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# CloudLink®

# Amazon Web Services Administration Guide

June 2014

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# 1 Introduction

CloudLink® is a data at rest encryption solution that provides a software defined storage encryption layer on top of existing storage infrastructures whether deployed in the enterprise data center, private clouds or in public clouds. Its cloud security management software enables a single data encryption solution for on-premise enterprise virtualized data centers, hybrid cloud deployments, and public cloud environments such as Amazon AWS, Microsoft Azure, and VMware-based cloud environments.

AFORE's CloudLink solution on the AWS Marketplace is a simple to deploy, self-contained AMI that enables customers to get up and running quickly. You deploy a CloudLink AMI instance from the AWS Marketplace and Amazon will simply add the CloudLink costs to your AWS bill as a separately identified charge.

There are two CloudLink AMIs: *CloudLink 1TB Edition* and *CloudLink 10TB Edition*. CloudLink instances can be deployed in either Elastic Compute Cloud (EC2) or Virtual Private Cloud (VPC) environments.

You manage deployed CloudLink instances from CloudLink Center, a web-based application residing on the CloudLink instance.

## 1.1 Audience and Purpose

This guide is intended for system administrators managing CloudLink deployments in an Amazon Web Services environment.

It assumes the administrator is experienced with Amazon Elastic Compute Cloud (EC2) services, Virtual Private Cloud (VPC) services, and IP networking. If you are new to AWS, visit the AWS documentation webpage for useful getting started guides at http://aws.amazon.com/documentation.

The purpose of this guide is to help you manage your CloudLink instances deployed in an AWS environment.

For information on how to deploy CloudLink instances in an AWS environment, refer to *CloudLink Amazon Web Services Deployment Guide* for this release.

## 1.2 Typographical Conventions

This guide uses the following typographical conventions.

| Convention | Used for |
|---|---|
| **Black bold** | User interface elements such as menus, menu items, tabs, boxes, lists, and buttons. For example:<br>In the CloudLink window, select the **Options** tab. |
| *Italic* | Examples of formats and values. Also used for emphasis. For example:<br>Use the default user name (*secadmin*)…<br>For *each* CloudLink instance you must… |

## 1.3 Administration Guide Organization

This administration guide consists of the following chapters:

- Chapter 1, *Introduction*, introduces you to CloudLink, the AWS Marketplace, and this document.
- Chapter 2, *Getting Started*, provides information on the CloudLink Center application and how to get help.
- Chapter 3, *CloudLink Center*, provides instructions how to use CloudLink Center to manage your CloudLink environment.

# 2 Getting Started

Once your CloudLink instances are deployed, you can manage the instances from CloudLink Center. The getting started topics are as follows:

- *Connecting to CloudLink Center over the Web*
- *Topology Tree*
- *Getting Help*
- *Customizing CloudLink Center Panel Views*
- *EULA and Ancillary Software*
- *Logging Out from a CloudLink Center Session*

## 2.1 Connecting to CloudLink Center over the Web

You can manage your CloudLink instances from a Web browser with Java Script enabled.

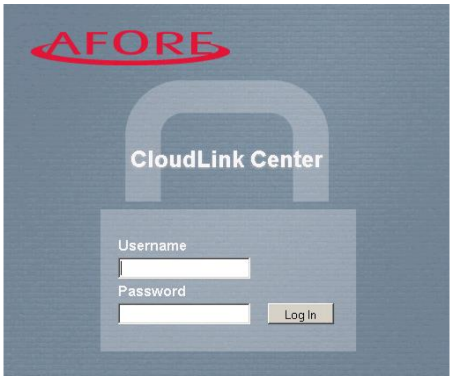
Adobe Flash is required for graphic representation of the storage statistics within CloudLink Center.

> **NOTE:** CloudLink Center uses a self-signed certificate.

**To connect to the CloudLink instance over the Web:**

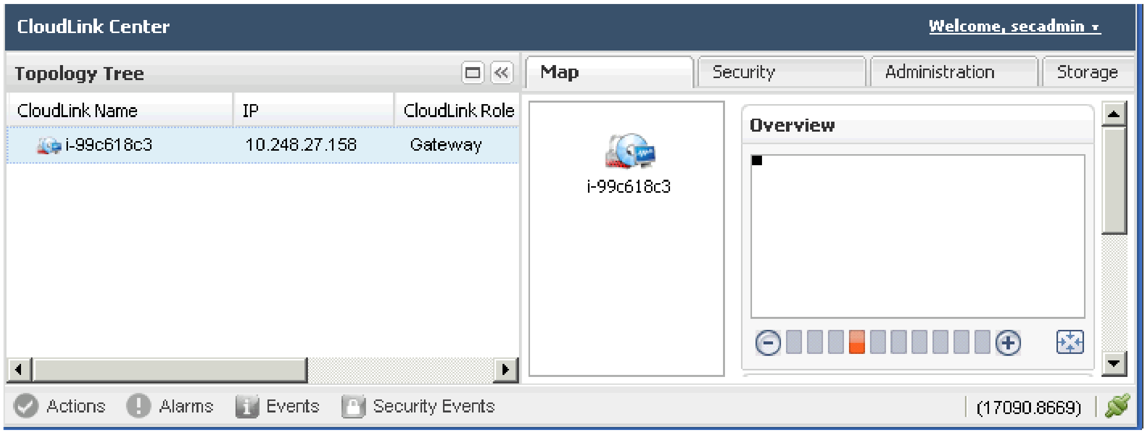
1. In your Web browser, type the URL of the CloudLink instance in the format **https://** *IpAddress***:8443** or **https://** *fqdn***:8443** where *IpAddress* is the public interface IP and *fqdn* is the fully qualified domain name (FQDN).

   Whenever you connect to CloudLink Center, the CloudLink Center home page is displayed. For example:



You can use the default user name *secadmin* and the default password *AWS instance ID* to access the CloudLink Center. For more information, see *CloudLink Center User Account Administration* on page 9.

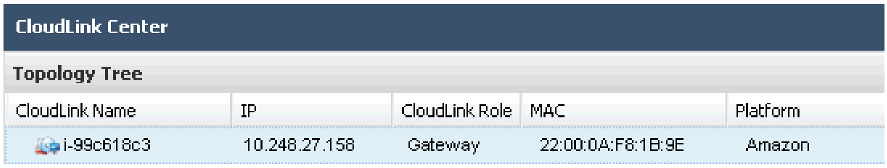
2. Enter a user name and password. After the credentials are validated, the main CloudLink Center window is displayed. For example:



| CloudLink Name | IP | CloudLink Role |
|---|---|---|
| i-99c618c3 | 10.248.27.158 | Gateway |

## 2.2 Topology Tree

The Topology Tree is an essential part of the CloudLink Center display. At the top of the list in the Topology Tree is the CloudLink instance to which the CloudLink Center is connected. For example:



| CloudLink Name | IP | CloudLink Role | MAC | Platform |
|---|---|---|---|---|
| i-99c618c3 | 10.248.27.158 | Gateway | 22:00:0A:F8:1B:9E | Amazon |

.

The Topology Tree shows the following parameters:

**CloudLink Name**: CloudLink Center's name for the instance.

**IP**: IP address of the instance's private network interface.

**CloudLink Role**: Role the instance plays in CloudLink.

**MAC**: MAC address of the instance's private network interface.

**Platform**: The virtualization platform on which the instance is running.

You can change the *CloudLink Name* by double-clicking in the name field and entering a new text string.

## 2.3 Getting Help

The CloudLink documentation is available on the CloudLink page in the AWS Marketplace.

- *CloudLink Amazon Web Services Deployment Guide*
- *CloudLink Amazon Web Services Administration Guide* (this guide)

For an overview of the available tabs and options as viewed from the CloudLink Center user interface, see *Appendix D: CloudLink Tabs and Options* on page 70.

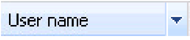
For customer support, call AFORE Solutions at (866) 356-4060 or email us at support@aforesolutions.com.

## 2.4 Customizing CloudLink Center Panel Views

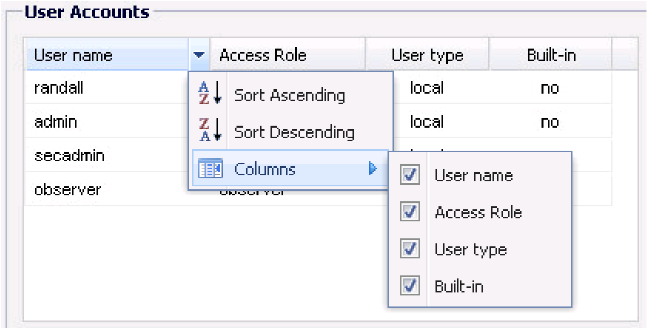
You can define the columns to be displayed in each panel and specify ascending or descending order for the column rows.

### To customize a column:

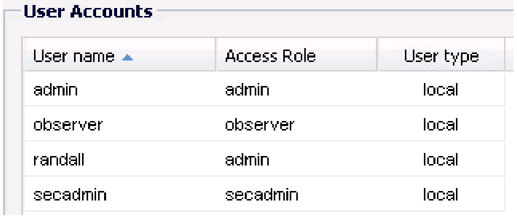
1. Access a panel, for example the **User Accounts** panel.
2. To display the dropdown icon, move the mouse pointer over the rightmost area of a column heading in the panel. For example:



3. Click the icon to display the column options. For example:



4. From the menu items, you can select **Sort Ascending** or **Sort Descending** to set the order of the column items, and select the columns to display or hide. For example, to display the **User name** list in ascending order, select **Sort  Ascending**. To hide the **Built-in** column, uncheck the **Built-in** checkbox. The results are as follows:



User Accounts

| User name ▲ | Access Role | User type |
|---|---|---|
| admin | admin | local |
| observer | observer | local |
| randall | admin | local |
| secadmin | secadmin | local |

5. A triangle appears in the **User name** column that allows you to resort the column contents by clicking the column heading.

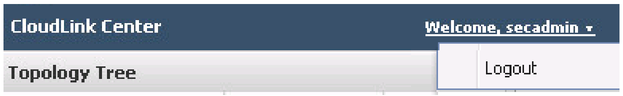
> **NOTE:** The settings only apply to the current CloudLink Center session.

## 2.5 EULA and Ancillary Software

The End User License Agreement (EULA) and the list of ancillary software distributed with the AFORE CloudLink Center software is available under the **System** tab of the CloudLink Center user interface.

## 2.6 Logging Out from a CloudLink Center Session

To logout from a CloudLink Center session, click on **Welcome** at the top corner of the CloudLink Center main page and select **Logout**. The session is terminated and the CloudLink Center login page is displayed.



# 3 CloudLink Center

After you deployed and configured a CloudLink instance on AWS, it is managed via the CloudLink Center web application accessible via a HTTPS session.

The default storage configuration for CloudLink is a single merged volume created from all of the EBS volumes specified during deployment of the CloudLink instance. Hence, ten 1TB EBS volumes defined during deployment appear as a single 10TB EBS volume in CloudLink Center. You can keep the single merged encrypted volume configuration or create separate encrypted volumes for the CloudLink instance depending upon which model best suits your needs. Any data that is written to the EBS volume is encrypted with AES 256-bit encryption and will have a unique encryption key used to encrypt each EBS volume when configured in split volume mode or a single encryption key for a merged volume.

CloudLink provides AWS instances with access to their encrypted storage over NFS/SMB or iSCSI remote disk protocols. A brief description of the different access models is provided below to assist with selecting the configuration that will work best for the intended application/services:

- NFS/SMB network-attached storage (NAS)

  This option is appropriate for standard deployments where instances will be attaching/mapping to an encrypted share.

- iSCSI remote disk for a single Windows server

  This option is appropriate for servers requiring dedicated, block-level high performance access to a remote disk.

- iSCSI remote disk for a Windows SMB server

  This option is appropriate for advanced SMB sharing configurations where Windows Kerberos authentication and access control is required.

This section covers the following topics:

- *Reviewing and Changing your Deployment Settings*
- *Adding Storage Volumes*
- *Managing User Accounts*
- *Assigning Storage Licenses*
- *Managing Secure Storage*

- *Accessing Secure Storage*
- *Configuring CloudLink Center Session Timeout*
- *Configuring a Domain Name Servers*
- *Configuring a Network Time Protocol Server*
- *Generating Performance Reports*
- *Logs and Events*
- *Configuring Syslog*
- *Configuring SNMP*

# 3.1 Reviewing and Changing your Deployment Settings

The *CloudLink Amazon Web Services Deployment Guide* includes the basic configuration steps to complete a deployment from CloudLink Center. For reference purposes, the steps are repeated in this section and include links to the associated reference section of this guide. Use this information to review or change your deployment settings.

1. Change the default *secadmin* user account password, see *3.3.5 Changing Local User Account Passwords* on page 22.
2. Assign storage licenses to the storage volume, see *3.4 Assigning Storage Licenses* on page 25.
3. Split the volume if desired, see *3.5.12 Splitting Volumes* on page 43.
4. Specify the storage type (NFS/SMB or iSCSI), see *3.5.8 Changing the Volume Type* on page 39.
5. Set the write mode for the storage volumes, see *3.5.13 Changing the Volume Write Mode* on page 44.
6. Format the storage volumes, see *3.5.14 Formatting the Volumes* on page 45.
7. Configure access rights to the storage volumes, see *3.5.5 Configuring NFS/SMB Access to Secure Storage* on page 34 and *3.5.6 Configuring iSCSI Access to Secure Storage* on page 35.
8. Access a storage volume, see *3.6 Accessing Secure Storage* on page 45.

# 3.2 Adding Storage Volumes

The *CloudLink 10TB Edition* instance is capable of supporting up to 10 TB of data in one or more EBS volumes. A single EBS volume provides the ability to increase the volume size to 10 TB to handle a large amount of data. In a multi-volume environment, each volume is limited to 1 TB and the maximum aggregated volume size is limited to 10 TB. Separate volumes allow you to provide a separate key for each volume and manage the volumes independently. The *CloudLink 1TB Edition* instance is capable of supporting up to 1 TB of data in one or more EBS volumes.

The instructions for increasing encrypted storage capacity differs depending upon whether a merged volume or split volume configuration has been selected, follow the appropriate instructions for your selected configuration.

Note: CloudLink does not support AWS encrypted EBS volumes in this release.

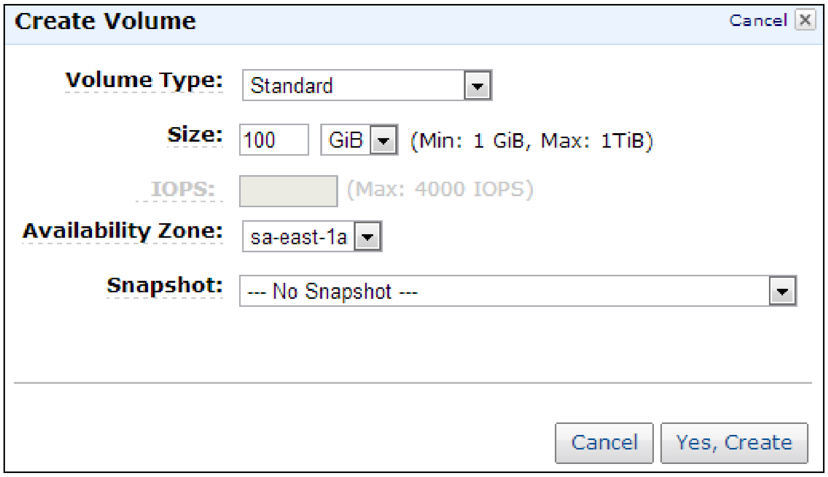
## 3.2.1 Adding Volumes to a Split Volume Configuration

From the EC2 console you create new volumes and attach them to the CloudLink instance. You then access CloudLink Center, perform a volume rescan to detect the newly added EBS volumes, and finally, format the new volumes to make them accessible.

> **NOTE:** Increasing encrypted storage capacity in a split volume configuration can be performed without affecting storage access.

**To add a storage volume to a CloudLink instance with a split volume configuration:**

1. Log on to the AWS Marketplace with your AWS account credentials.
2. Access the EC2 console and select **Volumes**.
3. Click **Create Volume**.
4. From the **Create Volume** dialog, enter the **Volume Type**, **Size**, **Availability Zone**, and optionally select a **Snapshot**. For example:



**Create Volume**

Volume Type: Standard

Size: 100 GiB (Min: 1 GiB, Max: 1TiB)

IOPS: (Max: 4000 IOPS)

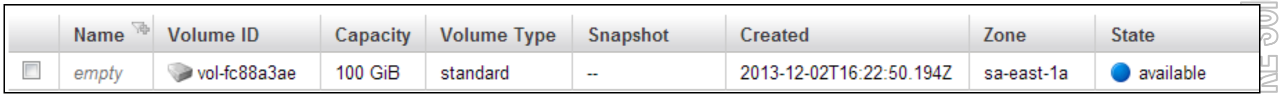
Availability Zone: sa-east-1a

Snapshot: --- No Snapshot ---

A snapshot is a backup of an EC2 volume that's stored in S3. You can create a new volume using data stored in a snapshot by entering the snapshot's ID. You can search for public snapshots by typing text in the **Snapshot** field. Descriptions are case-sensitive.

5. Click **Yes, Create**.

6. Observe the presence of the new volume in the volume list. For example:



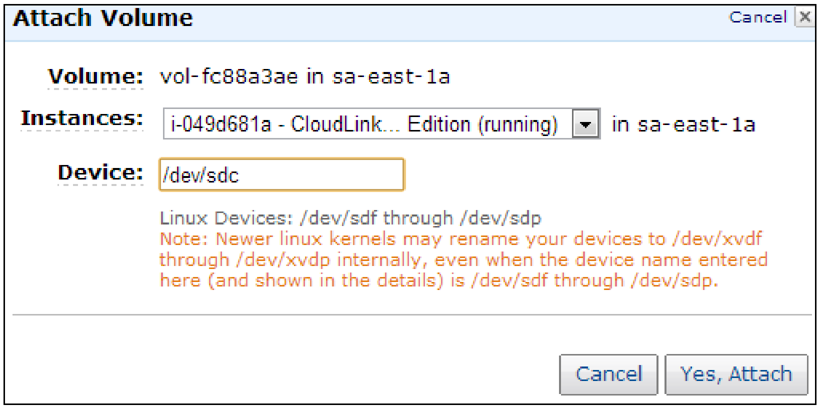
| | Name | Volume ID | Capacity | Volume Type | Snapshot | Created | Zone | State |
|---|---|---|---|---|---|---|---|---|
| □ | *empty* | vol-fc88a3ae | 100 GiB | standard | -- | 2013-12-02T16:22:50.194Z | sa-east-1a | ● available |

7. Right- click the volume in the list and select **Attach Volume** from the menu.

8. From the **Attach Volume** dialog, note the volume instance identifier (**vol-**).

9. From the **Instances** dropdown list, select a CloudLink instance.

10. Enter a unique volume label in the **Device** field and click **Yes, Attach**. For example:



**Attach Volume**

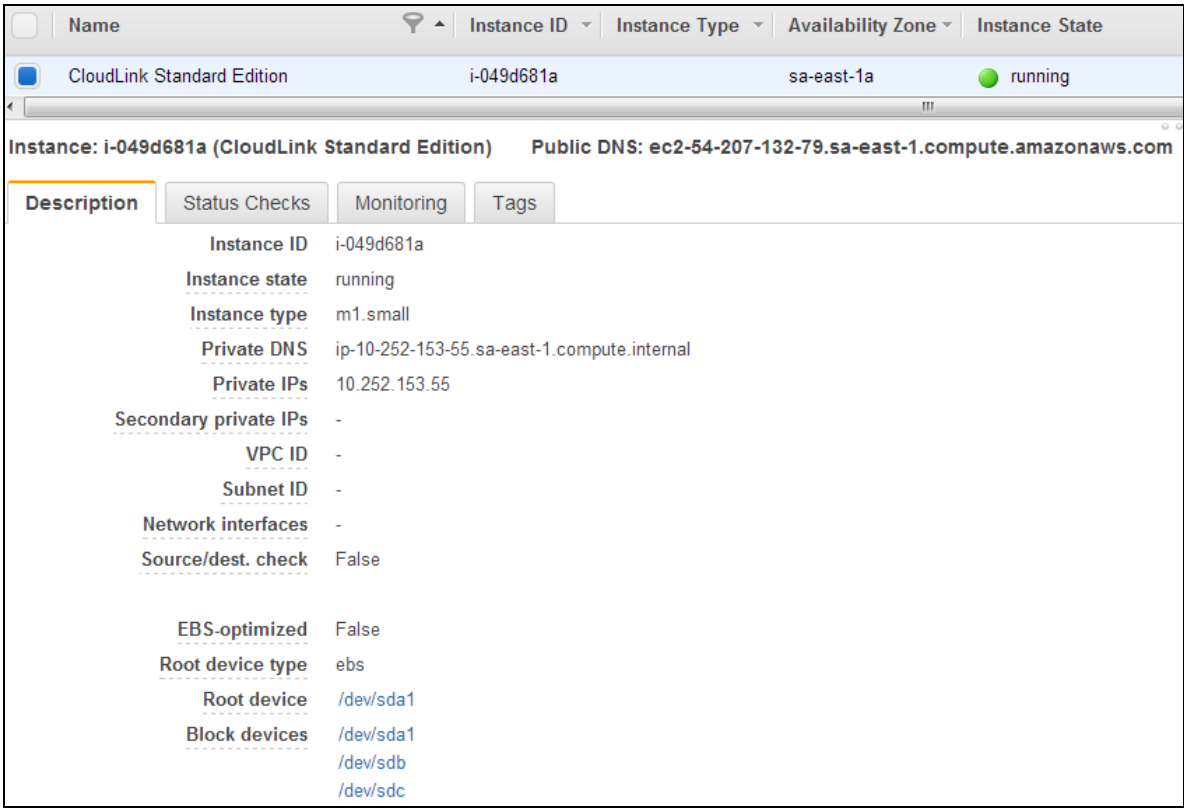
Volume: vol-fc88a3ae in sa-east-1a

Instances: i-049d681a - CloudLink... Edition (running) in sa-east-1a

Device: /dev/sdc

Linux Devices: /dev/sdf through /dev/sdp
Note: Newer linux kernels may rename your devices to /dev/xvdf through /dev/xvdp internally, even when the device name entered here (and shown in the details) is /dev/sdf through /dev/sdp.

11. Click **Instances** and observe that the new volume is listed in the **Block Devices** field of the specified CloudLink instance. For example:



| □ | Name | Instance ID | Instance Type | Availability Zone | Instance State |
|---|---|---|---|---|---|
| ■ | CloudLink Standard Edition | i-049d681a | | sa-east-1a | ● running |

Instance: i-049d681a (CloudLink Standard Edition) Public DNS: ec2-54-207-132-79.sa-east-1.compute.amazonaws.com

| | |
|---|---|
| Instance ID | i-049d681a |
| Instance state | running |
| Instance type | m1.small |
| Private DNS | ip-10-252-153-55.sa-east-1.compute.internal |
| Private IPs | 10.252.153.55 |
| Secondary private IPs | - |
| VPC ID | - |
| Subnet ID | - |
| Network interfaces | - |
| Source/dest. check | False |
| EBS-optimized | False |
| Root device type | ebs |
| Root device | /dev/sda1 |
| Block devices | /dev/sda1<br>/dev/sdb<br>/dev/sdc |

12. Log in to CloudLink Center on the CloudLink instance as a *secadmin* user (see *2.1 Connecting to CloudLink Center over the Web* on page 7).

13. From the **Topology Tree**, select the CloudLink instance.

14. Click the **Storage** tab and then the **Configuration** tab.

15. From the **Options** panel, select **Volumes**.

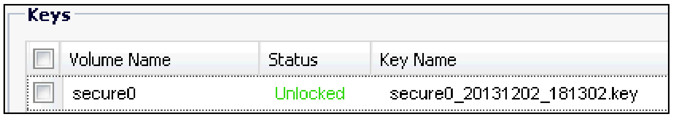
16. In the storage volumes table, select all volumes.

17. Right-click a volume and select **Rescan**. Wait until the operation is complete.

18. From the **Options** panel, select **Key**.

19. Right-click the new volume and select **Format**. Check the **Action** log status.

20. Once the format is complete, observe that a new key has been assigned to the volume. For example:



Keys

| □ | Volume Name | Status | Key Name |
|---|---|---|---|
| □ | secure0 | Unlocked | secure0_20131202_181302.key |

21. Test read/write access to the new encrypted storage volume (see *3.6 Accessing Secure Storage* on page 45).

22. You should log the CloudLink instance configuration on a worksheet and keep the worksheet in a safe place. A worksheet template is provided in the *CloudLink Amazon Web Services Deployment Guide*.

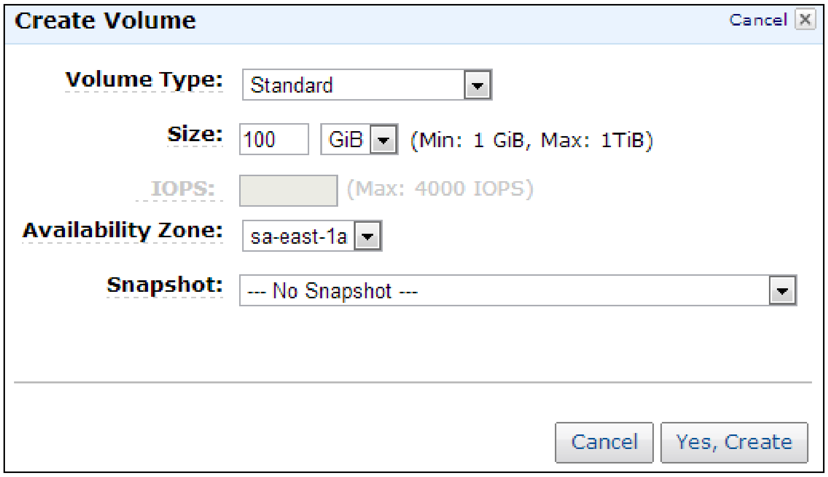
## 3.2.2 Adding Volumes to a Merged Volume Configuration

From the EC2 console you create a new volume and attach the new volume to the CloudLink instance. You then access CloudLink Center and then perform a volume resize and rescan to increase the encrypted capacity.

**NOTE:** Increasing encrypted storage capacity in a merged volume configuration should be performed during system maintenance periods. Storage access is not available during the volume expansion operation.

**To add a storage volume to a CloudLink instance with a merged volume configuration:**

1. Log on to the AWS Marketplace with your AWS account credentials.
2. Access the EC2 console and select **Volumes**.
3. Click **Create Volume**.
4. From the **Create Volume** dialog, enter the **Volume Type**, **Size**, **and Availability Zone**. Do not select **Snapshot** as this feature is not supported in merged volume configurations. For example:



Volume Type: Standard

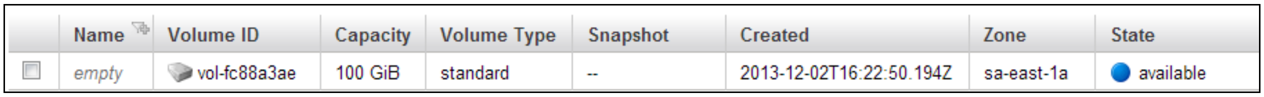
Size: 100 GiB (Min: 1 GiB, Max: 1TiB)

IOPS: (Max: 4000 IOPS)

Availability Zone: sa-east-1a

Snapshot: --- No Snapshot ---

5. Click **Yes, Create**.
6. Observe the presence of the new volume in the volume list. For example:



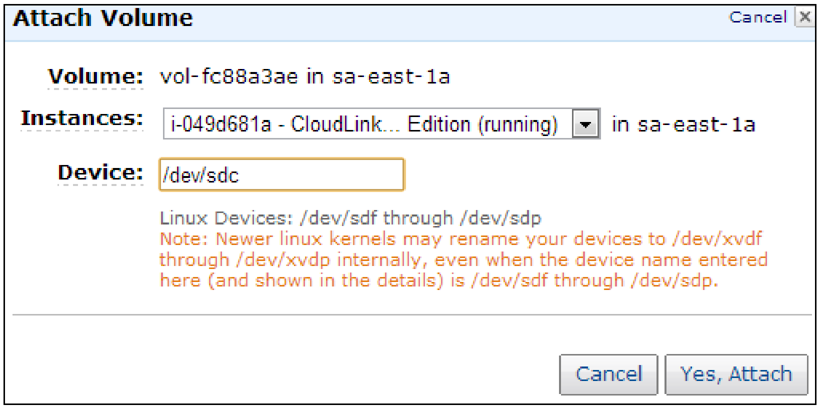
| | Name | Volume ID | Capacity | Volume Type | Snapshot | Created | Zone | State |
|---|---|---|---|---|---|---|---|---|
| □ | *empty* | vol-fc88a3ae | 100 GiB | standard | -- | 2013-12-02T16:22:50.194Z | sa-east-1a | ● available |

7. Right- click the volume in the list and select **Attach Volume** from the menu.

8. From the **Attach Volume** dialog, note the volume instance identifier (**vol-**).

9. From the **Instances** dropdown list, select a CloudLink instance.

10. Enter a unique volume label in the **Device** field and click **Yes, Attach**. For example:



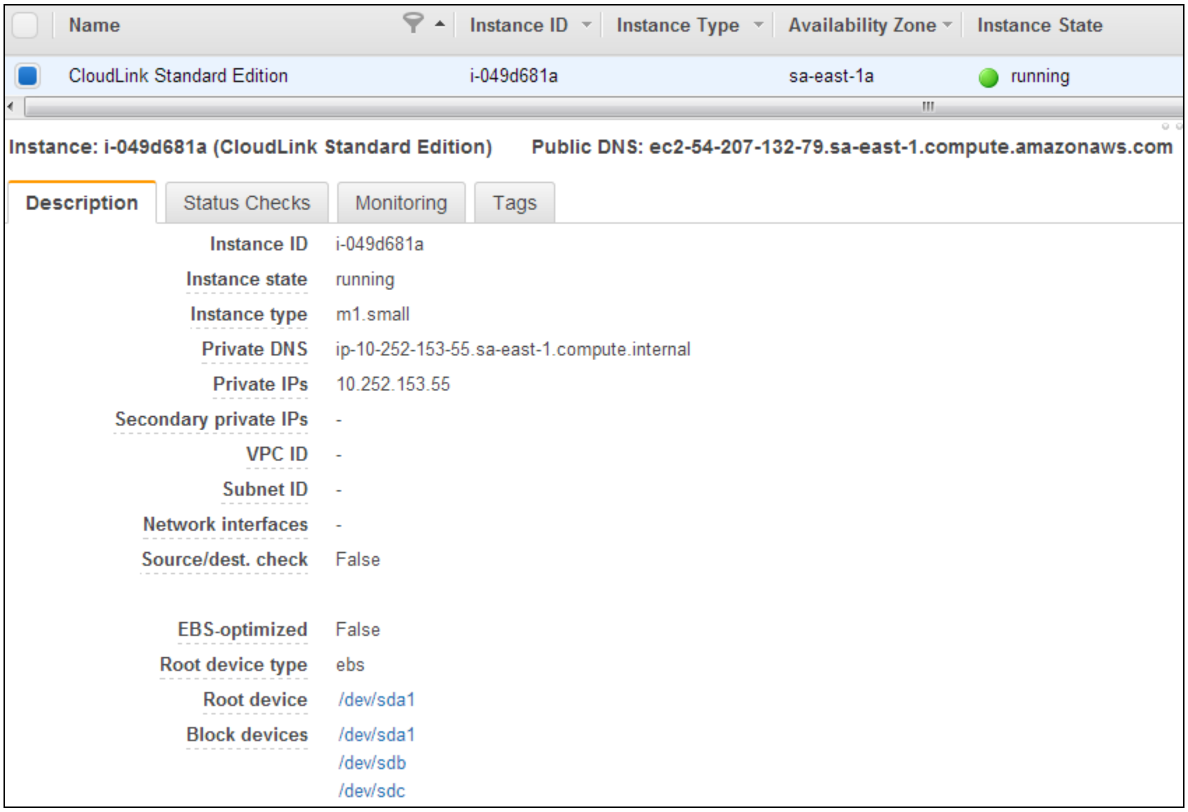
**Volume:** vol-fc88a3ae in sa-east-1a

**Instances:** i-049d681a - CloudLink... Edition (running) in sa-east-1a

**Device:** /dev/sdc

Linux Devices: /dev/sdf through /dev/sdp
Note: Newer linux kernels may rename your devices to /dev/xvdf through /dev/xvdp internally, even when the device name entered here (and shown in the details) is /dev/sdf through /dev/sdp.

11. Click **Instances** and observe that the new volume is listed in the **Block Devices** field of the specified CloudLink instance. For example:



| | Name | Instance ID | Instance Type | Availability Zone | Instance State |
|---|---|---|---|---|---|
| ■ | CloudLink Standard Edition | i-049d681a | | sa-east-1a | ● running |

**Instance: i-049d681a (CloudLink Standard Edition)** **Public DNS: ec2-54-207-132-79.sa-east-1.compute.amazonaws.com**

| | |
|---|---|
| Instance ID | i-049d681a |
| Instance state | running |
| Instance type | m1.small |
| Private DNS | ip-10-252-153-55.sa-east-1.compute.internal |
| Private IPs | 10.252.153.55 |
| Secondary private IPs | - |
| VPC ID | - |
| Subnet ID | - |
| Network interfaces | - |
| Source/dest. check | False |
| EBS-optimized | False |
| Root device type | ebs |
| Root device | /dev/sda1 |
| Block devices | /dev/sda1<br>/dev/sdb<br>/dev/sdc |

12. Log in to CloudLink Center on the CloudLink instance as a *secadmin* user (see *2.1 Connecting to CloudLink Center over the Web* on page 7).

13. From the **Topology Tree**, select the CloudLink instance.

14. Click the **Storage** tab and then the **Configuration** tab.

15. From the **Options** panel, select **Volumes**.

16. In the storage volumes table, select all volumes.

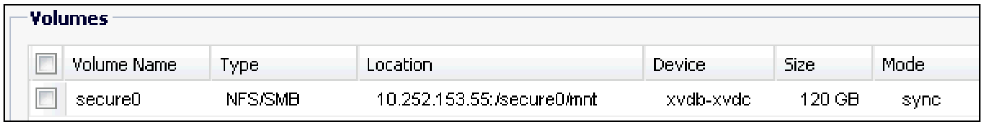
17. Right-click a volume and select **Rescan**. Wait until the operation is complete. Check the **Action** log status. When the **Rescan** operation is complete, the action details contain the message "**Resize required**".

> **NOTE:** The **Rescan** option will appear only if all disks are selected.

18. In the **Volumes** panel, right-click a volume and select **Resize**.

19. In the **Confirmation** window, click **Yes** to confirm the storage volume resize action.

20. Wait until the operation is complete. Check the **Action** log status. When the **Resize** operation is complete, the new volume size will be reflected in the volumes table. For example:



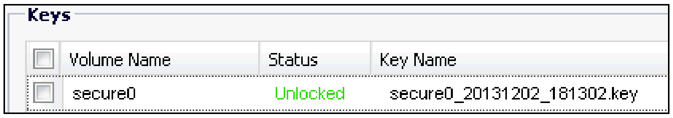
Volumes

| □ | Volume Name | Type | Location | Device | Size | Mode |
|---|---|---|---|---|---|---|
| □ | secure0 | NFS/SMB | 10.252.153.55:/secure0/mnt | xvdb-xvdc | 120 GB | sync |

21. From the **Options** panel, select **Key**.

22. Right-click the new volume and select **Format**. Check the **Action** log status.

23. Once the format is complete, observe that a new key has been assigned to the volume. For example:



Keys

| □ | Volume Name | Status | Key Name |
|---|---|---|---|
| □ | secure0 | Unlocked | secure0_20131202_181302.key |

24. You should log the CloudLink instance configuration on a worksheet and keep the worksheet in a safe place. A worksheet template is provided in the *CloudLink Amazon Web Services Deployment Guide*.

25. Test read/write access to the encrypted storage volumes (see *3.6 Accessing Secure Storage* on page 45).

## 3.3 Managing User Accounts

CloudLink Center defines three user roles: *secadmin, admin,* and *observer*. The default user credentials for CloudLink Center are as follows:

**User name**: *secadmin*

**Password**: *AWS instance ID*

The *secadmin* user has full access to all CloudLink Center functionality including user account management.

**WARNING:** For security purposes, you should change the default *secadmin* password to prevent unauthorized access. For more information, see *Changing Local User Account Passwords* on page 22.

### 3.3.1 User Accounts

Each person who needs to work with CloudLink must have a user account in CloudLink Center. The access role of a CloudLink Center user account defines what functions the user is permitted to perform in the CloudLink system.

You can create two types of CloudLink Center user accounts:

- **Local accounts**: These user accounts exist in and are applicable only to the ClouldLink system.
- **Domain accounts**: Rather than creating users specifically for your CloudLink needs, you can reuse existing user accounts in your organization’s Microsoft Active Directory (AD) domain and assign those accounts the appropriate CloudLink Center access role.

> **NOTE:** Before you can add Domain accounts, you must configure an Active Directory (AD) Domain. For more information, see *Configuring an AD Domain for User Accounts* on page 23.

User account parameters are as follows:

- **User Name**: Name to identify the user in the system.
- **Access Role**: The access roles are *secadmin*, *admin*, and *observer*.
    - The *secadmin* user has full access to all CloudLink Center functionality, including secure storage management and key store configuration. This user can create user accounts in CloudLink Center and change passwords for users. The *secadmin* user is the only user who is authorized to see the Security Events log.
    - The *admin* user has full access to all CloudLink Center functionality, except secure storage

management and key store configuration. The *admin* user can not see the Security Events log. This user can change the passwords for *admin* and *observer* users.

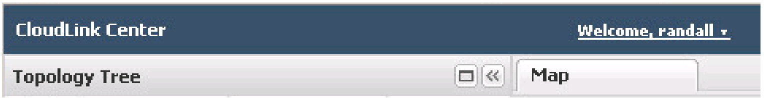
- The *observer* user can monitor statistics on the CloudLink Center and view test results.

For information on the available options for each access role, see *Appendix D: CloudLink Tabs and Options* on page 70.

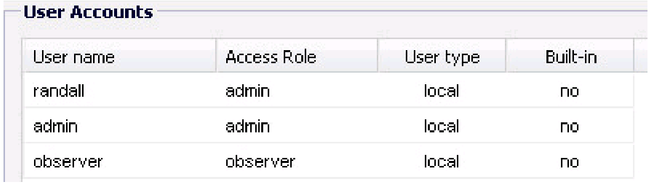
- **User Type**: The options are **local** and **domain**. If you select **domain**, the user will be able to reuse the password from the domain user account to log on to CloudLink Center. If you select **local**, the user must enter a password to access CloudLink Center.

## 3.3.2 Verifying Your Access Role for the Current Session

To verify your access role for the current CloudLink Center session, note the current session user name in the top right corner of the CloudLink Center window, For example:



Then follow the instructions in section *3.3.3 Viewing Current User Accounts* on page 20 and correlate the current session user name with the user account **Access Role** in **the User Accounts** panel. For this example, user *randall* has the *admin* access role as part of a local account.



User Accounts

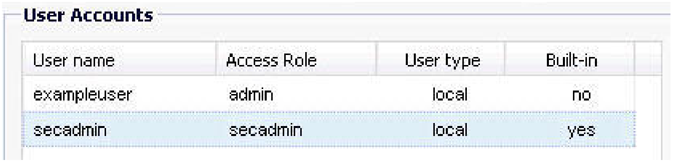
| User name | Access Role | User type | Built-in |
|---|---|---|---|
| randall | admin | local | no |
| admin | admin | local | no |
| observer | observer | local | no |

## 3.3.3 Viewing Current User Accounts

**To view the current user accounts, proceed as follows:**

1. From the **Topology Tree**, select a CloudLink instance.
2. Click the **Administration** tab.
3. From the **Options panel**, click **User Accounts**.

4. Observe the current user accounts. The **Built-in** column displays **yes** for the default user account *secadmin*. For example:



User Accounts

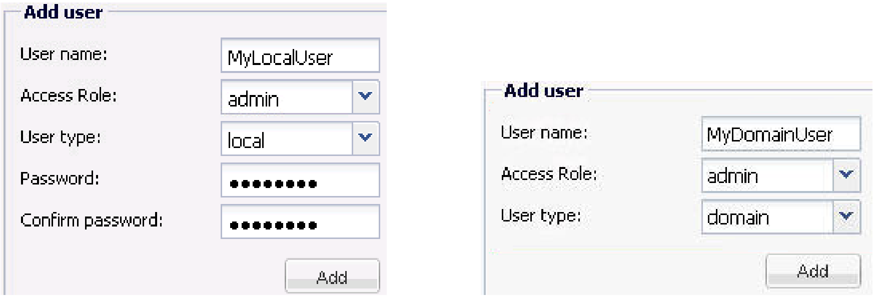
| User name | Access Role | User type | Built-in |
|---|---|---|---|
| exampleuser | admin | local | no |
| secadmin | secadmin | local | yes |

## 3.3.4 Adding User Accounts

**To add user accounts, proceed as follows:**

1. Log in as a *secadmin* or *admin* user (see *2.1 Connecting to CloudLink Center over the Web* on page 7).
2. From the **Topology Tree**, select a CloudLink instance.
3. Click the **Administration** tab
4. From the **Options** panel, click **User Accounts**.
5. From the **Add User** panel, select a user type from the **User Type** list (*Figure 3-1*). See *User Accounts* on page 19 for a description of the available user types.
6. Enter a user name. If the user type is **domain**, enter the exact user name from the domain user account. If the specified user name is not found in the Active Directory, the system displays an error message. For information on Active Directory domains, see *Configuring an AD Domain for User Accounts* on page 23.
7. From the **Access Role** list, select a role for the user. See *User Accounts* on page 19 for a description of the access roles.
8. For **local** user types, enter a password for the user. The password must be at least 6 characters long.
9. Click **Add** to add a user to the **User Accounts** panel.

**Figure 3-1: Adding user accounts (local and domain)**



Add user

User name: MyLocalUser

Access Role: admin

User type: local

Password: ●●●●●●●●

Confirm password: ●●●●●●●●

Add user

User name: MyDomainUser

Access Role: admin

User type: domain

## 3.3.5 Changing Local User Account Passwords

As a *secadmin* user, you can change the CloudLink Center password of all non-domain users without entering the current user account password. As an *admin* user, you must enter the current user password before changing the password of an *admin* or *observer* user. Observer account users cannot change their passwords.

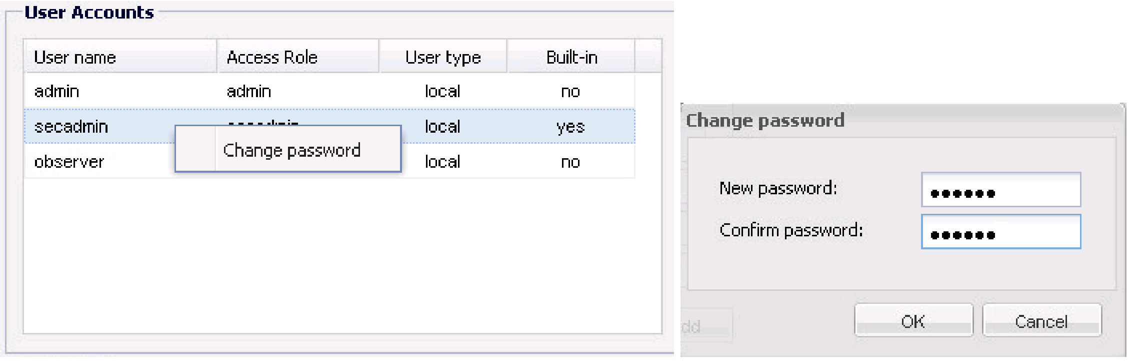
### To change CloudLink Center user passwords:

1. Log in as a *secadmin* or *admin* user (see *2.1 Connecting to CloudLink Center over the Web* on page 7).
2. From the **Topology Tree**, select a CloudLink instance.
3. Click the **Administration** tab.
4. From the **Options** panel, select **User Accounts**.

> **NOTE:** When logged in as an *admin* user, only the *admin* and *observer* accounts are visible from the **User Accounts** panel.

5. In the **User name** list, right-click a user account and click **Change password** (*Figure 3-2* and *Figure 3-3*).

**Figure 3-2: Changing a password (secadmin users)**



User Accounts

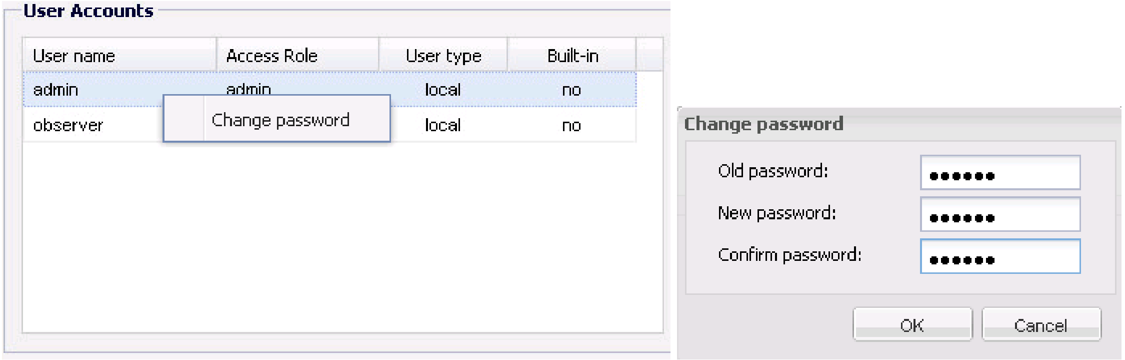
| User name | Access Role | User type | Built-in |
|---|---|---|---|
| admin | admin | local | no |
| secadmin | secadmin | local | yes |
| observer | | local | no |

Change password

New password: ●●●●●●

Confirm password: ●●●●●●

**Figure 3-3: Changing a password (admin users)**



User Accounts

| User name | Access Role | User type | Built-in |
|---|---|---|---|
| admin | admin | local | no |
| observer | | local | no |

Change password

Old password: ●●●●●●

New password: ●●●●●●

Confirm password: ●●●●●●

6. In the **Change password** window**,** type the current password if required and then type and confirm the new password.

7. Click **OK**.

## 3.3.6 Configuring an AD Domain for User Accounts

Rather than creating users specifically for your CloudLink needs, you can reuse existing user accounts in your organization's Microsoft Active Directory (AD) domain and assign those accounts the appropriate CloudLink Center access roles if the AD is accessible from the VPC environment.

**To configure an Active Directory domain for user accounts:**

1. Log in as a *secadmin* or *admin* user (see *2.1 Connecting to CloudLink Center over the Web* on page 7).

2. From the **Topology Tree**, select a CloudLink instance.

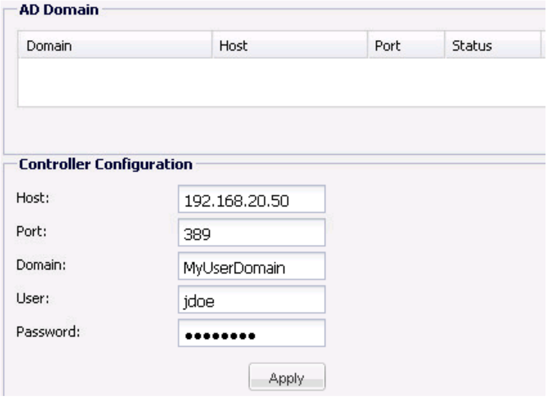
3. Click the **Administration** tab.

4. From the **Options** panel, click **AD Domain**.

5. In the **Controller Configuration** panel, specify the Active Directory parameters:

| | |
|---|---|
| **Host:** | The Active Directory host IP address (the Active Directory host is a Windows Server where the Active Directory is configured). |
| **Port:** | The TCP port number configured on the Active Directory host. |
| **Domain:** | Domain name configured on the Active Directory host. |
| **User:** | A user name configured on the Active Directory host. |
| **Password:** | Password configured for the user. |

6. Click **Apply** to use the configured Active Directory user names and passwords for CloudLink Center. For example:



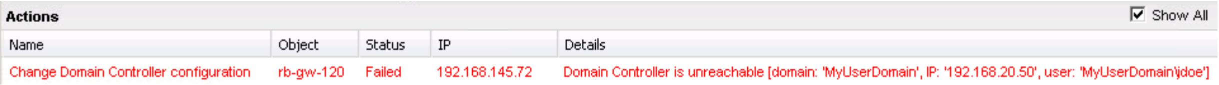
**AD Domain**

| Domain | Host | Port | Status |
|---|---|---|---|

**Controller Configuration**

| | |
|---|---|
| Host: | 192.168.20.50 |
| Port: | 389 |
| Domain: | MyUserDomain |
| User: | jdoe |
| Password: | •••••••• |

7. The Domain status is **Inaccessible** in red if the Active Directory host cannot be reached because of a network problem or incorrectly configured IP, or if there is a problem authenticating the configured user. While the Active Directory is inaccessible, all domain login attempts are disabled. Check the Action logs to determine why the domain is inaccessible. For example:



**Actions** ☑ Show All

| Name | Object | Status | IP | Details |
|---|---|---|---|---|
| Change Domain Controller configuration | rb-gw-120 | Failed | 192.168.145.72 | Domain Controller is unreachable [domain: 'MyUserDomain', IP: '192.168.20.50', user: 'MyUserDomain\jdoe'] |

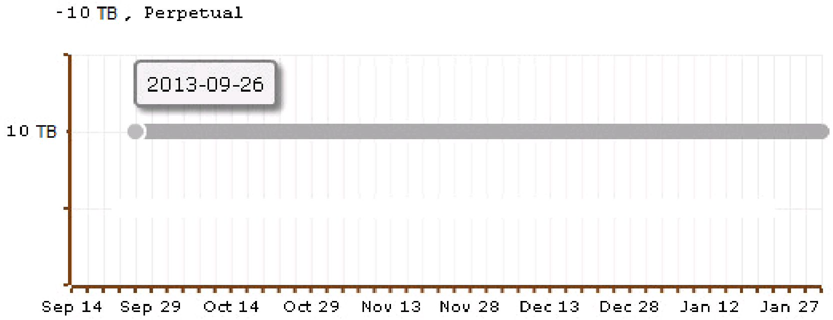
> **NOTE:** If Active Directory is inaccessible, it may take a few seconds to redisplay the **AD Domain** table.

## 3.4 Assigning Storage Licenses

Storage licenses allow control of storage space on CloudLink instances. The storage license variables include the customer domain, type of storage, platform, the amount of storage, and the active timeframe for the storage space. The CloudLink AMI includes a pre-packaged perpetual license which needs to be assigned to the volume before access to CloudLink encrypted storage is possible.

**To assign a storage license to a CloudLink instance:**

1. Log in as a *secadmin* or *admin* user (see *2.1 Connecting to CloudLink Center over the Web* on page 7).
2. From the **Topology Tree**, select a CloudLink instance.
3. Select the **Storage** tab.
4. From the **Options** panel, select the **License** option.
5. From the License **Assignment** panel, select a storage license from the **Available Licenses** dropdown list. Only valid licenses are displayed in the list.
6. Click **Assign** to assign the storage license.
7. Observe the graph in the License Usage panel. For example:



## 3.5 Managing Secure Storage

Each CloudLink instance can provide one or more encrypted EBS volumes. The volumes are encrypted using a default encryption key. You must change the default encryption key before using the encrypted storage. CloudLink provides three options to store encryption keys (Key Store):

- Local (the default Key Store)
- Active Directory
- RSA Data Protection Manager (DPM)

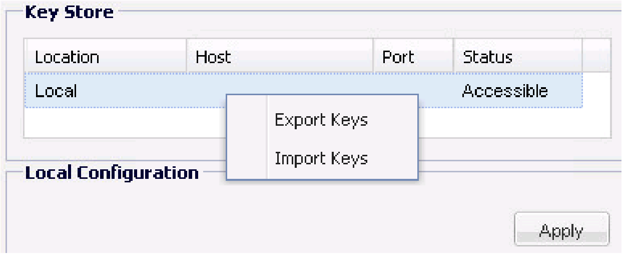
This section covers the following topics:

- *Local Key Store*
- *Active Directory and RSA DPM Key Store*
- *Managing Encryption Key Store*
- *Managing Secure Storage*
- *Configuring NFS/SMB Access to Secure Storage*
- *Configuring iSCSI Access to Secure Storage*
- *Viewing Storage Volumes*
- *Changing the Volume Type*
- *Changing a Volume Name*
- *Viewing Storage Statistics for a Volume*
- *Merging Volumes*
- *Splitting Volumes*
- *Changing the Volume Write Mode*
- *Formatting the Volumes*

**NOTE:** You cannot delete a volume from CloudLink Center.

### 3.5.1 Local Key Store

By default, the *Local* key store is used and all volume encryption keys are stored in the CloudLink instance. The Local key store must be used for EC2 deployments. A *secadmin* user can save and restore the keys using the **Export Keys** and **Import Keys** options available from the CloudLink Center **Security → Key Store** panel. For example:



Key Store

| Location | Host | Port | Status |
|---|---|---|---|
| Local | | | Accessible |

To retain access to your data in case of an unrecoverable failure of the CloudLink instance, you should back up the encryption keys on a regular basis and stored them in a *secure* environment. Upon an unrecoverable failure of your CloudLink instance, you can terminate the failed instance, launch a new instance, and attach the existing EBS volumes to the new instance. You then import the keys and restore access to the volumes. For information on how to migrate storage volumes to another CloudLink instance, refer to the *CloudLink Amazon Web Services Deployment Guide*.

### 3.5.2 Active Directory and RSA DPM Key Store

In VPC environments, to use Active Directory or RSA DPM for the CloudLink key store, AD or the RSA DPM must be accessible from the CloudLink instance. For information on configuring an Active Directory on a Windows Server, see *Appendix A: Configuring AD for Key Store* on page 65. For information on configuring RSA DPM, see *Appendix B: RSA DPM Configuration* on page 67.

**NOTE:** All encryption key and storage management operations require the *secadmin* user account. The storage state and storage statistics can also be viewed by *admin* and *observer* users.

The keys are preserved when changing from Local to AD, Local to RSA DPM, AD to RSA DPM, and from AD to Local.

**WARNING:** Other key change combinations are not supported.

## 3.5.3 Managing Encryption Key Store

Merged volumes are encrypted with a single encryption key. Unique encryption keys are used to encrypt each volume in a split volume configuration. You can trigger automatic encryption key changes based on a time interval. For example, if you specify an interval of eight hours, new encryption keys will be generated and assigned to all storage volumes every eight hours.

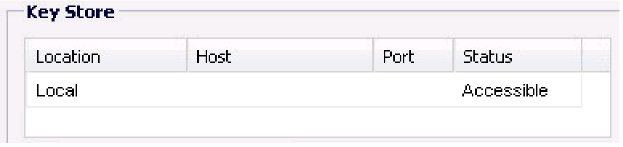
The specified interval applies only to those storage volumes that have encryption keys. Changing encryption keys manually does not affect the schedule for automatically generating and changing encryption keys for the specified interval. Changing the key store type does not affect the schedule for automatically generating and changing encryption keys.

This section shows you how to:

- Display the current location of the encryption key store.
- Configure Active Directory as the CloudLink key store location.
- Configure RSA DPM as the CloudLink key store location.
- Specify the interval for changing the storage volume encryption keys.

**To display the current location of the encryption key store:**

1. Log in as a *secadmin* user (see *2.1 Connecting to CloudLink Center over the Web* on page 7).
2. From the **Topology Tree**, select a CloudLink instance.
3. Click the **Security** tab and then the **Key Store** tab. For example:



Key Store

| Location | Host | Port | Status |
|---|---|---|---|
| Local | | | Accessible |

**To configure Active Directory as the CloudLink key store location:**

1. Configure Active Directory as outlined in *Appendix A: Configuring AD for Key Store* on page 65.
2. Log in as a *secadmin* user (see *2.1 Connecting to CloudLink Center over the Web* on page 7).
3. From the **Topology Tree**, select a CloudLink instance.
4. Click the **Security** tab and then the **Key Store** tab.

5. From the **Options** panel, click **Active Directory**.

6. In the **Active Directory Configuration** panel, specify the Active Directory parameters:

**Host:** The Active Directory host IP address (the Active Directory host is a Windows Server where the Active Directory is configured).

**Base DN:** Base domain name configured on the Active Directory host.

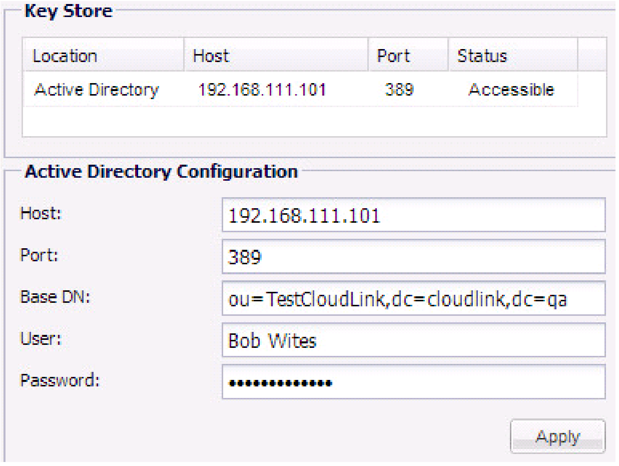
**Port:** The TCP port number configured on the Active Directory host.

**User:** A domain user name configured on the Active Directory host. This user account will be used to search the AD.

**Password:** Password configured for the user on the Active Directory host.

**NOTE:** The Base DN, Port, User, and Password parameters are part of the Active Directory configuration of a Windows Server.

7. Click **Apply** to use the configured Active Directory for storage of CloudLink encryption keys. For example:



Key Store

| Location | Host | Port | Status |
|---|---|---|---|
| Active Directory | 192.168.111.101 | 389 | Accessible |

Active Directory Configuration

Host: 192.168.111.101
Port: 389
Base DN: ou=TestCloudLink,dc=cloudlink,dc=qa
User: Bob Wites
Password: ••••••••••••••

The Key Store status is **Inaccessible** in red if the Active Directory host cannot be reached because of a network problem or incorrectly configured IP, or if there is a problem authenticating the configured user. Check the *Action logs* to determine why the key store is inaccessible.

If the storage was unlocked when the AD became inaccessible, it will stay unlocked. If after the AD became inaccessible, the instance which hosts the storage is restarted, the storage would become locked. The storage will be unlocked when the AD becomes available.

**NOTE:** If Active Directory is inaccessible, it may take a few seconds to redisplay the **Key Store** tab.

### To configure RSA DPM as the CloudLink key store location:

1. Verify that the RSA DPM server is reachable from CloudLink via its private LAN network interface. The supported RSA DPM versions are 3.2 and 3.5.

2. Verify that the client certificates have been created and uploaded to the RSA DPM server, and that they are accessible from CloudLink.

3. Log in as a *secadmin* user (see *2.1 Connecting to CloudLink Center over the Web* on page 7).

   **NOTES:**

   - If a security class for the RSA DPM client is *not* configured, see *Appendix B: RSA DPM Configuration* on page 67.
   - An instance can only register once with RSA DPM. To re-register an instance, you must either change the instance hostname or delete instance from the DPM server database.

4. From the **Topology Tree**, select a CloudLink instance.
5. Click the **Security** tab and then the **Key Store** tab.
6. From the **Options** panel, click **RSA DPM**.
7. In the **RSA DPM Configuration** panel, specify the RSA DPM parameters:

   **Host:** The RSA DPM host IP address.

   **Port:** The TCP port number configured on the RSA DPM host (default port is 443).

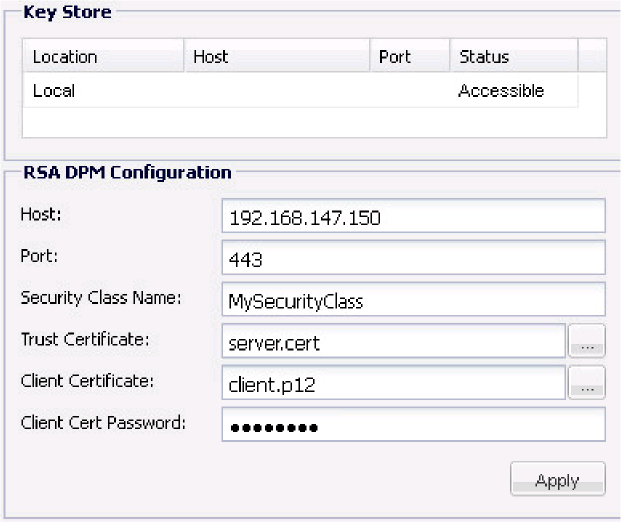
   **Security Class Name:** The name of the security class configured on the RSA DPM host for the RSA DPM client.

   **Trust Certificate:** The RSA DPM server certificate.

   **Client Certificate:** The RSA DPM client certificate.

   **Password:** The password used during the RSA DPM client certificate creation.

8. Click **Apply**. For example:



Key Store

| Location | Host | Port | Status |
|---|---|---|---|
| Local | | | Accessible |

RSA DPM Configuration

Host: 192.168.147.150

Port: 443

Security Class Name: MySecurityClass

Trust Certificate: server.cert

Client Certificate: client.p12

Client Cert Password: ●●●●●●●●

The Key Store status is **Inaccessible** in red if the RSA DPM host cannot be reached because of a network problem or incorrectly configured IP, or if there is a problem authenticating the configured user. Check the *Action logs* to determine why the key store is inaccessible.

If the storage was unlocked when the host became inaccessible, it will stay unlocked. If after the host became inaccessible, the instance which hosts the storage is restarted, the storage would become locked. The storage will be unlocked when the host becomes available.

### To specify the interval for changing the storage volume encryption keys:

1. Log in as a *secadmin* user (see *2.1 Connecting to CloudLink Center over the Web* on page 7).
2. From the **Topology Tree**, select a CloudLink instance.
3. Click the **Security** tab and then the **Key Store** tab.
4. From the **Options** panel, click **Schedule**.
5. In the **Key change interval, hours** list, select one of the options (**Disabled**, **8**, **12, 24**, or **Custom**). Select **Custom** to specify a customer interval from 1 to 1,000 hours. To disable key changes, select **Disabled**.
6. Click **Apply**.

## 3.5.4 Managing Secure Storage

Most storage operations are available only after the storage license is applied to the storage volume.

**To view or modify the storage state on the CloudLink instance:**

1. Log in as a *secadmin* user (see *2.1 Connecting to CloudLink Center over the Web* on page 7).
2. From the **Topology Tree**, select a CloudLink instance with storage attached.
3. Click the **Storage** tab and then the **Configuration** tab.
4. From the **Options** panel, click **Key**.

   Two panels are displayed on the right: **Key Store** and **Keys**.

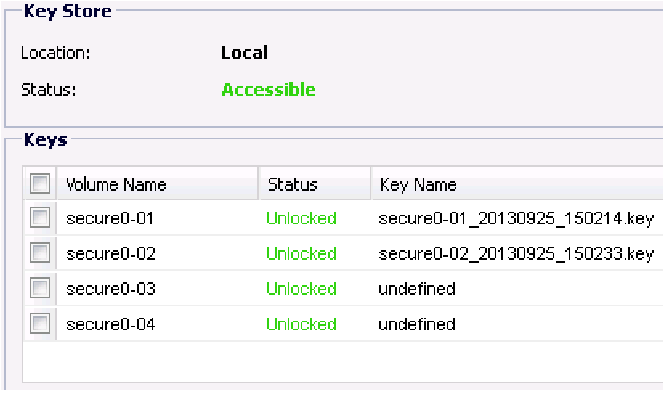
   - The **Key Store** panel shows the currently used key store location (*Local*, *Active Directory* or *RSA DPM*) and its status (*Accessible* or *Inaccessible*).
   - The **Keys** table shows the list of all configured storage volumes, status (*Locked* or *Unlocked*) and the currently used key name for each volume).

   The secure storage volume name format depends on what storage mode is in use:

   - If you opted to have each virtual disk assigned to the CloudLink instance presented as a separate encrypted volume, the storage volume name will have the following format:

     **secure***hostId***-***targetId*

     where *hostId* and *targetId* refer to the host number and target identifier you selected when assigning a hard disk. For example, if you selected **SCSI (0:1)**, select the volume labelled **secure0-01**. For example:



**Key Store**

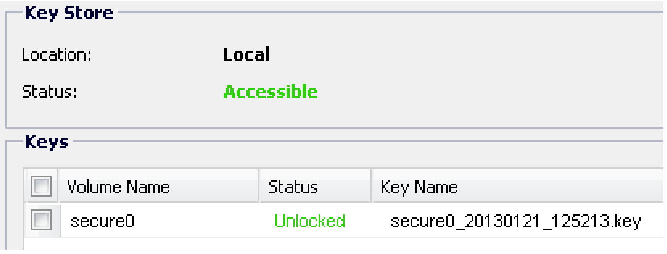
Location: **Local**

Status: **Accessible**

**Keys**

| ☐ | Volume Name | Status | Key Name |
|---|---|---|---|
| ☐ | secure0-01 | Unlocked | secure0-01_20130925_150214.key |
| ☐ | secure0-02 | Unlocked | secure0-02_20130925_150233.key |
| ☐ | secure0-03 | Unlocked | undefined |
| ☐ | secure0-04 | Unlocked | undefined |

- If you opted to merge all virtual disks assigned to the CloudLink instance so that they are presented as a single encrypted volume, the storage volume name will be **secure0**. For example:



Key Store

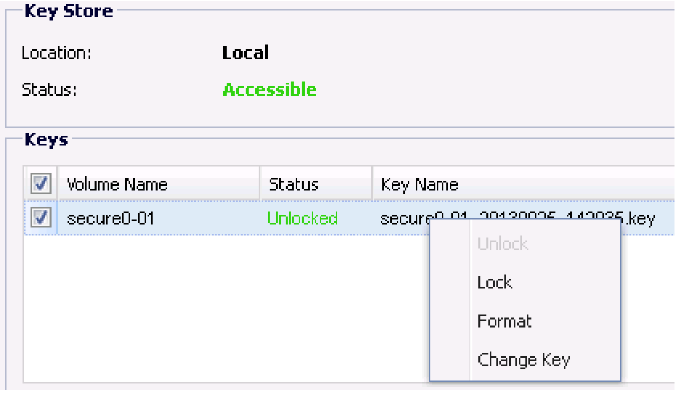
Location: Local

Status: Accessible

Keys

| ☐ | Volume Name | Status | Key Name |
|---|---|---|---|
| ☐ | secure0 | Unlocked | secure0_20130121_125213.key |

5. Right-click on the key in the **Keys** panel to see a list of the available management commands for the corresponding storage volume. For example:



Key Store

Location: Local

Status: Accessible

Keys

| ☑ | Volume Name | Status | Key Name |
|---|---|---|---|
| ☑ | secure0-01 | Unlocked | secure0-01_20130926_142035.key |

The commands are as follows:

| Command | Description |
|---|---|
| **Unlock** | Opens (unlocks) the encrypted storage volume for use.<br>Each volume is unlocked independently. |
| **Lock** | Closes (locks) the storage volume to make it unavailable for use.<br>Each volume is locked independently. |
| **Format** | Forces unlocking of the storage volume with a new key, formats the disk, and makes old data unusable.<br>Formatting a volume has no effect on other volumes. |

| Command | Description |
|---|---|
| **Change Key** | Changes a previously generated key. This command can be executed only if the storage volume is unlocked.<br>For CloudLink instance with multiple volumes, the Change Key operation affects only the selected volume.<br>The key secures storage access. The key is not used to encrypt the stored data. |

You can see the result of each storage operation by viewing the Actions, Events, and Security Events logs. For more information, see *Logs and Events* on page 52.

**NOTE:** Initially, the storage status shown in the CloudLink Center is *Unlocked*, and the key name is shown as *Undefined*, which means that the storage was opened using the default encryption key. Use the **Format** operation to generate your own key.

Before using the storage, perform the **Format** operation, see *3.5.14 Formatting the Volumes* on page 45. As a result of this operation, the storage is formatted and enters the unlocked state with a new key. The key name is displayed on the **Key** tab.

**WARNING:** The **Format** operation deletes all existing data on the storage volume.

The generated key has a name in the following format:

*volumeName_yyyyMMdd_HHmmss*.**key**

where:

| | |
|---|---|
| *volumeName* | - the name of volume |
| *yyyyMMdd* | - key generation date |
| *HHmmss* | - key generation time |

For example, **secure0-01_20131008_033222.key**.

## 3.5.5 Configuring NFS/SMB Access to Secure Storage

CloudLink provides virtual machines with direct access to their encrypted storage over NFS/SMB and iSCSI. The CloudLink Access Control List (ACL) must be configured to grant access to all machines connected to the CloudLink instance. As part of deployment, AWS Security Groups are configured and therefore act as a virtual firewall to control traffic into the CloudLink instance. For more information on security groups, refer to the *CloudLink Amazon Web Services Deployment Guide*.

**To configure the ACL to provide access to the storage for *all members*:**

1. Log in as a *secadmin* user (see *2.1 Connecting to CloudLink Center over the Web* on page 7).
2. From the **Topology Tree**, select a CloudLink instance.
3. Click the **Storage** tab then the **Configuration** tab.
4. In the **Options** panel, click **Access**.
5. Select a volume from the **Volume Name** dropdown list.
6. Click the **IP Address** dropdown list, and select **Any**.

> **NOTES:**
>
> - You can also configure individual IP addresses or a range of IP addresses for the ACL.
> - All IP entries in the Access Control List must be deleted before you can select **Any**.

7. Click **Add**.

The Access Control List will display the subnet(s) that will be granted access to the secure storage.

Once access to a secure storage has been granted, the storage is made available to those devices over NFS/SMB that form part of the proper AWS security groups.

For information on how to access the secure storage, see *3.6 Accessing Secure Storage* on page 45.

### 3.5.6 Configuring iSCSI Access to Secure Storage

To access a CloudLink instance secure storage over iSCSI, you must configure CHAP credentials for use in performing *incoming* access to the iSCSI target (that is, one-way CHAP authentication).

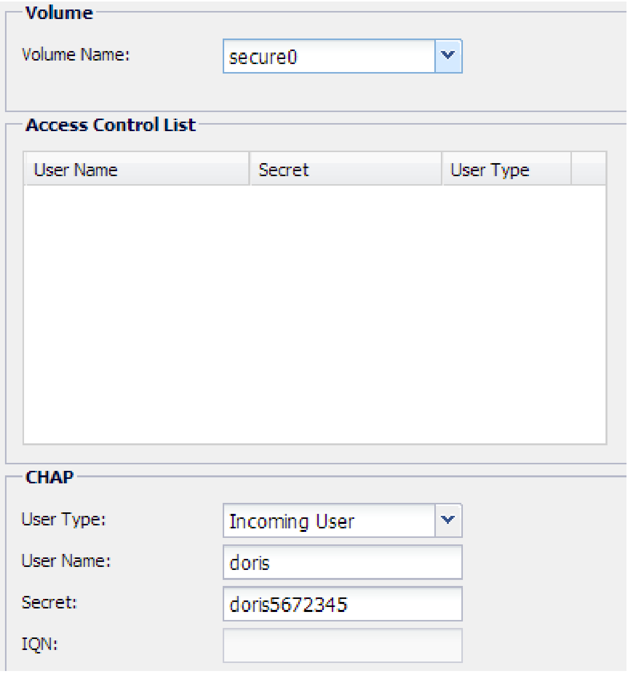
If you wish to configure mutual CHAP authentication, you can optionally configure CHAP credentials for performing *outgoing* access from the CloudLink instance to the iSCSI initiator.

This section shows you how to:

- Configure one-way CHAP authentication.
- Configure mutual CHAP authentication.
- Delete a CHAP credential from the Access Control List (ACL).

### To configure one-way CHAP authentication:

1. Log in as a *secadmin* user (see *2.1 Connecting to CloudLink Center over the Web* on page 7).
2. From the **Topology Tree**, select a CloudLink instance.
3. Click the **Storage** tab then the **Configuration** tab.
4. From the **Options** panel, click **Access**.
5. Select the encrypted volume for which you are configuring access from the **Volume Name** dropdown list in the **Volume** panel.
6. If the **Access Control List** is empty, then there are no credentials configured for accessing the iSCSI storage and the storage is therefore inaccessible. Set the ACL configuration to **Any**.
7. Enter a CHAP user name in the **User Name** field and a corresponding secret in the **Secret** field. This user name and secret combination will be used to authenticate the iSCSI initiator.
8. Select **Incoming User** in the **User Type** dropdown list and click **Add**. For example:



**Volume**

Volume Name: secure0

**Access Control List**

| User Name | Secret | User Type |
|---|---|---|

**CHAP**

User Type: Incoming User

User Name: doris

Secret: doris5672345

IQN:

**NOTES:**

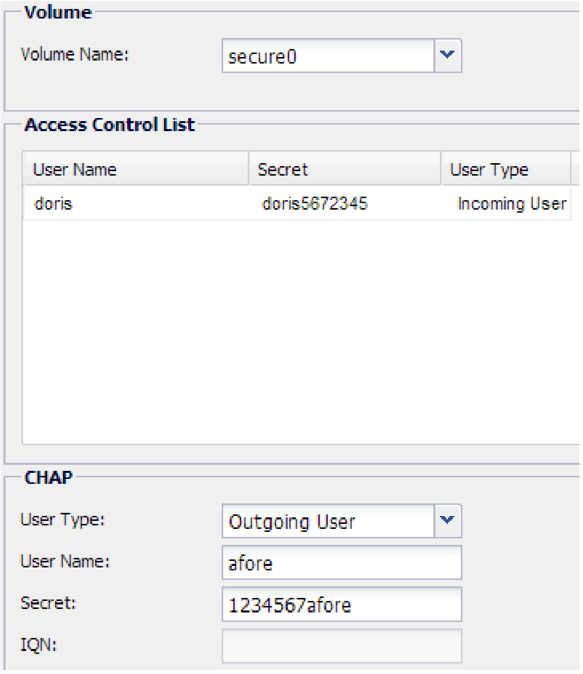
- You must configure the iSCSI initiator(s) you wish to connect to with one of the Incoming User credentials specified in the **Access Control List**.
- The iSCSI Qualified Name (**IQN)** field is not used for this release.

### To configure mutual CHAP authentication:

1. Configure one-way CHAP authentication as described in this section.

2. Enter a CHAP user name in the **User Name** field and a corresponding secret in the **Secret** field. This user name and secret combination will be used to authenticate the CloudLink iSCSI target to the initiator.

3. Select **Outgoing User** in the **User Type** dropdown list and click **Add**. For example:



Volume

Volume Name: secure0

Access Control List

| User Name | Secret | User Type |
|---|---|---|
| doris | doris5672345 | Incoming User |

CHAP

User Type: Outgoing User

User Name: afore

Secret: 1234567afore

IQN:

**NOTES:**

- You can configure only one Outgoing User credential for each volume.
- You must configure the iSCSI initiator(s) you wish to connect to with an Outgoing User credential specified in the Access Control List for mutual authentication.
- The iSCSI Qualified Name (**IQN)** field is not used for this release.

### To delete a CHAP credential from the Access Control List:

1. Log in as a *secadmin* user (see *2.1 Connecting to CloudLink Center over the Web* on page 7).

2. From the **Topology Tree**, select a CloudLink instance.

3. Click the **Storage** tab then the **Configuration** tab.

4. From the **Options** panel, click **Access**.

5. Select the encrypted volume for which you wish to delete CHAP credentials from the **Volume Name** dropdown list in the **Volume** panel.

6. In the **Access Control List,** right-click the credential you wish to delete and click **Delete**.

## 3.5.7 Viewing Storage Volumes

**To view secure storage volume information:**

1. Log in as a *secadmin* user (see *2.1 Connecting to CloudLink Center over the Web* on page 7).

2. From the **Topology Tree**, select a CloudLink instance.

3. Click the **Storage** tab then the **Configuration** tab.

4. From the **Options** panel, click **Volumes**. The **Volumes** table shows the following parameters for all existing storage volumes:

**Type**: The storage type (NFS/SMB or iSCSI).

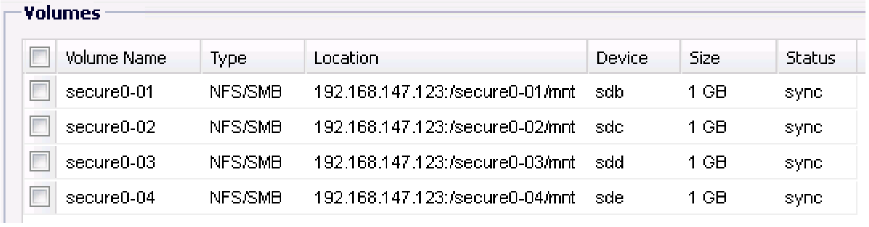
**Location:** The storage location in the format: *volumeIP /volumeName/***mnt**.

**Device:** The name of the storage device (**sd**# or **xvd**#, where # is an alphabet character, for example, *sdb* or *xvdb*).

**Size:** The storage volume size.

**Status** Represents the write mode for the storage volume: synchronous (**sync**) or asynchronous (**async**).

For example:



Volumes

| □ | Volume Name | Type | Location | Device | Size | Status |
|---|---|---|---|---|---|---|
| □ | secure0-01 | NFS/SMB | 192.168.147.123:/secure0-01/mnt | sdb | 1 GB | sync |
| □ | secure0-02 | NFS/SMB | 192.168.147.123:/secure0-02/mnt | sdc | 1 GB | sync |
| □ | secure0-03 | NFS/SMB | 192.168.147.123:/secure0-03/mnt | sdd | 1 GB | sync |
| □ | secure0-04 | NFS/SMB | 192.168.147.123:/secure0-04/mnt | sde | 1 GB | sync |

If you opted to merge all virtual disks assigned to the CloudLink instance so that they are presented as a single encrypted volume, a single volume will be displayed in the **Volumes** table. The **Device** will be shown as a range, for example, *sdb-sdd*, which means that the volume aggregates three disks: sdb, sdc, and sdd. The displayed **Size** of the multi-disk volume will represent the sum of all aggregated storage disk sizes.

## 3.5.8 Changing the Volume Type

You can change the volume type of a volume from NFS/SMB to iSCSI and from iSCSI to NFS/SMB.

Server Message Block (SMB) shares, also referred to as Common Internet File System (CIFS) shares, are primarily used in Windows operating systems.

Network File System (NFS) shares are primarily used in Unix and Linux based operating systems. When working with NFS you mount a remote folder to a local path.

The Internet Small Computer System Interface (iSCSI) provides better performance for raw I/O and is used for databases/clusters.

The results of a change in volume type are as follows:

- All data on the disk is lost.
- The storage keys are lost and the ACL configuration is lost.
- The storage write mode is set to **Sync**.

To access a CloudLink instance’s secure storage over iSCSI, you must also configure CHAP credentials for use in performing incoming access to the instance’s iSCSI target, see *Configuring iSCSI Access to Secure Storage* on page 35.

**WARNING:** Changing a volume type erases all data on the disk.

**To change the volume type for a storage volume:**

1. Log in as a *secadmin* user (see *2.1 Connecting to CloudLink Center over the Web* on page 7).
2. From the **Topology Tree**, select a CloudLink instance.
3. Click the **Storage** tab then the **Configuration** tab.
4. Click **Volumes** in the **Options** panel.
5. Right-click a NFS/SMB volume and select **Change volume type to iSCSI** or right-click an iSCSI volume and select **Change volume type to NFS/SMB**.
6. Observe that the volume type has changed in the **Volumes** panel.

**NOTES:** If the new volume type is iSCSI, you must reactivate the disk from the disk management facility on the client PC and configure CHAP credentials for use in performing access to the iSCSI target.

### 3.5.9 Changing a Volume Name

A name change affects only the name as it appears in CloudLink Center. The name change does not change the path of the storage.

**To change the volume name for a storage volume:**

1. Log in as a *secadmin* user (see *2.1 Connecting to CloudLink Center over the Web* on page 7).
2. From the **Topology Tree**, select a CloudLink instance.
3. Click the **Storage** tab then the **Configuration** tab.
4. Click **Volumes** in the **Options** panel.
5. Right-click a volume and select **Rename**.
6. Enter a new name for the volume and press the **Enter** key.

### 3.5.10 Viewing Storage Statistics for a Volume

You can view storage statistics for each encrypted volume attached to a CloudLink instance.

The following storage statistics are available in CloudLink Center in both graph and table form:

- Read/write rate (KBps)
- Read/write operations (operations/s)
- Read/write latency (ms)

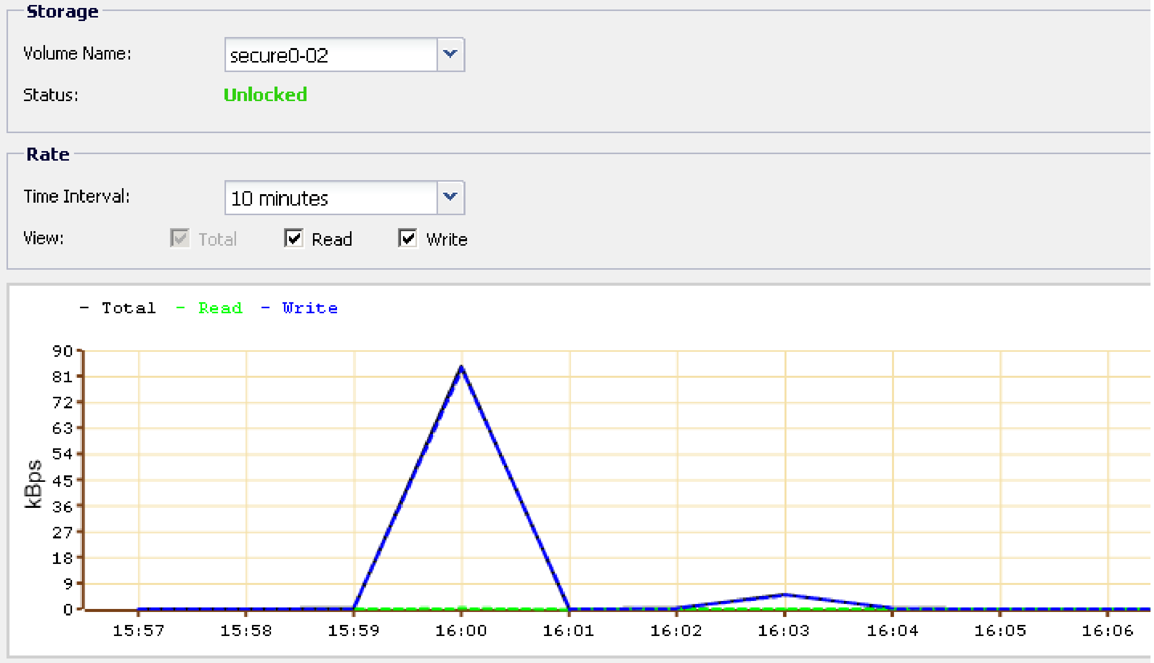
By default, the Statistics graph represents the statistics collected within the last 10 minutes. You can apply the appropriate time interval to the statistics (5 minutes, 10 minutes, 20 minutes, 30 minutes, or 1 hour). The statistics are collected every minute.

To see the traffic statistics collected over the last 24 hours, use the CloudLink Performance Report feature. For more information, see *Performance Reports* on page 50.

### To view storage statistics:

1. From the **Topology Tree**, select a CloudLink instance.
2. Click the **Storage** tab and then the **Statistics** tab.
3. In the **Volume Name** dropdown list, select a secure storage volume.
4. Use the **Read** and **Write** checkboxes to control whether read and write statistics are displayed. The graph always displays *Total* statistics which are a summary of total read and write activity.

   The storage rate statistics are displayed. For example:



Storage

Volume Name: secure0-02

Status: Unlocked

Rate

Time Interval: 10 minutes

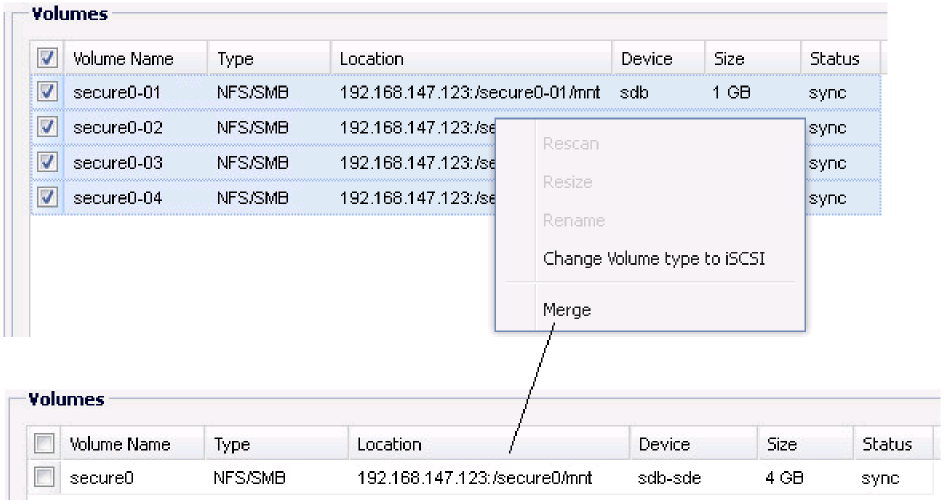
View: ☑ Total ☑ Read ☑ Write

5. In the **Time Interval** list, select an interval.
6. To view the read/write rate statistics, click **I/O Rate** in the **Options** panel.
7. To view the storage read/write latency statistics, click **I/O Latency** in the **Options** panel.
8. To view storage read/write operations statistics, click **I/O Operations** in the **Options** panel.

**NOTE:** No storage statistics are updated when the storage is locked.

## 3.5.11 Merging Volumes

By default, CloudLink is configured to merge multiple EBS volumes into a single encrypted volume. If you previously changed to a split volume configuration and now wish to revert to a merged volume model, you can merge all volumes of a given volume type into a single encrypted volume. The storage volume name will be **secure0**. The **Device** column will show a range of devices, for example, *sdb-sde*, to indicate that the volume aggregates four disks: sdb, sdc, sdd and sde. The displayed **Size** of the multi-disk volume will represent the sum of all aggregated storage disks sizes. For example:



**Volumes**

| ☑ | Volume Name | Type | Location | Device | Size | Status |
|---|---|---|---|---|---|---|
| ☑ | secure0-01 | NFS/SMB | 192.168.147.123:/secure0-01/mnt | sdb | 1 GB | sync |
| ☑ | secure0-02 | NFS/SMB | 192.168.147.123:/se | | | sync |
| ☑ | secure0-03 | NFS/SMB | 192.168.147.123:/se | | | sync |
| ☑ | secure0-04 | NFS/SMB | 192.168.147.123:/se | | | sync |

**Volumes**

| □ | Volume Name | Type | Location | Device | Size | Status |
|---|---|---|---|---|---|---|
| □ | secure0 | NFS/SMB | 192.168.147.123:/secure0/mnt | sdb-sde | 4 GB | sync |

**WARNING:** Merging volumes erases all data on the disk.

The results of a volume merge are as follows:

- All data on the disk is lost.
- The storage keys are lost and the ACL configuration is lost.
- The storage write mode is set to **Sync**.

**To merge all volumes:**

1. Log in as a *secadmin* user (see *2.1 Connecting to CloudLink Center over the Web* on page 7).
2. From the **Topology Tree**, select a CloudLink instance.
3. Click the **Storage** tab then the **Configuration** tab.
4. Click **Volumes** in the **Options** panel.
5. From the **Volumes** panel, select all volumes by clicking the **Volume Name** checkbox.

6. Right-click a volume and select **Merge**. Click **Yes** in the confirmation window.

7. Once the **Storage** tab reappears, select it to view the results.

### 3.5.12 Splitting Volumes

You can split the volume of a merged volume into its original volumes. The storage volume names will be **secure0-***xx* **where** *xx* starts at **01**. The **Device** rows will show the original device names, for example, *sdb, sdc, sdd,* and *sde*. The displayed **Size** of the volumes will show the original disk sizes.

**WARNING:** Splitting a volume erases all data on the disks.

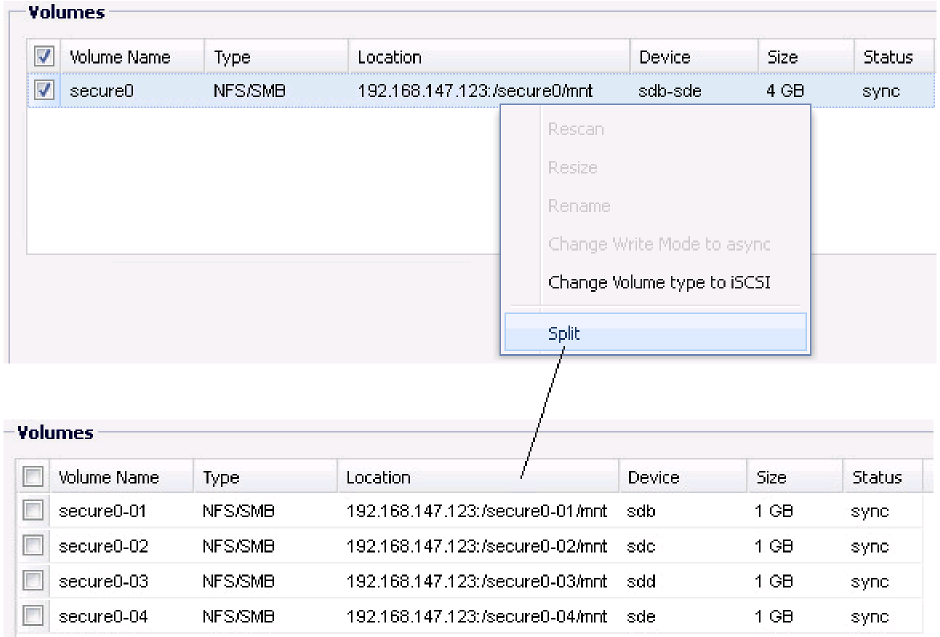
The results of a volume split are as follows:

- All data on the disk is lost.
- The storage key for the merged volume is lost and the ACL configuration is lost.
- The storage write mode is set to **Sync**.

**To split a volume:**

1. Log in as a *secadmin* user (see *2.1 Connecting to CloudLink Center over the Web* on page 7).
2. From the **Topology Tree**, select a CloudLink instance.
3. Click the **Storage** tab then the **Configuration** tab.
4. Click **Volumes** in the **Options** panel.
5. From the **Volumes** panel, right-click the volume and select **Split**. Click **Yes** in the confirmation window.

6. Once the **Storage** tab reappears, select it to view the results. For example:



Volumes

| ☑ | Volume Name | Type | Location | Device | Size | Status |
|---|---|---|---|---|---|---|
| ☑ | secure0 | NFS/SMB | 192.168.147.123:/secure0/mnt | sdb-sde | 4 GB | sync |

Volumes

| ☐ | Volume Name | Type | Location | Device | Size | Status |
|---|---|---|---|---|---|---|
| ☐ | secure0-01 | NFS/SMB | 192.168.147.123:/secure0-01/mnt | sdb | 1 GB | sync |
| ☐ | secure0-02 | NFS/SMB | 192.168.147.123:/secure0-02/mnt | sdc | 1 GB | sync |
| ☐ | secure0-03 | NFS/SMB | 192.168.147.123:/secure0-03/mnt | sdd | 1 GB | sync |
| ☐ | secure0-04 | NFS/SMB | 192.168.147.123:/secure0-04/mnt | sde | 1 GB | sync |

## 3.5.13 Changing the Volume Write Mode

The default write mode for NFS/SMB and iSCSI storage devices is synchronous. You can change the write mode to asynchronous for the purpose of reducing data transfer times to storage devices. In the asynchronous write mode, loss of data can occur under certain network failure scenarios.

**NOTE:** After changing the write mode for an iSCSI volume, you must reactivate the disk from the disk management facility on the client PC.

### To change the write mode of a volume:

1. Log in as a *secadmin* or *admin* user (see *2.1 Connecting to CloudLink Center over the Web* on page 7).
2. From the **Topology Tree**, select a CloudLink instance.
3. Click the **Storage** tab then the **Configuration** tab.
4. Click **Volumes** in the **Options** panel.
5. From the **Volumes** panel, right-click a volume and select the appropriate option; **Change Write Mode to async** or **Change Write Mode to sync**.

### 3.5.14 Formatting the Volumes

**To format a storage volume:**

1. Log in as a *secadmin* or *admin* user (see *2.1 Connecting to CloudLink Center over the Web* on page 7).
2. From the **Topology Tree**, select a CloudLink instance.
3. Click the **Storage** tab then the **Configuration** tab.
4. Click **Key** in the **Options** panel.
5. Select one or more volumes and right-click a selected volume.
6. Select **Format** from the menu.

The format operation formats the volume and encrypts it with a new key, rendering old data unusable. The generated key has a name in the following format:

*volumeName_yyyyMMdd_HHmmss*.**key**

where:

| | |
|---|---|
| *volumeName* | - the name of volume |
| *yyyyMMdd* | - key generation date |
| *HHmmss* | - key generation time |

For example, **secure0-01_20131008_033222.key**

## 3.6 Accessing Secure Storage

Once access to a CloudLink instance secure storage has been granted to virtual servers, the storage is made available to those devices over NFS/SMB or iSCSI.

If you opted to have the encrypted storage presented as a merged volume, the storage volume name is **secure0**.

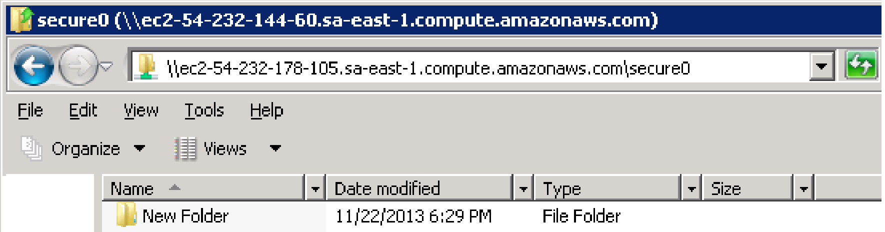
It you opted to split the encrypted storage into multiple volumes, the volume name format is as **secure0-***xx* where *xx* represents the numerical identifier of the encrypted storage volume. For example, **secure0-01** to **secure0-11**.

### 3.6.1 Storage Access in an EC2 Environment

To access an encrypted secure storage from a Windows machine in an EC2 environment, launch a file browser from a qualified instance and enter the domain name of the CloudLink instance followed by the secure storage name. For example, a CloudLink instance with an EIP address of 54.232.178.105, may be accessed as follows:

```
\\ec2-54-232-178-105.sa-east-1.compute.amazonaws.com\secure0
```

To test the storage, you can create a *folder* on the encrypted storage volume. For example:



secure0 (\\ec2-54-232-144-60.sa-east-1.compute.amazonaws.com)

\\ec2-54-232-178-105.sa-east-1.compute.amazonaws.com\secure0

| Name | Date modified | Type | Size |
|---|---|---|---|
| New Folder | 11/22/2013 6:29 PM | File Folder | |

To access the same encrypted secure storage from a Linux machine, you would mount the drive as follows:

```
mount ec2-54-232-178-105.sa-east-1.compute.amazonaws.com:/secure0/
mnt/ folderName
```

### 3.6.2 Storage Access in a VPC Environment

To access an encrypted secure storage from a Windows machine in an VPC environment, launch a file browser from a qualified instance and enter the private IP address of the CloudLink instance followed by the secure storage name. For a CloudLink instance with a private IP address of 10.0.0.103 with a single volume, we have the following entry:

```
\\10.0.0.103\secure0
```

For external access, you can use the public IP address.

To access the same encrypted secure storage from a Linux machine, you would mount the drive as follows:

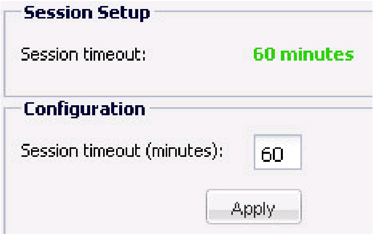
```
mount 10.0.0.103:/secure0/mnt/ folderName
```

# 3.7 Configuring CloudLink Center Session Timeout

CloudLink Center can be configured to close user sessions after a specified period of inactivity. If no operations are performed by the user for the period specified, the user is logged out and the login page is displayed. Note that actions such as switching CloudLink Center tabs, which do not affect the CloudLink system state, will not trigger a reset of the session countdown timer.

**To configure the Session Timeout for a CloudLink instance:**

1. Log in as a *secadmin* or *admin* user (see *2.1 Connecting to CloudLink Center over the Web* on page 7).
2. From the **Topology Tree**, select a CloudLink instance.
3. Click the **Administration** tab.
4. From the **Options** panel, click **Session Setup**.
5. Enter a value in minutes from *0* to *60* for **Session timeout**. Entering *0* disables the session timeout feature.
6. Click **Apply**. For example:



Session timeout: 60 minutes

Session timeout (minutes): 60

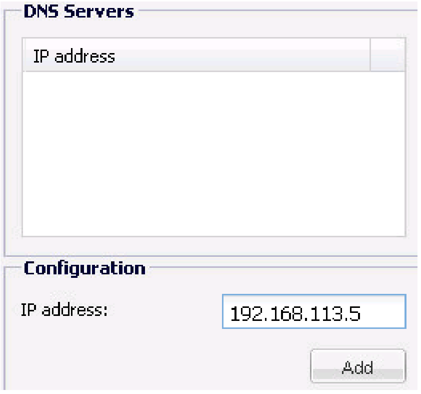
# 3.8 Configuring a Domain Name Server

The CloudLink instance may be configured to resolve hostnames using a Domain Name Server (DNS).

This section shows you how to add and delete a DNS from a CloudLink instance.

### To add a DNS:

1. Log in as a *secadmin* or *admin* user (see *2.1 Connecting to CloudLink Center over the Web* on page 7).
2. From the **Topology Tree**, select a CloudLink instance.
3. Click the **Administration** tab.
4. Click **DNS**.
5. Enter the IP address of the DNS in the **IP address** field.
6. Click **Add**. For example:



IP address: 192.168.113.5

### To delete a DNS server:

1. Log in as a *secadmin* or *admin* user (see *2.1 Connecting to CloudLink Center over the Web* on page 7).
2. From the **Topology Tree**, select a CloudLink instance.
3. Click the **Administration** tab.
4. Click **DNS**.
5. In the **DNS Servers** list, right-click the DNS you wish to delete.
6. Click **Delete**.

# 3.9 Configuring a Network Time Protocol Server

You can synchronize a CloudLink instance with a time of day obtained from Network Time Protocol (NTP) servers. By default, CloudLink is configured with four NTP servers.

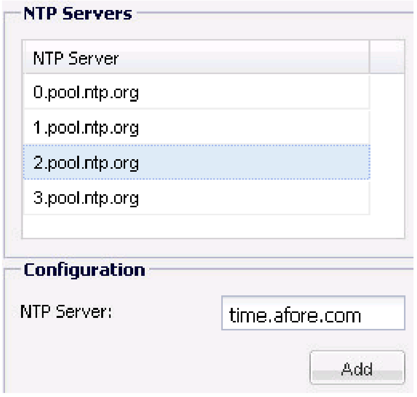
This section shows you how to add and delete a NTP server.

### To add a NTP Server:

1. Log in as a *secadmin* or *admin* user (see *2.1 Connecting to CloudLink Center over the Web* on page 7).
2. From the **Topology Tree**, select a CloudLink instance.
3. Click the **Administration** tab.
4. Click **NTP**.
5. Enter the IP address or hostname of the NTP server in the **NTP Server** field.

> **NOTE:** If you are planning to use a hostname for the NTP server, ensure that you have configured at least one DNS server first. See *Configuring a Domain Name Server* on page 48.

6. Click **Add**. For example:



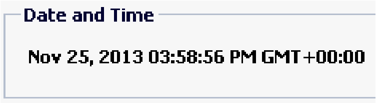
NTP Servers

| NTP Server |
|---|
| 0.pool.ntp.org |
| 1.pool.ntp.org |
| 2.pool.ntp.org |
| 3.pool.ntp.org |

Configuration

NTP Server: time.afore.com

7. To view the current date and time of day used by the CloudLink instance, observe the date and time displayed in **Date and Time** panel. For example:



Date and Time

Nov 25, 2013 03:58:56 PM GMT+00:00

> **NOTE:** License activation is based on the time and date of the CloudLink instance. Ensure that the servers associated with encrypted storage are synchronized with the time and date of the CloudLink instance.

**To delete a NTP server:**

1. Log in as a *secadmin* or *admin* user (see *2.1 Connecting to CloudLink Center over the Web* on page 7).
2. From the **Topology Tree**, select a CloudLink instance.
3. Click the **Administration** tab.
4. Click **NTP**.
5. In the **NTP Servers** list, right-click the NTP server you wish to delete.
6. Click **Delete**.

# 3.10 Generating Performance Reports

CloudLink Center lets you generate and save a report containing storage statistics for the last 24 hours.

The report is saved in the Microsoft Excel format (.xls). Report generation is available for the *secadmin*, *admin*, and *observer* user accounts.

You can generate reports for a particular type of storage statistics or a combination of particular storage statistic types (Rate, Operations, and Latency).

The name of the generated report has the following format:

*volumeName_yyyy*-*MM*-*dd_HH*-*mm*-*ss*.**xls**

where:

| | |
|---|---|
| *volumeName* | - name of the CloudLink instance volume |
| *yyyy-MM-dd* | - report generation date |
| *HH-mm-ss* | - report generation time |

For example:

**secure0_2013-11-25-15-45-25.xls**

The report includes the volume name and the CloudLink name, for example:
**i-99c618c3**

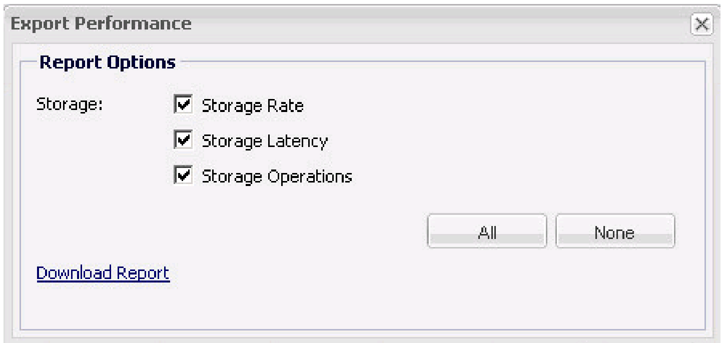
### To generate a storage statistics report:

1. From the **Topology Tree**, click a CloudLink instance.

2. Click the **Storage** tab and then the **Statistics** tab.

3. From the **Options** panel, select **Report**.

4. In the **Export Performance** window, select the types of storage statistics to include in the report and click the **Download Report** link. For example:



Export Performance

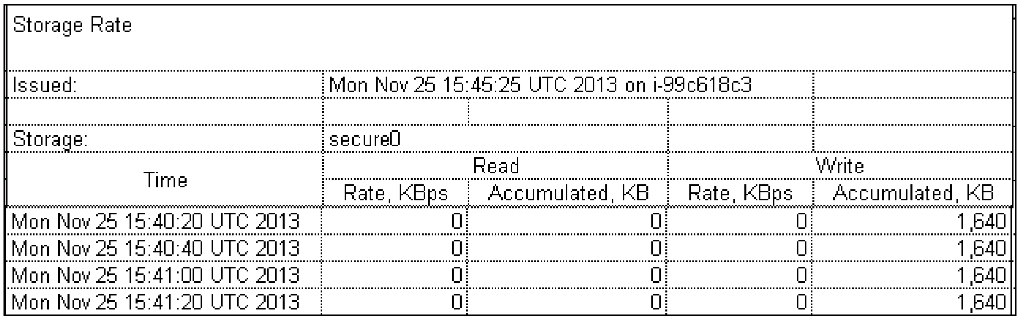
Report Options

Storage: ☑ Storage Rate<br>☑ Storage Latency<br>☑ Storage Operations

Depending on the download settings of your Web browser, you may be asked to specify the location to which to save the report. Otherwise, the report will be saved to the default downloads location specified in the browser settings.

> **NOTE:** Performance reports for Storage Statistics provide values averaged over 20-second periods whereas the graphs are based on values averaged over 60-second periods.

An excerpt from an example storage statistics report for CloudLink **i-99c618c3** and secure volume **secure0** follows:



| Storage Rate | | | | |
|---|---|---|---|---|
| Issued: | Mon Nov 25 15:45:25 UTC 2013 on i-99c618c3 | | | |
| | | | | |
| Storage: | secure0 | | | |
| Time | Read | | Write | |
| | Rate, KBps | Accumulated, KB | Rate, KBps | Accumulated, KB |
| Mon Nov 25 15:40:20 UTC 2013 | 0 | 0 | 0 | 1,640 |
| Mon Nov 25 15:40:40 UTC 2013 | 0 | 0 | 0 | 1,640 |
| Mon Nov 25 15:41:00 UTC 2013 | 0 | 0 | 0 | 1,640 |
| Mon Nov 25 15:41:20 UTC 2013 | 0 | 0 | 0 | 1,640 |

You can access each statistic type by clicking on the appropriate tab at the bottom of the spreadsheet.

# 3.11 Logs and Events

CloudLink Center logs provide comprehensive information about all activity associated with the CloudLink instance. All CloudLink logs have four categories:

- Actions
- Alarms
- Events
- Security events

> **NOTE:** CloudLink Center displays only those logs generated over the past six hours. A maximum of 60 log records is displayed for each log category. However, CloudLink stores all logs for two days for reporting via SNMP. To configure CloudLink for SNMP, see SNMP Configuration on page 57.

To view all logs, log on to in CloudLink Center as a *secadmin* user. A CloudLink *admin* user can view Actions, Alarms, and Events logs. The CloudLink *observer* user can view only Alarms and Events logs.

This section covers the following topics:

- *Viewing the CloudLink Actions Log*
- *Viewing the CloudLink Alarms Log*
- *Viewing the CloudLink Events Log*
- *Viewing the CloudLink Security Events Log*

## 3.11.1 Viewing the CloudLink Actions Log

To view the CloudLink **Actions** log, click the actions icon at the bottom of the CloudLink Center window:

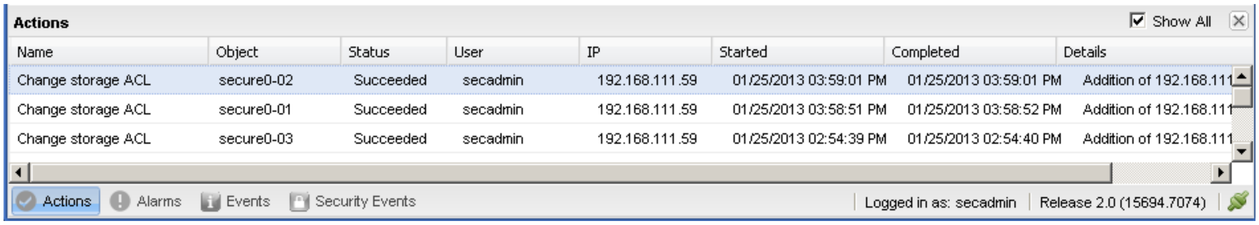
✓

Each action record will stay active for 5 minutes and then will be cleared from the panel (fixed time out).

You can use the **Show all** checkbox to display all Action records, including the timed-out records.

> **NOTE:** The actions icon appears dimmed if the log contains no records and if all the action records have timed out.

The **Actions** log window shows the actions associated with particular user actions. For example:



Actions ☑ Show All

| Name | Object | Status | User | IP | Started | Completed | Details |
|---|---|---|---|---|---|---|---|
| Change storage ACL | secure0-02 | Succeeded | secadmin | 192.168.111.59 | 01/25/2013 03:59:01 PM | 01/25/2013 03:59:01 PM | Addition of 192.168.111 |
| Change storage ACL | secure0-01 | Succeeded | secadmin | 192.168.111.59 | 01/25/2013 03:58:51 PM | 01/25/2013 03:58:52 PM | Addition of 192.168.111 |
| Change storage ACL | secure0-03 | Succeeded | secadmin | 192.168.111.59 | 01/25/2013 02:54:39 PM | 01/25/2013 02:54:40 PM | Addition of 192.168.111 |

Logged in as: secadmin | Release 2.0 (15694.7074)

An action record contains the following information:

- **Name:** Action name.
- **Object:** The name of the instance from which the action was performed.
- **Status:** Action status.
- **User:** User who performed the action.
- **IP:** The IP address of the computer where the action was performed.
- **Started:** Action started time stamp.
- **Completed:** Action completed time stamp.
- **Details**: Additional information about the action; for example, why the action failed.

## 3.11.2 Viewing the CloudLink Alarms Log

To view the CloudLink **Alarms** log, click the alarms icon at the bottom of the CloudLink Center window:

> **NOTE:** The alarms icon appears dimmed if the log contains no unacknowledged alarm records.

The **Alarms** log window records all major and critical severity alarms.

An alarms record contains the following information:

- **Time:** The alarm generation time.
- **Name:** The alarm name.
- **Object:** The name of the instance from which the alarm was generated.

## 3.11.3 Viewing the CloudLink Events Log

To view the CloudLink **Events** log, click the events icon at the bottom of the CloudLink Center window:

Each event record will stay active for 5 minutes and then will be cleared from the panel (fixed time out).

You can use the **Show all** checkbox to show all Events records, including the timed-out records.

> **NOTE:** The events icon appears dimmed if the Events log contains no records and if all the Event records have timed out.

The **Events** log window records all moderate and minor severity events.

An events record contains the following information:

- **Time:** The event generation time.
- **Name:** The event name.
- **Object:** The name of the instance where the event was generated.

## 3.11.4 Viewing the CloudLink Security Events Log

To view the CloudLink **Security Events** log, open CloudLink Center using the *secadmin* user account and click the security events icon at the bottom of the CloudLink Center window:

Each security event record will stay active for 5 minutes and then will be cleared from the panel (fixed time out).

You can use the **Show all** checkbox to show all Security Event records, including the timed-out records.

> **NOTE:** The security events icon appears dimmed if the Security Events log contains no records and if all the Security Event records have timed out.

The **Security Events** log window shows all CloudLink security events.
A security event record contains the following information:

- **Time**: The security event generation time.
- **Action:** The action name.
- **User:** User who performed the action.
- **Object:** The name of the instance where the security event was generated.
- **IP:** IP address of the computer where the action was performed.
- **Permission:** Status indicating whether the user is allowed to perform the action.
- **Details:** Additional information about the action.

> **NOTE:** Security events with the **Permission** of *Denied* are displayed in red.

## 3.12 Configuring Syslog

CloudLink Center lets you configure a syslog logger. When the syslog logger is configured, all system log messages are directed to the configured remote host via UDP Port 514. The log messages still appear in the CloudLink Center window. The priority levels are as follows:

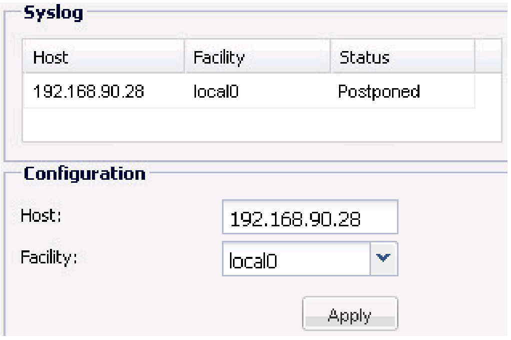
- The info (information) priority level tag is assigned to the event logs.
- The notice priority level tag is assigned to the action logs.

- The alert priority level tag is assigned to both the security events logs and alarms.

## 3.12.1 Configuring a Syslog Logger

### To configure a syslog server:

1. Log in as a *secadmin* or *admin* user (see *2.1 Connecting to CloudLink Center over the Web* on page 7).
2. From the **Topology Tree**, select a CloudLink instance.
3. Click the **Tools** tab and then the **Monitoring** tab.
4. From the **Options** panel, select **Syslog**.
5. On the **Syslog** tab, in the **Host** box, specify the IP address of the host to which the message logs will be sent.
6. In the **Facility** list, select the facility on which the syslog messages are to be logged.
7. Click **Apply**. For example:



Syslog

| Host | Facility | Status |
|---|---|---|
| 192.168.90.28 | local0 | Postponed |

Configuration

Host: 192.168.90.28

Facility: local0

> **NOTE:** By default, the syslog server status is **Postponed**, which means that logs are not sent out until the Syslog status is explicitly set to **Resume**.

8. Right-click a host and select **Resume**.
9. Observe that the status changes to **Accessible**.

> **NOTE:** Once syslog is activated with the **Resume** command, messages will be sent to the configured Syslog server until the **Postpone** command is selected.

If communication with the Syslog server fails, the syslog status is set to **Inaccessible**.

### 3.12.2 Viewing Syslog Output

**To view the syslog output as stored in the facility:**

1. Log in to the host where the system logs are stored.
2. Access the directory where the logs are located.
3. Enter the following command:

```
$ tail /var/log/syslog
```

## 3.13 Configuring SNMP

CloudLink can generate SNMPv2 traps for the logs it records. It also provides MIBs which support *get*, *get-next,* and *walk* operations for several CloudLink performance monitors.

> **NOTE:** CloudLink stores all logs for two days for reporting via SNMP.

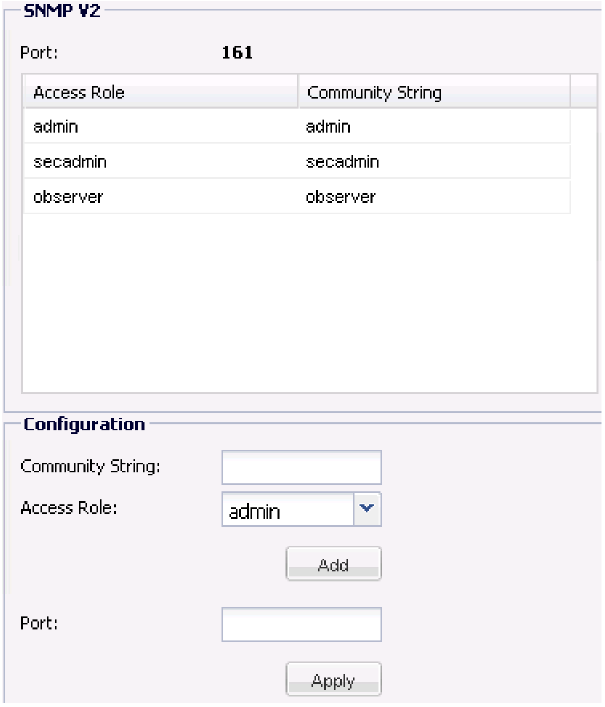
This section covers the following topics:

- *Viewing SNMP Configuration*
- *Creating a New Community String*
- *Deleting a Community String*
- *Viewing SNMP Trap Destinations*
- *Creating a new SNMP Trap Destination*
- *Deleting an SNMP Trap Destination*
- *Downloading CloudLink MIBs*

### 3.13.1 Viewing SNMP Configuration

**To view CloudLink's SNMP configuration:**

1. Log in as a *secadmin* or *admin* user (see *2.1 Connecting to CloudLink Center over the Web* on page 7).
2. From the **Topology Tree**, select a CloudLink instance.
3. Click the **Tools** tab and then the **Monitoring** tab.
4. From the **Options** panel, select **SNMP V2**. For example:



SNMP V2

Port: 161

| Access Role | Community String |
|---|---|
| admin | admin |
| secadmin | secadmin |
| observer | observer |

Configuration

Community String:

Access Role: admin

Port:

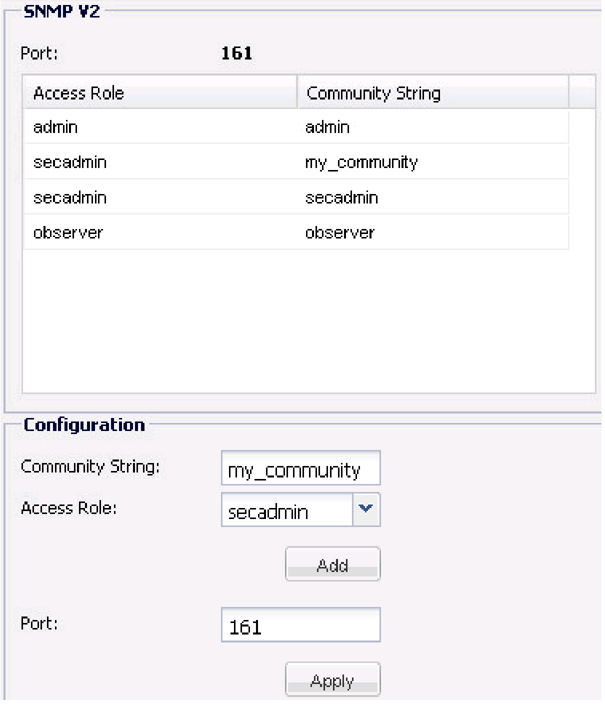
### 3.13.2 Creating a New Community String

**To create a new community string:**

1. Log in as a *secadmin* or *admin* user (see *2.1 Connecting to CloudLink Center over the Web* on page 7).
2. From the **Topology Tree**, select a CloudLink instance.
3. Click the **Tools** tab and then the **Monitoring** tab.
4. From the **Options** panel, select **SNMP V2**.
5. Specify the **Community String** parameter.

6. Select the required **Access Role** from the dropdown list in the **Configuration** panel.

7. Click **Add**. For example:



Port: 161

| Access Role | Community String |
|---|---|
| admin | admin |
| secadmin | my_community |
| secadmin | secadmin |
| observer | observer |

Community String: my_community

Access Role: secadmin

Port: 161

8. To change the receive port number for the SNMP agent, specify the port number and click **Apply**.

   The valid port numbers are 161 (default) and any value from 1024 to 65535.

## 3.13.3 Deleting a Community String

**To delete a community string:**

1. Log in as a *secadmin* or *admin* user (see *2.1 Connecting to CloudLink Center over the Web* on page 7).

2. From the **Topology Tree**, select a CloudLink instance.

3. Click the **Tools** tab and then the **Monitoring** tab.

4. In the **Options** panel, select **SNMP V2**.

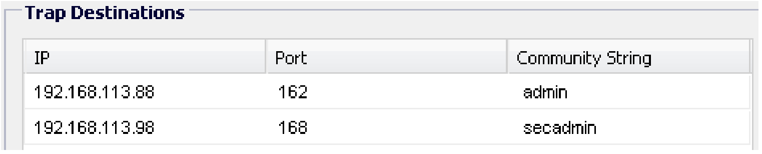
5. In the **SNMP V2** panel, right-click a community and select **Delete**.

6. In the **Confirmation** window, click **Yes**.

## 3.13.4 Viewing SNMP Trap Destinations

**To view SNMP trap destinations:**

1. Log in as a *secadmin* or *admin* user (see *2.1 Connecting to CloudLink Center over the Web* on page 7).
2. From the **Topology Tree**, select a CloudLink instance.
3. Click the **Tools** tab and then the **Monitoring** tab.
4. In the **Options** panel, select **SNMP Traps**. For example:



Trap Destinations

| IP | Port | Community String |
|---|---|---|
| 192.168.113.88 | 162 | admin |
| 192.168.113.98 | 168 | secadmin |

The Trap Destinations panel shows the configured SNMP trap destinations**.** The default is no SNMP trap destinations.

## 3.13.5 Creating a new SNMP Trap Destination

**To create a new SNMP trap destination:**

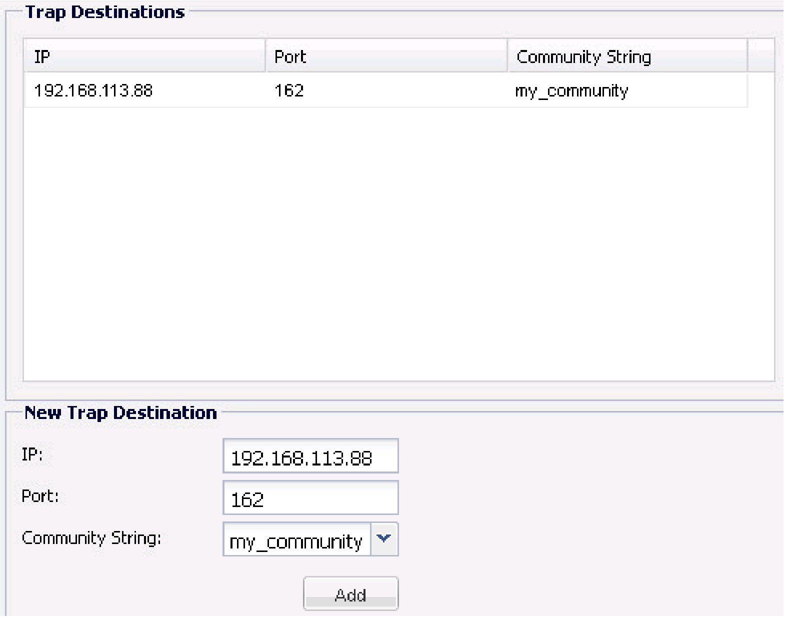
1. Log in as a *secadmin* or *admin* user (see *2.1 Connecting to CloudLink Center over the Web* on page 7).
2. From the **Topology Tree**, select a CloudLink instance.
3. Click the **Tools** tab and then the **Monitoring** tab.
4. From the **Options** panel, select **SNMP Traps**.
5. In the **New Trap Destination** panel, specify the following parameters:

**IP:** The trap destination host IP address.

**Port:** The UDP port used for sending SNMP traps.

**Community String:** The SNMP community string.

6. Click **Add**. For example:



Trap Destinations

| IP | Port | Community String |
|---|---|---|
| 192.168.113.88 | 162 | my_community |

New Trap Destination

IP: 192.168.113.88

Port: 162

Community String: my_community

## 3.13.6 Deleting an SNMP Trap Destination

### To delete an SNMP trap destination:

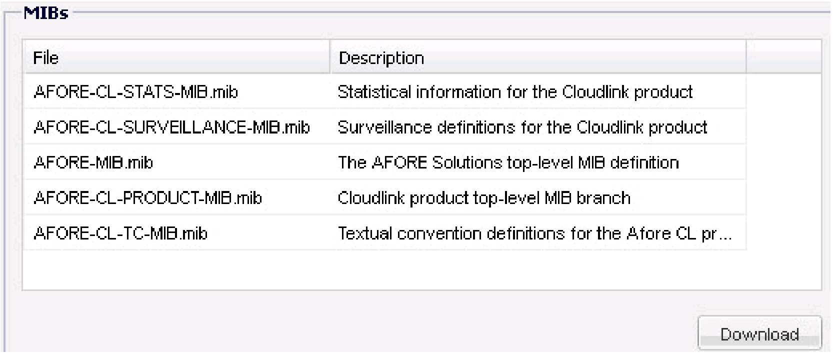
1. Log in as a *secadmin* or *admin* user (see *2.1 Connecting to CloudLink Center over the Web* on page 7).
2. From the **Topology Tree**, select a CloudLink instance.
3. Click the **Tools** tab and then the **SNMP** tab.
4. From the **Options** panel, select **Trap Destinations**.
5. In **Trap Destinations** panel, right-click a trap destination and click **Delete**.
6. In the **Confirmation** window, click **Yes**.

## 3.13.7 Downloading CloudLink MIBs

### To download the CloudLink MIBs:

1. Log in as a *secadmin* or *admin* user (see *2.1 Connecting to CloudLink Center over the Web* on page 7).
2. From the **Topology Tree**, select a CloudLink instance.
3. Click the **Tools** tab and then the **Monitoring** tab.
4. From the **Options** panel, select **MIBs**.

5. To download a MIB file, select the file from the MIBs panel, click **Download**, and select a file location from the dialog. For example:



MIBs

| File | Description |
|---|---|
| AFORE-CL-STATS-MIB.mib | Statistical information for the Cloudlink product |
| AFORE-CL-SURVEILLANCE-MIB.mib | Surveillance definitions for the Cloudlink product |
| AFORE-MIB.mib | The AFORE Solutions top-level MIB definition |
| AFORE-CL-PRODUCT-MIB.mib | Cloudlink product top-level MIB branch |
| AFORE-CL-TC-MIB.mib | Textual convention definitions for the Afore CL pr... |

# Terms and Acronyms

| | |
|---|---|
| ACL | Access Control List |
| AD | Active Domain |
| AMI | Amazon Machine Image |
| AWS | Amazon Web Services |
| AWS Marketplace | An online store of software and services to build products and run businesses. AWS Marketplace includes databases, application servers, testing tools, monitoring tools, content management, and business intelligence software. |
| CHAP | Challenge-Handshake Authentication Protocol |
| DNS | Domain Name Server |
| DPM | Data Protection Manager |
| EBS | Elastic Block Store |
| EC2 | Elastic Compute Cloud |
| EULA | End User License Agreement |
| FQDN | Fully Qualified Domain Name |
| GB | Gigabyte |
| HTTP | Hypertext Transfer Protocol |
| HTTPS | Hypertext Transfer Protocol Secure |
| I/O | Input/Output |
| IOPS | Input/Output Operations per Second |
| IP | Internet Protocol |
| iSCSI | Internet Small Computer System Interface |
| IQN | iSCSI Qualified Name |
| ISO | International Organization for Standardization |
| KBps | Kilobytes per second |
| LAN | Local Area Network |
| MAC | Media Access Control |
| MIB | Management Information Base |
| ms | Milliseconds |
| NAS | Network-attached Storage |
| NFS | Network File System |
| NTP | Network Time Protocol |
| SMB | Server Message Block |
| SNMP | Simple Network Management Protocol |
| SSH | Secure Shell |

| | |
|---|---|
| TB | Terabyte |
| TCP | Transmission Control Protocol |
| UDP | User Datagram Protocol |
| URL | Uniform Resource Locator |
| UTC | Coordinated Universal Time |
| vDC | Virtual Data Center |
| VPC | Virtual Private Cloud |

# Appendix A: Configuring AD for Key Store

To use Active Directory to store CloudLink encryption keys, deploy a Windows Server so that it will be accessible by the CloudLink Gateway from its private LAN network.

This appendix shows you how to configure the Active Directory for the CloudLink encryption key store on Windows 2003 or 2008 Server that is configured as a domain controller.

**To configure the Active Directory for the CloudLink encryption key store on Windows 2003 or 2008 Server that is configured as a domain controller:**

1. Setup Organization unit on Windows Server:
   a. On the Windows taskbar, click the **Start** button, select **All Programs -> Administrative Tools**, and select **Active Directory Users and Computers**.
   b. Create an Organization Unit by expanding your domain name, and right-click, highlight **New** and click **Organizational Unit**.
   c. Specify a Name (for example, *CloudLink_OU)*.
   d. Right-click the Organization Unit (for example, *CloudLink_OU*), highlight **New** and select **Group**.
   e. Specify the Group Name (for example, *CloudLink_Group*).
2. Create a bind user.
   a. Select Global and Security.
   b. Right-click the Organization Unit (for example, *CloudLink_OU*), highlight **New** and select **User**.
   c. Specify the First Name (for example, *Cloud*), Last Name (for example, *Link*), login name and click **Next**.
   d. Specify the Password and click **Finish**.
   e. Right click the Organization Unit (for example, *CloudLink_OU*) and select **Delegate Control.**
   f. Click **Next** to follow setup wizard.
   g. Click **Add** and specify the CloudLink group name (for example,. *CloudLink_Group*) and click **OK** and then click **Next**.
   h. Select **Create a custom task to delegate** and click **Next**.
   i. Select the first bullet: **This folder, existing objects in this folder, and creation of new objects in this folder** and select **Next**.

j. Select **Full Control** and click **Next**.

k. Select **Finish**.

3. Add the bind user to the security group.
   a. Double-click **Security Group**.
   b. Click the **Members** tab.
   c. Click **Add**.
   d. Type the bind user name.
   e. Click **OK**.
4. Record the DN of CloudLink.

a. Click Start button, select **Run**.

b. Enter *cmd* and select **OK**.

c. Enter *dsquery OU* (Support tool is required) and record the DN (for example, *OU=CloudLink_OU,DC=company,DC=com).*

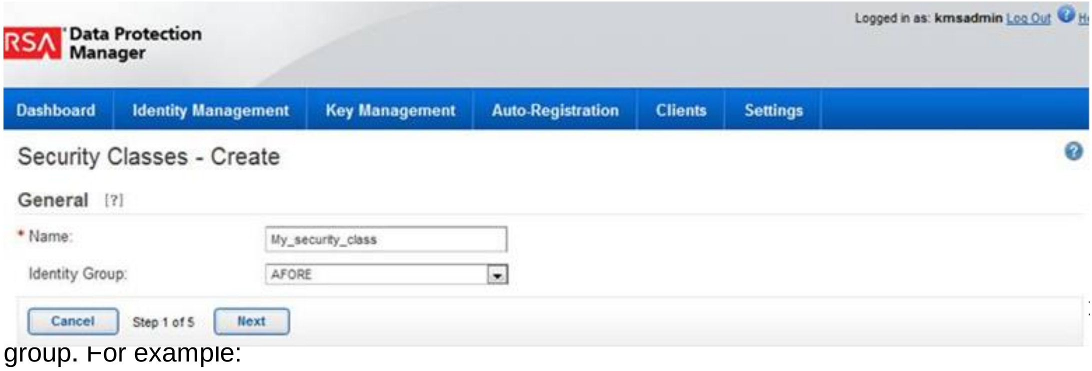
5. Apply domain controller in CloudLink.
   a. Log in to CloudLink Center with *secadmin* user.
   b. Select the CloudLink Gateway server in the topology tree .
   c. Click on the **Security** tab.
   d. Click on the **Key Store** tab.
   e. Click the **Active Directory** link in **Options**.
   f. Enter the IP address of the Windows Server for **Host**.
   g. Enter the DN recorded in step 4 (for example, *OU=CloudLink_OU,DC=company,DC=com*) for **Base DN**.
   h. Enter User name from step 2c (for example, Fred Smith) for **User** and select **Apply**.

# Appendix B: RSA DPM Configuration

To use RSA DPM to store encryption keys, ensure that an RSA DPM server is accessible from the CloudLink instance via its private LAN network. The supported RSA DPM versions are 3.2 and 3.5. Verify that the client certificates have been created and uploaded to the RSA DPM server, and that they are accessible from the CloudLink instance.

### To configure the RSA DPM for storage of CloudLink encryption keys:

1. Log on to the RSA Data Protection Manager console.
2. Create an identity that belongs to a particular RSA DPM identity group. For example:



Security Classes - Create

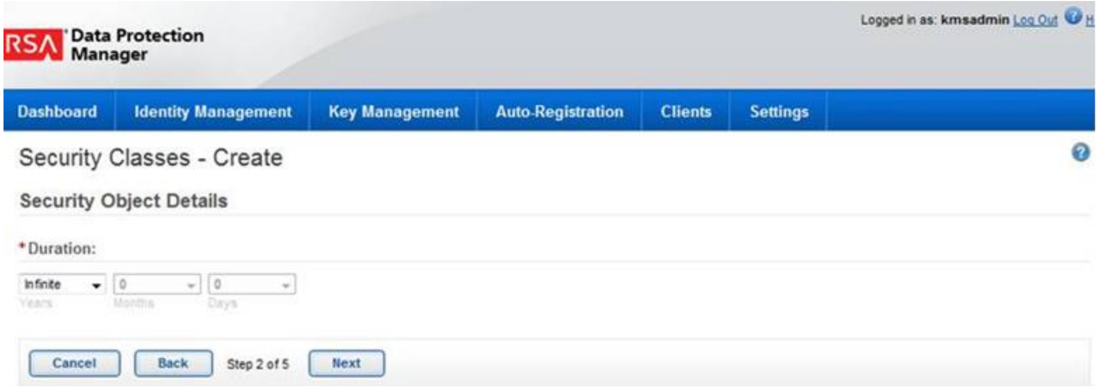
General [?]

* Name: My_security_class

Identity Group: AFORE

Step 1 of 5

3. ity group. For example:



Security Classes - Create

Security Object Details

*Duration: Infinite 0 0

Step 2 of 5

4.

# Appendix C: Migrating the Encrypted Storage

If there is a situation where the existing CloudLink instance needs to be replaced, either because of a CloudLink instance failure or the presence of a newer version of CloudLink, you can migrate the encrypted EBS volumes to a new CloudLink instance.

> **NOTE:** To retain access to the secure storage in the event of an unrecoverable failure of the CloudLink instance, you must export and securely save all keys before the occurrence of an unrecoverable CloudLink instance failure. The exported keys will allow you to access the storage volumes from another CloudLink instance. You can also log the CloudLink instance configuration in a deployment worksheet provided in the *CloudLink Amazon Web Services Deployment Guide*.

### To migrate the encrypted storage volumes of a CloudLink instance:

1. Backup all data associated with the CloudLink encrypted storage as a precaution.

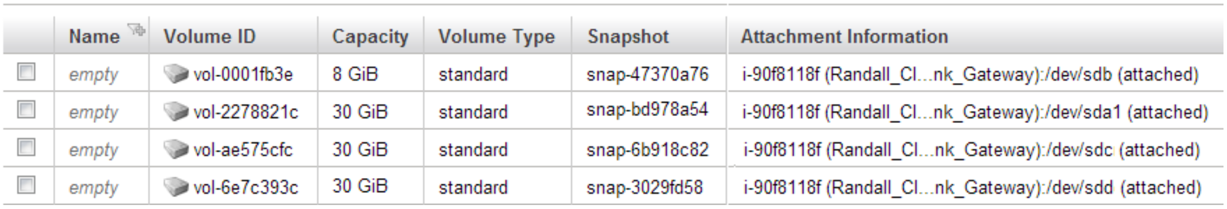
   > **NOTE:** The use of AWS volume *Snapshots* as a backup mechanism is not supported for merged volumes.

2. If not already done, document the configuration of the EBS volumes attached to the CloudLink instance. You can use the deployment worksheet template from the *CloudLink Amazon Web Services Deployment Guide* to log the configuration of the CloudLink Instance.

3. From the AWS EC2 console, select **Volumes** and select *all* data EBS volumes attached to the CloudLink instance.

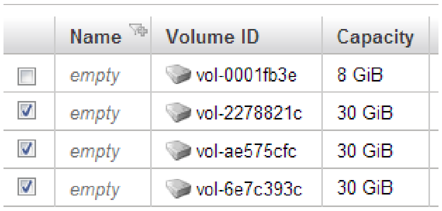
   > **NOTES:**
   >
   > - For *merged volume configurations*, the encrypted EBS volumes must be attached as a *set*, meaning that for the encrypted data to be accessible, *all* encrypted EBS volumes must be attached.
   > - For *split volume configurations*, *each* encrypted EBS storage volume is treated separately and can be attached separately.
   > - Sorting the volumes based on the **Attachment Information** column may facilitate the identification of the EBS volumes associated with the CloudLink instance.

In the following example, the CloudLink instance has an 8 GB operating system root volume and three 30 GB EBS encrypted volumes. Only the three 30 GB EBS encrypted volumes will be moved to the replacement CloudLink instance.



| | Name | Volume ID | Capacity | Volume Type | Snapshot | Attachment Information |
|---|---|---|---|---|---|---|
| □ | *empty* | vol-0001fb3e | 8 GiB | standard | snap-47370a76 | i-90f8118f (Randall_Cl...nk_Gateway):/dev/sdb (attached) |
| □ | *empty* | vol-2278821c | 30 GiB | standard | snap-bd978a54 | i-90f8118f (Randall_Cl...nk_Gateway):/dev/sda1 (attached) |
| □ | *empty* | vol-ae575cfc | 30 GiB | standard | snap-6b918c82 | i-90f8118f (Randall_Cl...nk_Gateway):/dev/sdc (attached) |
| □ | *empty* | vol-6e7c393c | 30 GiB | standard | snap-3029fd58 | i-90f8118f (Randall_Cl...nk_Gateway):/dev/sdd (attached) |

4. Select *all* of the EBS encrypted storage volumes associated with the CloudLink instance and record the **Volume ID** before detaching the EBS volumes from the original CloudLink instance. For example:



| | Name | Volume ID | Capacity |
|---|---|---|---|
| □ | *empty* | vol-0001fb3e | 8 GiB |
| ☑ | *empty* | vol-2278821c | 30 GiB |
| ☑ | *empty* | vol-ae575cfc | 30 GiB |
| ☑ | *empty* | vol-6e7c393c | 30 GiB |

**NOTES:**

- As mentioned previously, if working with a CloudLink *merged* volume configuration, the CloudLink encrypted EBS volumes must be treated as a set of volumes, meaning that *all* three data volumes in this example must be attached to the new CloudLink instance for the data to be usable. Attaching only two of the three CloudLink encrypted EBS volumes would cause *all* of the encrypted data to be inaccessible.
- For split volume deployments, each CloudLink encrypted EBS volume can be treated as separate and independent volumes and attached to the new CloudLink instance independently

5. Right-click a selected volume and select **Detach Volume**. If the detach process fails, use the **Force Detach** option.

6. Import the saved keys.

7. Attach the encrypted EBS volumes to the new CloudLink instance.

8. Reboot the CloudLink instance.

9. Test read/write access to the storage volumes.

# Appendix D: CloudLink Tabs and Options

This section provides an overview of the available tabs and options as viewed from the CloudLink Center user interface. Links to the topics are also included.

| CloudLink Role | Tab | Sub-tab | Options | Access Role | Help Topic Link |
|---|---|---|---|---|---|
| **Gateway** | Administration | | User Accounts<br>Session Setup<br>DNS<br>NTP<br>AD Domain | admin, secadmin | 19<br>47<br>48<br>49<br>23 and 65 |
| **Gateway** | Map | | | All | |
| **Gateway** | Security | Key Store | Local<br>Active Directory<br>RSA DPM<br>Schedule | secadmin | 26 |
| **Gateway** | Security | VPN | Certificates<br>Configuration<br>One-time Passcode | Not used | Not available |
| **Gateway** | Storage | Configuration | Key<br>Volumes<br>Access<br>License | secadmin | 32<br>38 to 44<br>34 and 35<br>25 |
| **Gateway** | Storage | Statistics | I/O Rate<br>I/O Latency<br>I/O Operations<br>Report | All | 40 |
| **Gateway** | System | | Storage License<br>Version Control<br>Eula<br>Ancillary Software | admin, secadmin | 25<br>Not available<br>10<br>10 |
| **Gateway** | Tools | Deployment | vCloud Director<br>Amazon Cloud<br>Windows Azure | Not used | Not available |
| **Gateway** | Tools | Monitoring | Syslog<br>SNMP V2<br>SNMP Traps<br>MIBs | admin, secadmin | 55<br>57<br>60<br>61 |