloud .....	11
Mount Points, Virtual Volumes, and Vaults .....	11
Preinstallation Requirements.....	12
Installation Planning Checklist .....	13
Chapter 3: Installing CA Cloud Storage for System z on Linux	15
How to Install CA Cloud Storage for System z on Linux .....	15
Install CA Cloud Storage for System z .....	16
Upgrade RPMs.....	17
Chapter 4: Configuring CA Cloud Storage for System z on Linux	19
How to Configure CA Cloud Storage for System z on Linux .....	19
Example Configuration .....	20
Configure CA Cloud Storage for System z .....	20
Verify the Configuration.....	26
Setting Up NFS Devices .....	26
Chapter 5: Using Commands	27
Command Prefix and Syntax .....	27
Start, Stop, or Restart the Linux Server .....	28
Additional Command Resources .....	28
Work with z/VM Spool File Queues - vmur Facility.....	28
Commands .....	28
diag_info—List Diagnostic Data File Directory Contents .....	29
diag_trace—Record Diagnostic Trace Data about cacloud Subsystem Files.....	29

---

help—Display Linux Command Syntax.....	29
lscss—List sysfs Subchannels .....	30
lsqeth—List Qeth-Based Network Devices .....	31
mp_stats—Display Mount Point and Disk Utilization Information .....	31
process_info—Display Linux Server Information .....	32
scr_stats—Display Virtual Volume Information .....	32
scr_sync—Delete Expired, Scratched Virtual Volume Files.....	32
setup—Display Configuration Menu .....	33
status—Display Linux Server Status .....	33
task_info—Display Linux System and Process Information .....	33
vault_stats—Display Monthly Average Disk Usage Report.....	33
version—Display RPMs Version and Size .....	33
vol_info—Display Virtual Volume Directory Information .....	34
vol_mkdir—Create Virtual VOLSER Subdirectories.....	34
vol_stats—Display Virtual Volume Number and Size Statistics .....	35

## Chapter 6: Troubleshooting 37

Diagnosing Connectivity Problems.....	37
Linux Server Unresponsive .....	37
Gather Error Diagnosis Information for z/OS .....	38
Gather Error Diagnosis Information for Linux .....	38
Dumpconf Service .....	39

## Appendix A: Using CA Cloud Storage for System z with Specific Devices 41

How to Use CA Cloud Storage for System z with Data Domain NFS Exports .....	41
How to Use CA Cloud Storage for System z with NetApp NFS Exports .....	43
How to Use CA Cloud Storage for System z with SteelStore NFS Exports .....	45

## Appendix B: Configuring Your Network to Enable Jumbo Frames 47

How to Exploit Jumbo Frames for CA Cloud Storage for System z.....	47
Configure Network Switch .....	47
Update the CA Cloud Storage for System z Linux Server Configuration Files .....	48
Modify MTU Size .....	49
Verify MTU Size .....	50
Change the NFS Device MTU.....	50

# Chapter 1: About this Guide

---

This guide contains information to deploy CA Cloud Storage for System z components on the Linux on System z platform.

This section contains the following topics:

[Audience](#) (see page 7)

[Conventions](#) (see page 7)

## Audience

Users of this guide should be experienced mainframe technicians with knowledge of their mainframe tape systems, tape related software, and security configuration.

## Conventions

The following conventions are used throughout this guide to document features, functions, and other aspects of the system:

- Variable text, most commonly used for data set names and console commands, is entered in italics.  
For example, `VVE_SCRATCH=volser` where *volser* is the Virtual Volume VOLSER.
- Commands are entered in uppercase and lower-case. The uppercase portion is the minimum number of characters that must be entered for CA Vtape to recognize the command. The lower-case portion is provided for clarity.
- Features, functions, and components of CA Cloud Storage for System z are capitalized. These include, for example: Virtual Volumes and Virtual Devices.



# Chapter 2: Performing a Linux Preinstallation

---

This section contains the following topics:

[CA Cloud Storage for System z Installation](#) (see page 9)

[How to Perform a Linux Preinstallation](#) (see page 9)

## CA Cloud Storage for System z Installation

If you have not started the CA Cloud Storage for System z installation, see the *z/OS Installation Guide*.

## How to Perform a Linux Preinstallation

Before you install CA Cloud Storage for System z, review the preinstallation information and download CA Cloud Storage for System z from CA Support.

1. [Review the CA Vtape Limited-Use License Requirement](#) (see page 9).
2. [Review the System z installation resources](#) (see page 10).
3. Review [public](#) (see page 10) and [private](#) (see page 11) cloud information.
4. [Review mount points, Virtual Volumes, and Vault information](#) (see page 11).
5. [Review the preinstallation requirements](#) (see page 12).
6. [Follow the Installation Planning Checklist](#) (see page 13).

## Limited-Use CA Vtape License Requirement

New and existing CA Vtape customers require the Limited-Use CA Vtape License to implement CA Cloud Storage for System z.

## System z Installation Resources

Find information about installation topics that are not in this guide at these sources:

- [z/VM and Linux on IBM System z The Virtualization Cookbook for SLES 11 SP1 SG24-7931](#)
- [System z ESCON and FICON Channel-to-Channel Reference SB10-7034](#)
- [IBM System z Connectivity Handbook SG24-5444](#)
- [Problem Determination for Linux on System z SG24-7599](#)
- [Linux on System z Device Drivers, Features, and Commands SC33-8411](#)
- [Linux on System z Using the Dump Tools SC33-8412](#)

## Public Cloud

Cloud gateway appliances like Riverbed SteelStore provide:

- Local storage
- Data compression
- Data deduplication
- Data encryption
- Access to public cloud storage like Amazon S3 and Glacier

For more information, see the *Best Practices*.

Data is retained on the local disk cache as long as possible and can be evicted using algorithms such as a least recently used algorithm. If the data is later needed, it is retrieved from the cloud. Determine the amount of local disk cache through the [planning checklist](#) (see page 13). A properly sized local disk cache minimizes delays getting data from the cloud.

## Private Cloud

You can set up CA Cloud Storage for System z to use private cloud storage (also known as on-premise storage). Network attached storage appliances can provide disk storage and services such as:

- Data compression
- Data deduplication
- Data encryption
- Data replication

Deciding what features to exploit is up to you.

## Mount Points, Virtual Volumes, and Vaults

The Linux File System contains files and directories. On Linux, disk storage appliances are mapped to directories of the file system. The directory an appliance is mapped to is a mount point.

CA Cloud Storage for System z records Virtual Volume data as files on disk storage appliances that are mapped to directories of the file system. Different storage devices can be mapped to different directories or mount points. The collection of mount points that hold the Virtual Volumes is collectively known as the Vault.

CA Vtape can be set up to assign specific virtual VOLSER numbers for new scratch mounts through its data set and data class policy-based filters. You control which disk storage appliance is used for z/OS applications and workloads.

[Virtual Volumes](#) (see page 11) are directed to a [mount point](#) (see page 11) by volume serial range. You have the flexibility to use one or more mount points by assigning volume serial ranges to those mount points. CA Vtape on z/OS is able to assign virtual volume serial ranges through its data set and data class policy-based filters. You decide what z/OS applications and workloads get assigned to which mount point.

The mount point storage is accessed at local disk speed. You can map each mount point to a different gateway appliance. These appliances provide features such as data compression, data deduplication, data encryption, and data replication. Deciding what features to exploit is up to you.

## Directory Structure Definition

CA Cloud Storage for System z uses the following directory structure to store its Virtual Volumes:

- `/var/lib/cacloud/vault_01`

The vault or main directory where all Virtual Volumes are stored.

- `/var/lib/cacloud/vault_01/mp_01`  
`/mp_02`  
`/mp_03`

Under `/vault_01` are the mount point directories. Each of the directories can be mapped to local disk drives, a gateway, or an NFS appliance.

**Note:** The `/etc/FSTAB` file contains the file systems that are mounted during boot. Update this file with the settings recommended by your appliance for your mount points.

- `/var/lib/cacloud/vault_01/mp_01/vv_100` <- VOLSERS 100000-100999  
`/vv_101` <- VOLSERS 101000-101999  
`/mp_02/vv_102` <- VOLSERS 102000-102999  
`/mp_03/vv_103` <- VOLSERS 103000-103999

Virtual VOLSERS in sets of 1000 must be defined as directories under a mount point.

- Soft links, like MVS catalog aliases, map the location of each VOLSER range. The mapped range allows the CA Cloud Storage for System z Server to locate any volume within the vault.

```
/var/lib/cacloud/vault_01/vv_100 -> mp_01/vv_100  
                                  /vv_101 -> mp_01/vv_101  
                                  /vv_102 -> mp_02/vv_102  
                                  /vv_103 -> mp_03/vv_103
```

The `cacloud` rpm defines the directory structure down to the mount point directories (`mp_01`, `mp_02`, and so on).

## Preinstallation Requirements

Verify the items that exist in your environment:

- Linux:
  - An account on the Linux system and the ability to issue `sudo` commands
  - An application listener TCP/IP address and port number
  - A systems communication end-point CTC addresses (minimum of 2)

- Storage Appliance such as EMC Data Domain, NetApp, or Riverbed SteelStore:
  - Administrator user ID, password, and so on.
- Cloud Storage Provider such as Amazon:
  - Account name and password, access, and so on.

## Installation Planning Checklist

Before you install the Linux Server, ensure that these items are completed.

1. Run VMA analysis and perform tape management study.
2. Determine the number of servers and disaster backup and recovery configurations.
3. Define the CTC connections between z/OS hosts and Linux on System z. For more information, see the *z/OS Configuration Guide*.
4. Set up your [mount points](#) (see page 11).



# Chapter 3: Installing CA Cloud Storage for System z on Linux

---

This section contains the following topics:

[How to Install CA Cloud Storage for System z on Linux](#) (see page 15)

## How to Install CA Cloud Storage for System z on Linux

CA Cloud Storage for System z lets you use cloud storage for your z/OS mainframe virtual tape volumes. A private cloud is under your control to configure how you want. You can use any combination of both public and private cloud storage.

CA Cloud Storage for System z includes:

- CA Vtape on z/OS
- An application server that runs on Linux on System z

You can find more information about Linux in System z in z/VM and Linux on IBM System z: The Virtualization Cookbook <http://www.redbooks.ibm.com/>.

Use the following scenario to guide you through the process:

1. [Install CA Cloud Storage for System z](#) (see page 16).
2. [Upgrade the RPMs](#) (see page 17).

## Install CA Cloud Storage for System z

After you have met the requirements (see [Planning CA Cloud Storage for System z Installation](#) (see page 9)), you are ready to install the CA Cloud Storage for System z server.

**Follow these steps:**

1. Log in to Linux on System z.
2. Create a user download directory or identify your standard software download directory.
3. Download the latest cacloud and ctcl rpms for CA Cloud Storage for System z from the CA Support Site. CA uses the following naming convention for the rpms:  
product-version.release-modification.platform.rpm
  - a. Log in to CA Support and select Support by Product.
  - b. Select or type CA Cloud Storage for System z.
  - c. Select CA Cloud Storage for System z Maintenance Grid from the search results.  
If the link does not appear in the search results, select the Knowledge Base button.
4. Select the CA Cloud Storage for System z product download.
5. Install the ctcl rpm using the following Linux command:  

```
sudo rpm -ihv ctcl-cacloud.r-m.s390x.rpm
```
6. Verify the ctcl installation using the following Linux command:  

```
/sbin/modinfo ctcl
```
7. Install the cacloud rpm from the download directory to:
  - Create a cacloud user and group (uid/gid=325).
  - Install the Linux Server, support scripts, and configuration files.
  - Define the Virtual Volume Vault Directory (Vault).Install the rpm using the installation command:  

```
sudo rpm -ihv cacloud-v.r-m.s390x.rpm
```
8. Verify the cacloud rpm installation using the following command:  

```
cacloud help
```

9. Mount the network storage disk device to the appropriate CA Cloud Storage for System z Virtual Volume Vault directory. The cacloud rpm creates `/var/lib/cacloud/vault_01/mp_nn` where nn is 01, 02, 03, and 04. You can use each mount point for a different disk storage appliance with different storage characteristics. If needed, you can define more Virtual Volume mount point subdirectories.
10. Start the Linux Server using the following command:  

```
sudo cacloud start
```
11. Check the connectivity, if you have already installed, configured, and started CA Vtape on z/OS. Use the following z/OS console command:  

```
SVTn X PING
```
12. Read Channel-to-Channel Overview and Definition and [Mount Point Planning](#) (see page 11).
13. Perform the [configuration steps](#) (see page 19).

## Upgrade RPMs

Upgrading RPMs lets you preserve any customization that you performed as part of the initial RPM installation.

### Follow these steps:

1. Determine your current RPM maintenance level:  

```
rpm -qi cacloud ctcl
```
2. Log in to CA Support and select Support by Product.
3. Select or type CA Cloud Storage for System z.
4. Select CA Cloud Storage for System z Maintenance Grid from the search results.  
If the link does not appear in the search results, select the Knowledge Base button.
5. Select the CA Cloud Storage for System z product download.

The version release and modification level are embedded in the rpm file name. If the version is more current than yours, download it and apply it with the following command:

```
sudo rpm -U product-version.release-modification.platform.rpm
```

6. Reboot the Linux server when upgrading the ctcl rpms:  
`sudo /sbin/reboot`
7. Restart the Linux server when updating the cacloud rpms:  
`sudo cacloud restart`

# Chapter 4: Configuring CA Cloud Storage for System z on Linux

---

This section contains the following topics:

[How to Configure CA Cloud Storage for System z on Linux](#) (see page 19)

## How to Configure CA Cloud Storage for System z on Linux

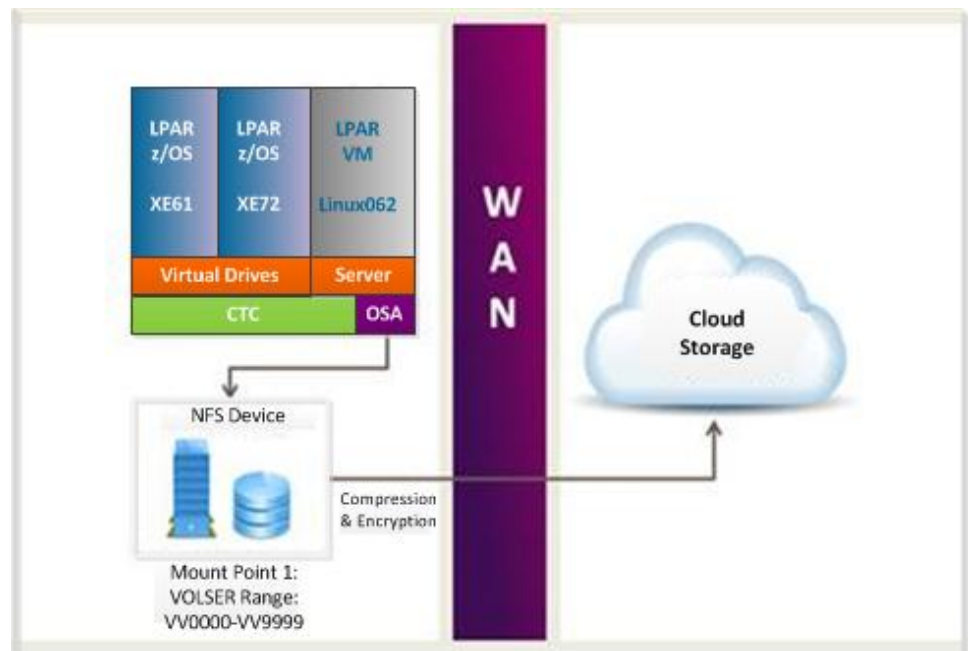
This section describes how to build an example configuration with two z/OS LPARs communicating with a CA Cloud Storage for System z server. In the example, the Linux server uses a Riverbed NFS device and writes to Amazon Cloud storage.

View the example and then try the example configuration. Use the following scenario:

1. Review the [example configuration](#) (see page 20).
2. [Configure CA Cloud Storage for System z](#) (see page 20).
3. [Verify the configuration](#) (see page 26).
4. [Set up NFS devices](#) (see page 26).

## Example Configuration

The following diagram shows how tape data gets from a z/OS LPAR to Amazon cloud storage. In the diagram, two z/OS LPARs run CA Vtape. CA Vtape uses Virtual Drives to intercept tape mounts. It uses a Channel to Channel (CTC) connection to pass the data to another LPAR that is running Linux on System z. An NFS device is mounted on Linux on System z and an OSA adapter is used to read/write the passed data to the NFS device. The NFS device compresses, deduplicates, and encrypts the data and sends it to cloud storage.



## Configure CA Cloud Storage for System z

Configure CA Cloud Storage for System z Linux Server with two z/OS LPARs communicating with a CA Cloud Storage for System z server.

### Follow these steps:

1. Use a telnet session to log in to Linux on System z.
2. Run the following command and provide a root password, to open the Setup menu:

```
sudo cacloud setup  
root's password:
```

3. To modify syslog permissions, select Setup, ACL from the menu.
4. Add the following line in the editor:

```
/usr/bin/setfacl -m g:cacloud:r /var/log/messages
```

This example adds the setfacl statement. Lines starting with '#' are comments.

```
# the firewall,acpid,NetworkManager log files
# are used by syslog-ng and rsyslog only, the
# other by all syslog daemons.
/var/log/warn /var/log/messages /var/log/allmessages /var/log/localmessages
/var/log/firewall /var/log/acpid /var/log/NetworkManager {
    compress
    dateext
    maxage 365
    rotate 99
    missingok
    notifempty

    size +4096k
    create 640 root root
    sharedscripts
    postrotate
        /etc/init.d/syslog reload
        /usr/bin/setfacl -m g:cacloud:r /var/log/messages <- Added line.
    endscript
}
```

5. Save your changes and exit the editor.

6. Select Setup > CONFIG to configure the CTC and other Linux Server settings.

An editor screen opens for the file `/etc/cacloud/subsystems.conf`. To change the port where the TCP/IP listener looks to accept connection requests from CA Vtape, use the following panel:

- The buffer size to use for TCPIP communications
- The prefix that is used for diagnostic messages that are written to the message log
- The verbosity of logging
- The scratch retention period

7. Page down to change the CTC definitions.

- The string that follows the subsystem attribute in the `InitSubsystems()` section must be lower case, and must start with `zos_`.
- Your LPAR name and the CA Vtape subsystem name on z/OS follows the CTC definition.
- Use the two CTC addresses following the string identifier to communicate with the instance of CA Vtape. In this example they read as follows:

```
subsystem zos_xe72_svt1 0.0.1a00 0.0.1a01
subsystem zos_xe61_svt1 0.0.1a20 0.0.1a23
```

The order of the CTC addresses must match the order that is defined on z/OS. The CTC addresses can be the same on both sides of the connection.

Example of the InitSubsystems() section

```
InitSubsystems() {
##
## PURPOSE:
##
## Describe CTC connections to zOS client subsystem
##
## SYNTAX:
##
## subsystem os_sysname_svtm ctc ctc ...
##
## WHERE:
##
## os
## is the client operating system
## example: (ZOS, VM, DOS, LINUX, etc..)
##
## sysname
## is the sysname of the client operating system
## example: (LPAR1, LPAR2, XE61, SYSA)
##
## svtn
## is the svts subsystem running on that client operating system
## example: (SVT1, SVT2, SVT3, ...)
##
## ctc ctc, ...
## is a CTC device list used to communicate with the svts subsystem
##
## Each CTC device known to Linux is represented by a directory
## entry in sysfs. For CCW and CCW group devices the name used
## in the directory is a bus ID that identifies the device
## within the scope of a Linux instance. For a CCW device, the
## bus ID is the device's device number with a leading ?0.n.?,
## where n is the subchannel set ID.
##
## For example, 0.1.0ab1.
##
## CCW group devices are associated with multiple device numbers.
## For CCW group devices, the bus ID is the primary device
## number with a leading ?0.n.?, where n is the subchannel set
## ID.
##
##
##
```

```

## EXAMPLE:
##
##      subsystem zos_xe72_svt8 0.0.1a00 0.0.1a01
##      subsystem zos_xe61_svt8 0.0.1a20 0.0.1a21

      subsystem demo_xe72_svt8 0.0.1a00 0.0.1a01    <-Modify these lines.
      subsystem demo_xe61_svt8 0.0.1a20 0.0.1a21
}

```

8. Type the CTC addresses that you use to communicate with the instance of CA Vtape on z/OS.

9. Save your changes and exit the editor.

You return to the Setup main menu.

10. Select Setup > FSTAB to update the files table. The Linux system mounts the mount points you defined in Mount Point Planning.

The file FSTAB contains information about the read-only file systems.

11. Add your NFS mount point similar to the last line in the example:

```

/dev/disk/by-path/ccw-0.0.0200-part1 swap          swap    defaults        0
0
/dev/disk/by-path/ccw-0.0.0201-part1 /          ext3    acl,user_xattr
1 1
/dev/disk/by-path/ccw-0.0.0202-part1 /usr       ext3    acl,user_xattr
1 2
proc          /proc      proc     defaults        0 0
sysfs        /sys       sysfs    noauto          0 0
debugfs      /sys/kernel/debug debugfs  noauto          0 0
devpts       /dev/pts   devpts   mode=0620,gid=5 0 0

```

```

ip_address:/nfs_export_name /var/lib/cacloud/vault_01/mp_nn nfs
rsize=131072,tcp,noexec,wsiz=131072,intr,nfsvers=3

```

#### **ip\_address**

Indicates the IP address of the NFS device.

#### **nn**

Indicates the mount point number.

12. Save your changes and exit the editor.

You return to the Setup main menu.

13. Select Setup > JOBS to verify that the cacloud definitions were automatically set up in the crontab file by the rpm.

The crontab file instructs the cron daemon to *run this command at this time on this date*. For more details type `man crontab, 5`, and press Enter.

```
##
## (Cron table entries used for cacloud)
##
5 4 * * 1-6 test -x /usr/local/bin/cacloud && /usr/local/bin/cacloud --text
scr_sync --live --verbose 2>&1 >> /var/lib/cacloud/reports/scr_sync # Run
scratch sync Mon-Sat @ 4:05am
5 5 * * * test -x /usr/local/bin/cacloud && /usr/local/bin/cacloud --text
mp_stats 2>&1 >> /var/lib/cacloud/reports/mp_stats # mountpoint
stats daily @ 5:05am
35 5 * * * test -x /usr/local/bin/cacloud && /usr/local/bin/cacloud --text
vol_stats 2>&1 >> /var/lib/cacloud/reports/vol_stats # Get
volume stats daily @ 5:35am
## | | | | |
## | | | | +- command to be executed ## optional comments
## | | | +---- day of week (0 - 6) (Sunday=0)
## | | | +----- month (1 - 12)
## | | +----- day of month (1 - 31)
## | +----- hour (0 - 23)
## +----- min (0 - 59)
```

14. Save your changes and exit the editor.

You return to the Setup main menu.

15. Select Setup > MISC to update the system.

This command starts the Linux Server when the Linux system initializes.

16. Type Y to set up automatic start and return to the Setup main menu.

```
cacloud-app-server on
Start cacloud-app-server on boot, Y|N?
```

17. Select Setup > REPORTS to verify that the rpm set up the report log rotations.

The CA Cloud Storage for System z server creates a log file as part of its ongoing operations.

This code is an example of the Scratch Sync log rotation instructions:

```
# Rotate cacloud logfiles
#
/var/lib/cacloud/reports/scr_sync {
    nocompress
    dateext
    maxage 120
    rotate 12
    missingok
    notifempty
    size 4096k
    create
    sharedscripts
    weekly
}
```

18. Exit the editor environment to return to the Setup main menu.
19. Select Setup > SITEINFO and enter information about your installation site. The CA Cloud Storage for System z Server uses this information in reports for billing services.

This example shows the SITEINFO information:

```
## Customer Information
CustomerInfo() {
##
## PURPOSE: Describe contact information
##
## CA Assigned Customer Site id, e.g. CUSTOMER_SITE_ID="12345"
CUSTOMER_SITE_ID="EVAL Site"

## CA Assigned Customer SAP Contract Number, e.g. CUSTOMER_SAP="CS4Z-12345"
CUSTOMER_SAP_CONTRACT="Unlicensed evaluation copy"

## The name of your company, e.g. CUSTOMER_NAME="CA Technologies"
CUSTOMER_NAME="Your Company Name"
## Customer contact information, e.g. CUSTOMER_CONTACT="John Doe"
CUSTOMER_CONTACT="John Doe"

## Customer contact email address, e.g. CUSTOMER_EMAIL="John.Doe@anycompany.com"
CUSTOMER_EMAIL="john.doe@mycompany.com"
## Customer misc notes, e.g. CUSTOMER_NOTES="Phone# (111) 222-3333"
# CUSTOMER_NOTES="uncomment to enter one additional line of information here"
}
```

20. Exit the editor environment to return to the Setup main menu.
21. Select Setup > Quit to leave the setup session.

You completed the setup tasks for CA Cloud Storage for System z Linux Server. The final customization task is to define the VOLSER ranges that match what you define on CA Vtape on z/OS.

## Verify the Configuration

After you configure CA Cloud Storage for System z, verify the configuration.

**Follow these steps:**

1. Reboot Linux.
2. Navigate to the point above the mount point `/var/lib/cacloud/vault_01`.
3. Issue the command:

```
df -h
```

Information similar to the following displays:

```
Filesystem      Size  Used Avail Use% Mounted on
/dev/dasda1    2.3G  238M  2.0G  11% /
```

`/dev/dasda1` indicates the communication with the native Linux file system. Your capacity numbers are likely different.

4. Navigate out one level to the mount point by `cd mp_nn`.
5. Issue the command:

```
df -h
```

Information similar to the following displays:

```
Filesystem      Size  Used Avail Use% Mounted on
141.202.24.170:/rfs/nfs/
455T           0 455T   0% /var/lib/cacloud/vault_01/mp_01
```

This information indicates that the mount point is communicating with the SteelStore device. Your capacity numbers are likely different.

**Note:** These results show after you reboot the Linux system.

## Setting Up NFS Devices

See [Appendix A](#) (see page 41) for information about defining NFS devices for the CA Cloud Storage for System z server. See your NFS device documentation for information about setting up a specific device.

# Chapter 5: Using Commands

---

## Command Prefix and Syntax

This guide uses the following command syntax conventions:

- Enter uppercase letters and special characters exactly as shown.
- Use lowercase italic letters as a generic description of a variable parameter value.
- Enter lowercase nonitalic letters exactly as shown.
- Use brackets ([ ]) to enclose optional values.
- Use vertical bars (|) to separate alternative options.
- Use ellipses (...) to specify that a parameter can be repeated.
- Underline default values.

The following syntax conventions are used throughout this chapter:

### Braces

{A | B}

Braces represent a set of multiple parameter values, one of which must be selected.

### Brackets

[A] [B]

Brackets represent optional parameters that can be selected or ignored.

### Single bar

A | B

A single bar separates multiple values for the same parameter.

### Underlining

A|B|C

Underlines indicate the default value of a parameter.

### Italics

*nn*

Text in italics represents a variable, for example, Group=*nn* where *nn* is a number.

## Start, Stop, or Restart the Linux Server

These Linux commands require super user authority so they can only be issued in a Linux terminal session.

**cacloud start**

Start the Linux Server.

**cacloud stop**

Stop the Linux Server.

**cacloud restart**

Stop and restart the Linux Server.

## Additional Command Resources

Find more command resources information on the IBM Linux on System z documentation web site

[www.ibm.com/developerworks/linux/linux390/documentation\\_dev.html](http://www.ibm.com/developerworks/linux/linux390/documentation_dev.html).

## Work with z/VM Spool File Queues - vmur Facility

To interact with spools and reader files use the vmur facility from the Linux command-line interface instead of using the VM 3270 console.

**Follow these steps:**

1. Install the kernel device driver:  

```
sudo /sbin/modprobe vmcp
```
2. Issue a command to generate a dump. This procedure takes a few minutes to complete:  

```
sudo /usr/sbin/vmur li
```

## Commands

The [cacloud help](#) (see page 29) command displays the syntax of all valid commands.

This list shows the valid CA Cloud Storage for System z commands.

---

## diag\_info—List Diagnostic Data File Directory Contents

The `diag_info` command lists the directory contents of `/var/lib/cacloud/debug/* .tgz`. Diagnostic trace data files are stored in this directory by the `diag_trace` command:

**Syntax**

```
cacloud diag_info
```

## diag\_trace—Record Diagnostic Trace Data about cacloud Subsystem Files

This `diag_trace` command records diagnostic trace data about the `cacloud` subsystem as files. These files contain state information that you can use for problem determination. The files are recorded in the directory `/var/lib/cacloud/debug`. List the files using the command `cacloud diag_info`.

The files are named:

```
*/var/lib/cacloud/debug/cacloud-hostname-yyyymmdd-hhmmss.tgz*
```

**Syntax**

```
cacloud diag_trace
```

## help—Display Linux Command Syntax

This `help` command displays the syntax of all the Linux commands.

**Syntax**

```
cacloud help [man|syntax|usage]
```

**man**

Displays man page as text.

**syntax**

Displays usage, options, and arguments.

**usage**

Displays usage.

## lscss—List sysfs Subchannels

The lscss command gathers subchannel information from sysfs and displays it in a summary format.

### Syntax

```
lscss
```

This code is an example of the information displayed.

```
linux062:~> sudo /sbin/lscss
root's password:
Device  Subchan.  DevType CU Type Use  PIM PAM POM  CHPIDs
-----
0.0.0f00 0.0.0000  1732/05 1731/05      80 80 ff  ff000000 00000000
0.0.0f01 0.0.0001  1732/05 1731/05      80 80 ff  ff000000 00000000
0.0.0f02 0.0.0002  1732/05 1731/05      80 80 ff  ff000000 00000000
0.0.0a60 0.0.0003  1732/01 1731/01 yes  80 80 ff  04000000 00000000
0.0.0a61 0.0.0004  1732/01 1731/01 yes  80 80 ff  04000000 00000000
0.0.0a62 0.0.0005  1732/01 1731/01 yes  80 80 ff  04000000 00000000
0.0.1a00 0.0.0006  0000/00 3088/1e yes  80 80 ff  43000000 00000000
0.0.1a01 0.0.0007  0000/00 3088/1e yes  80 80 ff  43000000 00000000
0.0.1a02 0.0.0008  0000/00 3088/1e yes  80 80 ff  20000000 00000000
0.0.1a03 0.0.0009  0000/00 3088/1e yes  80 80 ff  20000000 00000000
0.0.1a10 0.0.000a  0000/00 3088/1e      80 80 ff  43000000 00000000
0.0.1a11 0.0.000b  0000/00 3088/1e      80 80 ff  43000000 00000000
0.0.1a12 0.0.000c  0000/00 3088/1e      80 80 ff  20000000 00000000
0.0.1a13 0.0.000d  0000/00 3088/1e      80 80 ff  20000000 00000000
0.0.1a20 0.0.000e  0000/00 3088/1e yes  80 80 ff  43000000 00000000
0.0.1a21 0.0.000f  0000/00 3088/1e      80 80 ff  43000000 00000000
0.0.1a22 0.0.0010  0000/00 3088/1e      80 80 ff  20000000 00000000
0.0.1a23 0.0.0011  0000/00 3088/1e yes  80 80 ff  20000000 00000000
0.0.0200 0.0.0012  9336/10 6310/80 yes  80 80 ff  54000000 00000000
0.0.0191 0.0.0013  3390/0a 3990/e9      ff ff ff  33353738 393b3d3f
0.0.0201 0.0.0014  3390/0c 3990/e9 yes  ff ff ff  33353738 393b3d3f
0.0.0202 0.0.0015  3390/0c 3990/e9 yes  ff ff ff  33353738 393b3d3f
0.0.0c00 0.0.0016  1732/01 1731/01 yes  80 80 ff  06000000 00000000
0.0.0c01 0.0.0017  1732/01 1731/01 yes  80 80 ff  06000000 00000000
0.0.0c02 0.0.0018  1732/01 1731/01 yes  80 80 ff  06000000 00000000
0.0.0d00 0.0.0019  1732/01 1731/01      80 80 ff  08000000 00000000
0.0.0d01 0.0.001a  1732/01 1731/01      80 80 ff  08000000 00000000
etc.
```

## lsqeth—List Qeth-Based Network Devices

The `lsqeth` command displays an information summary about qeth-based network devices.

### Syntax

```
lsqeth
```

This code is an example of information displayed:

```
linux062:~> sudo /sbin/lsqeth
root's password:
Device name           : eth1
-----
card_type             : GuestLAN QDIO
cdev0                 : 0.0.0a60
cdev1                 : 0.0.0a61
cdev2                 : 0.0.0a62
chpid                 : 04
online                : 1
portname              : RIVERBED
portno                : 0
route4                : no
route6                : no
checksumming          : sw checksumming
state                 : UP (LAN ONLINE)
priority_queueing     : always queue 2
fake_broadcast        : 0
buffer_count          : 16
layer2                : 0
large_send             : no
isolation              : none
sniffer                : 0
etc.
```

## mp\_stats—Display Mount Point and Disk Utilization Information

The `mp_stats` command displays mount point and disk utilization information that is used for storing Virtual Volume Files under the disk vault at `/var/lib/cacloud/vault_01`.

### Syntax

```
cacloud mp_stats [mp*/vv*]
```

The optional `mp*/vv*` parameter lets you display volser ranges of mount points that are mapped to the Cloud Connector.

## process\_info—Display Linux Server Information

The `process_info` command displays information from the Linux TOP command to show dynamic real-time information about the Linux Server and its forked threads or processes.

### Syntax

```
cacloud process_info
```

## scr\_stats—Display Virtual Volume Information

The `scr_stats` command displays information about the number, size, and state (pending or expired status) of the virtual volume files residing within the vault. Pending virtual volume files are scratch volumes that have not aged to the point that they can be deleted from disk.

### Syntax

```
cacloud scr_stats [--days {+|-}n]
```

The optional `--days` parameter lets you execute the command with an expiration date other than today.

## scr\_sync—Delete Expired, Scratched Virtual Volume Files

The `scr_sync` command instructs `cacloud` to delete all expired, scratched Virtual Volume Files from the Vault on disk. Expired Virtual Volume Files are files that were scratched more than three days ago.

Once deleted, the Virtual Volume File is lost and the data cannot be recovered locally.

**Note:** Talk to your cloud provider to see if they offer other means to retrieve the data outside of the scope of `cacloud`.

### Syntax

```
cacloud scr_sync [--days {+|-}n] [--live|--sim]
```

(Optional) `--days` parameter lets you adjust the delete reference date from the current date.

(Optional) `--live|--sim` parameters indicate whether to perform or simulate the delete action.

---

## setup—Display Configuration Menu

The setup command displays the configuration menu.

**Note:** This command can only be issued in a Linux terminal session.

**Syntax**

```
cacloud setup
```

## status—Display Linux Server Status

The status command displays Linux server status.

**Syntax**

```
cacloud status
```

## task\_info—Display Linux System and Process Information

The task\_info command displays information about the Linux system and processes where the Linux Server is running.

**Syntax**

```
cacloud task_info
```

## vault\_stats—Display Monthly Average Disk Usage Report

The vault\_stats command displays a report of monthly average disk usage within the virtual vault. The report can be emailed when using the --mail option.

```
/var/lib/cacloud/vault_01
```

**Syntax**

```
cacloud vault_stats [--mail email-addresses]
```

(Optional) The --mail parameter lets you direct the report to single or multiple email addresses.

## version—Display RPMs Version and Size

The version command displays the version and size information for the source rpms installed for cacloud.

**Syntax**

```
cacloud version
```

## vol\_info—Display Virtual Volume Directory Information

Like the Linux `ls` or `dir` command, the `vol_info` command displays directory information for Virtual Volume Files on the disk vault.

### Syntax

```
cacloud vol_info volser-pattern
```

The optional `volser-pattern` lets you display individual Virtual Volume Files, sets of Virtual Volume Files, or all Virtual Volume Files.

For example:

- `cacloud vol_info 105931.vve` lists the active Virtual Volume File for VOLSER 105931, if 105931 is an active Virtual Volume.
- `cacloud vol_info 1059*.vve` lists any active Virtual Volume Files for the 1059nn range of VOLSERS.
- `cacloud vol_info 1059*` lists any active and scratch Virtual Volume Files for the 1059nn range of VOLSERS.

## vol\_mkdir—Create Virtual VOLSER Subdirectories

The `vol_mkdir` command creates Virtual VOLSER subdirectories in a mount point under the disk vault at: `/var/lib/cacloud/vault_01*` and create the required soft links to them.

### Syntax

```
cacloud vol_mkdir {mpdir/vvdir|--fix}
```

#### **mpdir**

The mount point subdirectory (mp\_01, mp\_02, and so on)

#### **vvdir**

The VOLSER subdirectory or directories you are creating.

For example:

- `cacloud vol_mkdir mp_01/vv_100` creates the `vv_100` subdirectory in `/var/lib/cacloud/vault_01/mp_01` and soft links it to `/var/lib/cacloud/vault_01/vv_100`.
- `cacloud vol_mkdir mp02/vv_10{0,1,2,3,4,5,6,7,8,9}` creates the `vv_100` through `vv_109` subdirectories under `/var/lib/cacloud/vault_01/mp_02` and soft links them to `/var/lib/cacloud/vault_01/vv_100` through `vv_109` respectively.

The `--fix` option scans the mount point subdirectories and create any missing soft links.

## vol\_stats—Display Virtual Volume Number and Size Statistics

The `vol_stats` command displays statistics about the number and size of Virtual Volume files residing on the disk vault. The command reports information for Virtual Volume files by vault mount point, Volser ranges, or both.

**Syntax**

```
cacloud vol_stats
```



# Chapter 6: Troubleshooting

---

This section contains the following topics:

[Diagnosing Connectivity Problems](#) (see page 37)

[Linux Server Unresponsive](#) (see page 37)

[Gather Error Diagnosis Information for z/OS](#) (see page 38)

[Gather Error Diagnosis Information for Linux](#) (see page 38)

[Dumpconf Service](#) (see page 39)

## Diagnosing Connectivity Problems

When you suspect connectivity problems, issue the SVTn LINUX PING command. This command tests TCP/IP connectivity and CTC communications on all CTC addresses defined to both the z/OS and Linux servers.

```
SVT8 X PING
SVT8X0100I Command Complete
SVT8X2204I StorageServer Response: 914
Owner      CTC          State    Count      Writer    rc
XE72.SVT8  01a00->01a00  1        191567     1         0
Linux      01a00->01a00  1        19809      0         0
XE72.SVT8  01a01->01a01  1         929       0         0
Linux      01a01->01a01  1         229       1         0
```

The PING command uses TCP/IP to create a process on Linux to initiate CTC transactions on each CTC address that is defined to it. z/OS tests its CTC addresses and displays a running usage count. If a nonzero return code displays, see the z/OS parmlib section OpenSystemServer and PipeUnitAddress attributes against the Linux /etc/cacloud/subsystems.conf file. The CTC addresses must be in the same order on both sides.

## Linux Server Unresponsive

When the Linux Server becomes unresponsive, try the following steps:

1. Ping the IP address of the server.
2. Telnet into the Linux system.
3. Issue the command: cacloud status.
4. Issue the command: cacloud restart.

## Gather Error Diagnosis Information for z/OS

To gather diagnostic data for problems that you believe originate on z/OS, use the `SVTn DUMP` command. This command generates an SDUMP which includes first failure support data, internal logger trace data, and the CA Vtape address and data space information. TERSE the file and send to CA Support for analysis.

## Gather Error Diagnosis Information for Linux

To gather diagnostic data for problems that you believe originate on Linux, use the `SVTn X DUMP` command to gather diagnostic data. This command generates a tar file which includes first failure support data, internal logger trace data, and Linux Server control block information. Send the file to CA Support for analysis.

```
SVT8 X DUMP
SVT8X2204I cacloud dump 150
Diagnostic data in /var/lib/cacloud/debug:
376K cacloud-linux062-20130925-143842.tgz
```

In this example, the file `cacloud-linux062-20130925-143842.tgz` was created in directory `/var/lib/cacloud/debug`.

To see all the files that reside in the Linux debug directory use the `SVTn X DIAG_INFO` command.

```
SVT8 X DIAG_INFO
SVT8X2204I cacloud diag_info 154
Directory of /var/lib/cacloud/debug/cacloud*.tgz
120K cacloud-linux062-20130920-181614.tgz
376K cacloud-linux062-20130925-115722.tgz
376K cacloud-linux062-20130925-143842.tgz
```

## Dumpconf Service

The dumpconf service configures the action to take if a kernel panic or PSW restart occur.

**Note:** For information about implementing the dumpconf service, see Appendix C in IBM Linux on System z Using the Dump Tools SC33-8412.

This cod is an example configuration for a CCW dump device (DASD) using vmcmd and DELAY\_MINUTES:

```
ON_PANIC=vmcmd
VMCMD_1="MSG MASTER Starting VMDUMP"
VMCMD_2="VMDUMP"
VMCMD_3="IPL 201 CLEAR"
DELAY_MINUTES=5
```



# Appendix A: Using CA Cloud Storage for System z with Specific Devices

---

This section shows how to use CA Cloud Storage for System z with specific devices.

## How to Use CA Cloud Storage for System z with Data Domain NFS Exports

CA Cloud Storage for System z can use NFS export directories as repositories for Virtual Volume files. The Linux operating system mounts NFS exports as subdirectories of its file system by reading the `/etc/fstab` configuration file at startup.

Use the EMC DataDomain (DD) Enterprise Manager to create NFS export directories for use with CA Cloud Storage for System z.

### Follow these steps:

1. Use a web browser to log in to the EMC DataDomain Enterprise Manager. For more information, see the EMC DataDomain Administration Guide <http://www.scribd.com/doc/116275425/EMC-DataDomain-OS-5-1-Administration-Guide>.
2. Select the MTree tab to create a new or edit an existing NFS export directory for use with CA Cloud Storage for System z.

**Important:** Consider replicating the NFS exports in a Private Cloud or on premise implementation. To prevent data loss in a disaster recovery situation, we recommend that you replicate Virtual Volumes to a remote site.

When you create an NFS export to use with CA Cloud Storage for System z:

- a. Use the TCPIP address of the Linux system where CA Cloud Storage for System z runs as the client.
- b. Specify the following options:
  - Allow connections from ports below 1024 (secure)
  - Anonymous User ID (UID) = 326
  - Anonymous Group ID (GID) = 326

**Note:** 326 is the UID/GID defined for use by CA Cloud Storage for System z.

Using these options the NFS export indicates:

```
rw,no_root_squash,no_all_squash,secure,anonuid=326,anongid=326
```

3. Exit the EMC DataDomain Enterprise Manager and log in to the Linux system running CA Cloud Storage for System z.

4. Run the cacloud setup command:

```
sudo cacloud setup
```

5. Select the FSTAB option to map the DD NFS export to the appropriate mount point subdirectory of Vault\_01 used by CA Cloud Storage for System z.

The following is an illustration of an /etc/fstab table entry that is used to mount an NFS export as mp\_01:

```
ip_address:/data/coll/VtapeDD /var/lib/cacloud/vault_01/mp_01 nfs  
rsize=131072,tcp,nolock,wsize=131072,nfsvers=3,intr,bg 0 0
```

6. Save your changes to update the FSTAB table.
7. Reboot the Linux system to execute the FSTAB changes or use the following Linux command to apply the FSTAB changes:

```
sudo /sbin/mount -a
```

8. Issue the following Linux command to confirm that the proper file system table changes were made:

```
df -h
```

# How to Use CA Cloud Storage for System z with NetApp NFS Exports

CA Cloud Storage for System z can use NFS export directories as repositories for Virtual Volume files. The Linux operating system mounts NFS exports as subdirectories of its file system by reading the `/etc/fstab` configuration file at startup.

To create NFS export directories for use with CA Cloud Storage for System z, use the NetApp OnCommand System Management software. For more information, see <http://www.netapp.com> <http://www.netapp.com>.

## Follow these steps:

1. Select the Netapp appliance to begin the configuration.
2. Select Configuration > Protocols > NFS and enable NFS.
3. Select Storage > Aggregates and create an aggregate.

An aggregate is like a large logical DASD device that is created from some number of physical disks drives. You assign disks to the aggregate based on the amount of space that is required to hold your virtual volumes and RAID requirements.

4. Select Create.

The user interface wizard guides you through the process of creating the aggregate.

5. Select Storage > Volumes and create a volume under the aggregate.

Volumes behave like subdirectories or local partitions. You can mount Volumes to your Linux Server as an NFS export. Volumes can also be replicated to a secondary appliance using NetApp SnapMirror technology.

6. Select the General tab.
7. Assign the maximum size of the volume you want to allocate for CA Cloud Storage use and set the volume to Thin Provisioned.
8. Select the Storage Efficiency tab to enable data deduplication and compression.
9. Select Storage > Exports to create an NFS export to use with CA Cloud Storage.
10. Use the browse button to select the path to the volume or subdirectory to use with CA Cloud Storage.
11. Select the security setting for All hosts.
12. Edit the Export Rule.
13. Ensure that the Security flavor indicates UNIX.
14. Select Anonymous Access > Map anonymous users to and assign them to the `cacloud` group and 326 user ID.
15. Select Client Permissions > Add client permission and grant root access to the Linux Server running CA Cloud.

(Optional) You can perform this step later.

16. Select Data Protection > SnapMirror to add replication.

Use the SnapMirror Relationship setup wizard to define the source, target, and replication schedule of your netapp volume to a remote Netapp appliance. The SnapMirror is useful for disaster recovery and can also be used to implement bidirectional replication between CA Vtape complexes.

17. Exit the OnCommand System Manager.
18. Log in to the Linux system running CA Cloud Storage for System z.
19. Run the cacloud setup command:

```
sudo cacloud setup
```

20. Select the FSTAB option to map the NFS export to the appropriate mount point subdirectory of Vault\_01 used by CA Cloud Storage for System z.

The following example of an /etc/fstab table entry mounts an NFS export as mp\_01:

```
ip_address:/vol/cs4z_prod_mp_01 /var/lib/cacloud/vault_01/mp_01  
nfs rsize=131072,tcp,noLOCK,wsize=131072,nfsvers=3,intr,bg 0 0
```

21. Save your changes to update the FSTAB table.
22. Reboot the Linux system to execute the FSTAB changes or use the following Linux command to apply the FSTAB changes:

```
sudo /sbin/mount -a
```

23. Issue the following Linux command to confirm that the proper file system table changes were made:

```
df -h
```

## How to Use CA Cloud Storage for System z with SteelStore NFS Exports

CA Cloud Storage for System z uses NFS export directories as repositories for Virtual Volume files. The Linux operating system mounts NFS exports as subdirectories of its file system by reading the `/etc/fstab` configuration file at startup.

Use the Riverbed SteelStore browser interface to create NFS export directories for use with CA Cloud Storage for System z.

### Follow these steps:

1. Use a web browser to log in to the Riverbed SteelStore device. For more information, see the Riverbed documentation.
2. Select the Configure > NFS tab to create a new or edit an existing NFS export directory to use with CA Cloud Storage for System z.
3. Log in to the Linux system running CA Cloud Storage for System z.

4. Run the `cacloud` set-up command:

```
sudo cacloud setup
```

5. Select the FSTAB option to map the NFS export to the appropriate mount point subdirectory of `Vault_01` used by CA Cloud Storage for System z.

This table entry shows an `/etc/fstab` table entry that is used to mount an NFS export as `mp_01`:

```
ip_address:/nfs_export_name /var/lib/cacloud/vault_01/mp_01 nfs  
rw,nolock,hard,intr,nfsvers=3,tcp,rsize=131072,wsiz=131072,bg  
0 0
```

6. Save your changes to update the FSTAB table.
7. Reboot the Linux system to execute the FSTAB changes or use this Linux command to apply the FSTAB changes:

```
sudo /sbin/mount -a
```

8. Issue this Linux command to confirm that the proper file system table changes were made:

```
df -h
```



# Appendix B: Configuring Your Network to Enable Jumbo Frames

---

This section contains the following topic:

[How to Exploit Jumbo Frames for CA Cloud Storage for System z](#) (see page 47)

## How to Exploit Jumbo Frames for CA Cloud Storage for System Z

Exploiting jumbo frames (also known as large buffer sizes) decreases System z CPU usage and increases network throughput. You increase the maximum transmission unit (MTU), thus decreasing the amount of overhead attributed to using a small block size.

**Important!** Remember to enable jumbo frames for all routers and other network interfaces on the same path.

The *Best Practices Guide* provides jumbo frames recommendations.

To guide you through the process, use the following scenario:

1. [Configure Network Switch](#) (see page 47).
2. [Update CA Cloud Storage for System z Linux Server Configuration Files](#) (see page 48).
3. [Modify the MTU size](#) (see page 49).
4. [Verify the MTU size](#) (see page 50).
5. [Change NFS Device MTU](#) (see page 50).

### Configure Network Switch

For more information about configuring jumbo frames, see your network switch documentation.

## Update the CA Cloud Storage for System z Linux Server Configuration Files

To ensure that your system can handle jumbo frames, update your CA Cloud Storage for System z Linux Server configuration files.

### Follow these steps:

1. Use a telnet session to log in to Linux on System z.
2. Run the following command to become a super user:

```
su
```

3. Enter your root password:  
root password:
4. Enter the following command in the file system table:

```
vim /etc/fstab
```

5. Modify your NFS device line entries to include the retrans and timeo key value pairs, like the following example:

```
141.202.201.27:/rfs/qa1 /var/lib/cacloud/vault_01/mp_01 nfs  
rsize=131072,tcp,nolock,wsize=131072,nfsvers=3,intr,bg,retrans=  
2,timeo=5 0 0
```

6. Enter the following command to modify your sysctl configuration file:

```
vim /etc/sysctl.conf
```

7. Add the following statements to the end of the file:

```
## IPV4 specific settings  
# turn TCP timestamp support off, default 1, reduces CPU use  
net.ipv4.tcp_timestamps = 0  
# turn SACK support off, default on  
# on systems with a VERY fast bus -> memory interface this is the big gainer  
net.ipv4.tcp_sack = 0  
# set min/default/max TCP read buffer, default 4096 87380 174760  
net.ipv4.tcp_rmem = 10000000 10000000 10000000  
# set min/pressure/max TCP write buffer, default 4096 16384 131072  
net.ipv4.tcp_wmem = 10000000 10000000 10000000  
# set min/pressure/max TCP buffer space, default 31744 32256 32768  
net.ipv4.tcp_mem = 10000000 10000000 10000000  
### CORE settings (mostly for socket and UDP effect)  
# set maximum receive socket buffer size, default 131071  
net.core.rmem_max = 524287  
# set maximum send socket buffer size, default 131071  
net.core.wmem_max = 524287  
# set default receive socket buffer size, default 65535  
net.core.rmem_default = 524287  
# set default send socket buffer size, default 65535  
net.core.wmem_default = 524287
```

```
# set maximum amount of option memory buffers, default 10240
net.core.optmem_max = 524287
# set number of unprocessed input packets before kernel starts dropping them;
default 300
net.core.netdev_max_backlog = 300000
```

8. Enter the following commands to modify your rules.d device file:

```
vim /etc/udev/rules.d/51-qeth-0.0.nnnn.rules (where nnnn is the OSA device
address)
```

9. Add the following statements before the online attribute statement:

```
ACTION=="add", SUBSYSTEM=="ccwgroup", KERNEL=="0.0.0a60", ATTR{blkt/inter}="5"
ACTION=="add", SUBSYSTEM=="ccwgroup", KERNEL=="0.0.0a60",
ATTR{blkt/inter_jumbo}="15"
ACTION=="add", SUBSYSTEM=="ccwgroup", KERNEL=="0.0.0a60",
ATTR{blkt/total}="250"
ACTION=="add", SUBSYSTEM=="ccwgroup", KERNEL=="0.0.0a60",
ATTR{buffer_count}="128"
```

## Modify MTU Size

To decrease the amount of overhead that is caused when using a small block size modify the MTU size. The default MTU is 1492 bytes for networks in Layer 3 mode. When using jumbo frames the MTU is 8992.

### Follow these steps:

1. Type the following command:
 

```
yast
```
2. Navigate to Network devices, Network settings in the YaST Control Center to modify your MTU type.
3. Move your cursor to the line for your OSA adapter in Network Settings. Tab to Edit and press Enter.
4. Go to the General tab in Network Card Setup and change the MTU to 8992. Tab to NEXT and press Enter.
5. Select OK to save the network configuration changes.
6. Reboot your CA Cloud Storage for System z Linux Server.

## Verify MTU Size

Ensure that the configuration changes were made and the MTU size is 8992.

**Follow these steps:**

1. To verify that you properly set the MTU size, log in to the telnet terminal.
2. Type the following command to go back to root:

```
su
```

3. Type the following command:

```
ifconfig
```

4. Inspect the output for an MTU size of 8992 and click OK.

The network configuration changes are saved.

## Change the NFS Device MTU

When your CA Cloud Storage for System z Linux Server changes are made, log in to your NFS device. Change the NFS device MTU size to 8992. For more information, see your NFS device documentation.