

Open Enterprise Server 2018 SP1

Cloud Integrated Storage Administration Guide

January 2019

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About This Guide

This documentation describes how to install, configure and manage the Cloud Integrated Storage (CIS) for Open Enterprise Server (OES) 2018 SP1. It is divided into the following sections:

- ♦ Chapter 1, “Overview of Cloud Integrated Storage,” on page 7
- ♦ Chapter 2, “What’s New or Changed in CIS,” on page 15
- ♦ Chapter 3, “Planning Your Cloud Integrated Storage Server Environment,” on page 17
- ♦ Chapter 4, “Installing and Configuring Cloud Integrated Storage (CIS),” on page 19
- ♦ Chapter 5, “Management Tools for CIS,” on page 33
- ♦ Chapter 6, “Migrating DST Volumes to Cloud,” on page 47
- ♦ Chapter 7, “Troubleshooting CIS,” on page 51
- ♦ Chapter 8, “Best Practices and Common Questions,” on page 57
- ♦ Chapter 9, “Limitations for CIS,” on page 63
- ♦ Appendix A, “Configuration and Log Files,” on page 65
- ♦ Appendix B, “Installing and Configuring MariaDB,” on page 67

Audience

This guide is intended for storage services administrators.

Feedback

We want to hear your comments and suggestions about this manual and the other documentation included with this product. Please use the **comment on this topic** link at the bottom of each page of the online documentation.

Additional Documentation

For documentation on other OES guides, see the [OES 2018 SP1 Documentation web site \(https://www.novell.com/documentation/open-enterprise-server-2018/\)](https://www.novell.com/documentation/open-enterprise-server-2018/).

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1 Overview of Cloud Integrated Storage

Cloud Integrated Storage (CIS) is a hybrid cloud solution that provides a secure gateway to store, manage, and access data across private or public cloud.

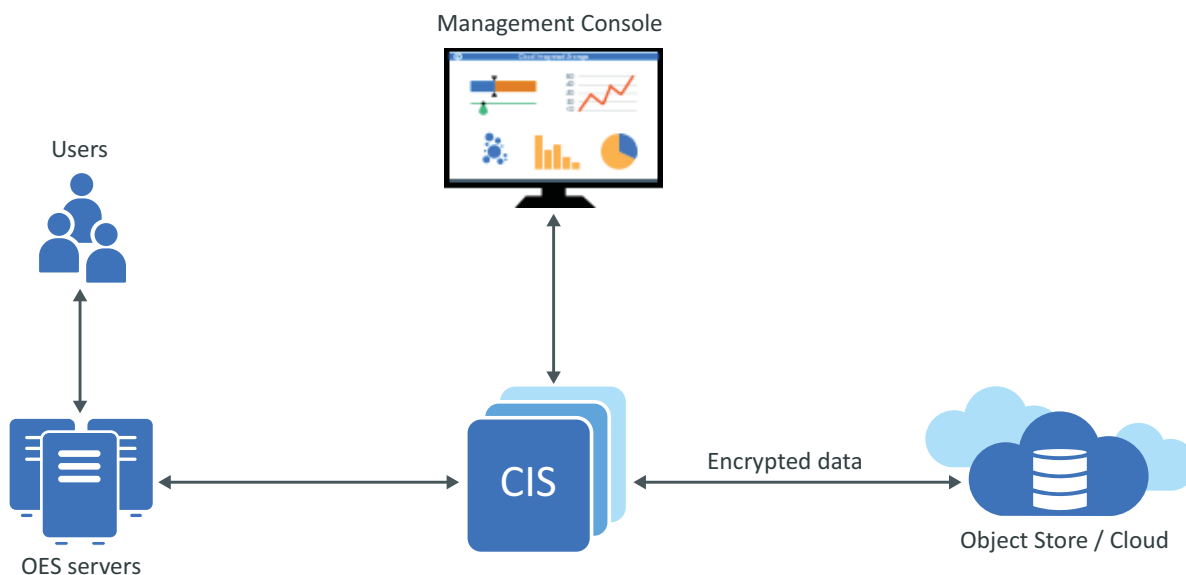
- ♦ [Section 1.1, “Understanding Cloud Integrated Storage,” on page 7](#)
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- ♦ [Section 1.6, “Management Tools,” on page 13](#)
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1.1 Understanding Cloud Integrated Storage

A lot of our OES customers deal with huge storage (greater than TB) of data that is stored in the OES servers. As time grows, the data keeps increasing adding to the storage and maintenance cost. In the past few years, an object store or cloud has become very popular as a storage solution as it provides scalable storage and deployment with the total cost of ownership often being much less.

As the enterprise data continues to grow, the cold or inactive data keeps increasing and fills up the primary or expensive storage. This results in less space for hot or active data. Instead, you can move the cold data to cloud storage using pre-defined policies.

Keeping this in mind, we asked ourselves how can we help our users take advantage of the benefits of an object store or cloud storage through OES and decided to offer a solution called Cloud Integrated Storage (CIS). CIS allows you to move and provision the enterprise data from the OES servers to object store or cloud storage by using pre-defined policies.



The three main objectives of CIS are:

- ♦ **Analyze:** A single view of data available across your organization. CIS performs adaptive scanning of the data on the OES servers and provides meaningful information such as:
 - ♦ Percentage of hot and cold data available based on the access time and modified time
 - ♦ Volumes with more cold data
 - ♦ Top file types available as part of cold data

This information helps you to decide on how to manage the data effectively.

- ♦ **Migrate:** Based on your organizational needs, CIS helps you to create rich policies to decide what kind of data to be migrated. It offloads the cold data from highly expensive storage to much cheaper cloud storage while users still continue to seamlessly access the files.
- ♦ **Report:** Provides a rich dashboard to view the trends around the data movement. Generate reports on data migration and recall and also provides a graphical representation of the same for better understanding. You get to explicitly see how the data is moving within your organization.

Use the CIS Management console to perform the following major tasks:

- ♦ Configure your server
 - ♦ Configure cloud account, policies, and tiers
 - ♦ Create and manage roles for other users
 - ♦ Configure CIS and agents settings
- ♦ Monitor and manage your server's health
 - ♦ Overall status of the server
 - ♦ Monitor the status of individual services in the CIS server
- ♦ Data migration solution for DST volumes
- ♦ Securely transfer the data to the cloud using AES encryption

Cloud Integrated Storage is a network service that manages the data intelligently and reduces the total cost of ownership while improving flexibility.

The following video provides an introduction to Cloud Integrated Storage (CIS):



<http://www.youtube.com/watch?v=6x9fdjlzFf4>

1.2 Benefits of Cloud Integrated Storage

Cloud Integrated Storage has the following benefits:

- ♦ [Section 1.2.1, "Reduce Total Cost of Ownership," on page 9](#)
- ♦ [Section 1.2.2, "Transparent File Access for End Users," on page 9](#)
- ♦ [Section 1.2.3, "Data Availability on Access," on page 9](#)
- ♦ [Section 1.2.4, "Policy-Based Migration," on page 9](#)

1.2.1 Reduce Total Cost of Ownership

The active data (hot data) or frequently accessed data is stored on fast and high quality storage. The less accessed data (cold data) is placed on a cloud storage with relatively slower access. CIS policies helps you to partition the files based on last accessed time, size, type, name, and so on. You can move the less active data (cold data) from a higher performance storage to a lower performance storage, thus reserving the expensive storage for active data (hot data).

1.2.2 Transparent File Access for End Users

Users can seamlessly access the files through CIFS protocol. The user maps to the same logical path and is not aware of the physical location of the file. This allows the administrator to manage the data without disrupting the user's view of the files. Accessing the files through NCP protocol is not supported because the NCP protocol does not support recalling the files.

IMPORTANT: CIS does not support accessing files uploaded to the cloud using NCP protocol.

1.2.3 Data Availability on Access

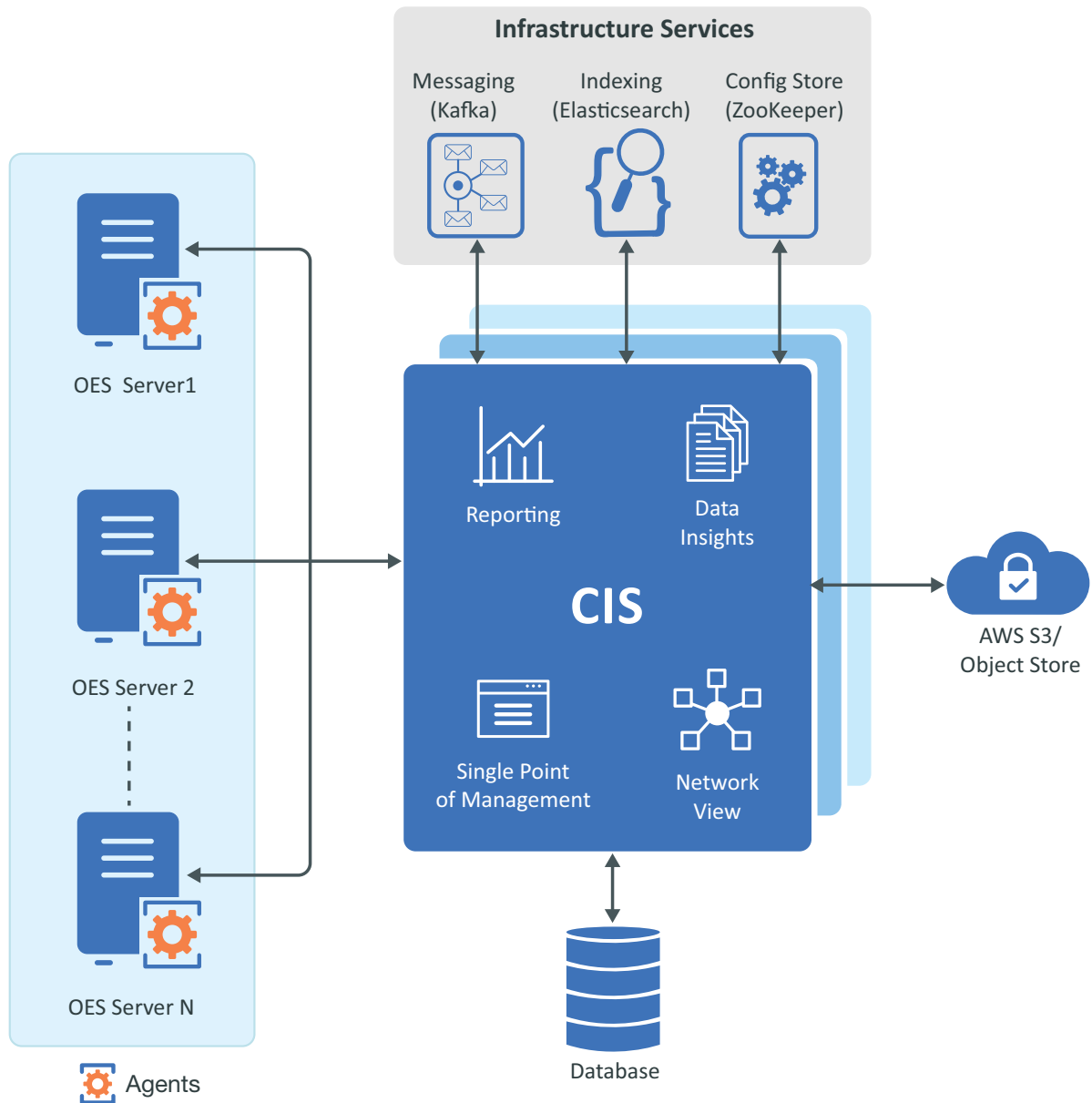
After moving the data to cloud, you still have access to the data. The access to the data available in the cloud storage is through secondary volumes called Cloud Backed Volumes (CBV). The CBV contains the metadata information of the data available in the cloud. When the data is accessed, they are brought back to the OES server.

1.2.4 Policy-Based Migration

Administrator can set policies to migrate the data from the primary volume to the cloud storage depending on the last accessed time, modified time, file type, size, and so on. To migrate the data, the policy can be run manually or automatically based on the scheduled time.

1.3 CIS Architecture Overview

Figure 1-1 CIS Components Overview



For detailed information about CIS and its infrastructure components, see [Section 1.4, “CIS Components,”](#) on page 10.

1.4 CIS Components

The following are the main components of Cloud Integrated Storage:

- [Section 1.4.1, “Server,”](#) on page 11
- [Section 1.4.2, “Clients,”](#) on page 11

1.4.1 Server

The CIS server requires multiple services to perform the overall operation. These services are built based on the concept of microservices. Microservices are a suite of independently deployable, small, modular services in which each service runs a unique process and communicates through a well-defined, lightweight mechanism to serve a business goal. All microservices run as an individual dockerized images.

The following are eleven microservices available for Cloud Integrated Storage:

- ♦ **Authentication:** Authenticates the agent and user. Also, facilitates token creation. The authentication service name is `cis-auth`.
- ♦ **Data:** Used for migration, recall, and communication of data with the target cloud. The data service name is `cis-data`.
- ♦ **Metadata:** Provides the capability to migrate, recall and maintain the metadata. The metadata service name is `cis-metadata`.
- ♦ **Policy:** It deals with the policies, agents, jobs, tiers, and schedule operation. The policy service name is `cis-policy`.
- ♦ **Management:** Handles all the management operations such as CIS account configuration, policy creation, tier configuration, assigning roles for other users, CIS server, and agent settings. The management service name is `cis-mgmt`.
- ♦ **Collector and Aggregator:** Obtains the metadata information from the OES servers and performs calculations on the overall data and provides a meaningful information (hot and cold data) for the administrator. The collector and aggregator service names are `cis-collector` and `cis-aggregator`.
- ♦ **Collector and Aggregator for Reporting:** Obtains the information of files migrated to the cloud, files recalled from the cloud and then perform calculations on the overall migrated and recalled data and provides meaningful information. The collector and aggregator service names for reporting are `cis-repcollector` and `cis-repaggregator`.
- ♦ **Gateway:** It is the entry point to all services of CIS. It receives request from the OES servers and users and redirects it to the respective services. The gateway service name is `cis-gateway`.
- ♦ **Fluent Bit:** It is the logging framework used to collect the log information of all the CIS services at a common location. The logging service name is `cis-fluentbit`. The CIS services log information is located at `/var/opt/novell/log/cis/microservices`. Different log levels can be set for all the CIS services.

All these microservices communicate through the following default ports:

- ♦ **8343:** All requests from the OES server comes through this port.
- ♦ **8344:** All management operations are performed through this port.

1.4.2 Clients

The OES server acts as a client to the CIS server. The components that are available on the client side are as follows:

- ♦ **CIS Agent:** Acts as a client to the CIS server. It performs the major operations such as volume listing, tier configuration, and so on. The CBV contains the metadata information of files that are migrated to the cloud. By default, agent communicates through port 8000. The CIS agent name is `cis-agent.service`.

- ♦ **CIS Recall Agent:** Helps in recalling the data. When a request comes from a user for a specific file, the recall agent sends a request to the CIS server to retrieve the data from the cloud by using the metadata information. The CIS recall agent name is `cis-recall-agent.service`.
- ♦ **CIS Scanner:** Scans the metadata on the NSS volumes of the OES server and sends it to CIS server. The CIS scanner name is `cis-scanner.service`.

1.5 Services and Components Used by CIS

The services and components in this section are used by CIS.

- ♦ [Section 1.5.1, “Infrastructure Services,” on page 12](#)
- ♦ [Section 1.5.2, “Database,” on page 12](#)

1.5.1 Infrastructure Services

CIS infrastructure services includes the following:

- ♦ [“Elasticsearch \(Indexing\)” on page 12](#)
- ♦ [“ZooKeeper \(Configuration Store\)” on page 12](#)
- ♦ [“Kafka \(Messaging\)” on page 12](#)

Elasticsearch (Indexing)

CIS uses Elasticsearch for the following benefits:

- ♦ Stores indexes and provides the capability for text search that enables faster discovery and deliver of relevant data.
- ♦ Analyze and aggregate the metadata obtained from the respective OES servers and enables CIS to query the information faster.

ZooKeeper (Configuration Store)

CIS uses ZooKeeper service for maintaining the configuration information.

Kafka (Messaging)

CIS uses Kafka for the following benefits:

- ♦ Good solution for large scale message processing applications.
- ♦ Asynchronous communication across services and to report event processing.

1.5.2 Database

CIS supports MariaDB and MS SQL database to store and retrieve the information. For example, OES server information, cloud information, CIS service related information, and information about the migrated data.

1.6 Management Tools

Cloud Integrated Storage policies, tiers, roles, agent settings, and cloud account configuration is managed in the CIS management console. For more information about using CIS management console, see [Section 5.1, “Managing CIS,” on page 33](#).

1.7 What’s Next

For information about planning your CIS solution, see [Chapter 3, “Planning Your Cloud Integrated Storage Server Environment,” on page 17](#).

For information about installing and configuring CIS, see [Chapter 4, “Installing and Configuring Cloud Integrated Storage \(CIS\),” on page 19](#).

2 What's New or Changed in CIS

This section describes enhancements and changes in Cloud Integrated Storage.

2.1 What's New (OES 2018 SP1-Update 2-Patch)

CIS provides the following enhancements and changes in this patch:

- ♦ Resolved Mac issue for automatic recall of files from the cloud on Finder window. For more information, see [Section 7.2, "Mac Issue," on page 52](#).
- ♦ Verify and recover the corrupted files on the Cloud Backed Volume (CBV).
- ♦ Enhanced administrator policy to recall files uploaded to the cloud.

3 Planning Your Cloud Integrated Storage Server Environment

This section describes the software requirements and configuration guidelines for installing and using Cloud Integrated Storage (CIS) on your Open Enterprise Server (OES) servers.

- ♦ [Section 3.1, “Open Enterprise Server 2018 SP1,” on page 17](#)
- ♦ [Section 3.2, “Cloud Storage Requirements,” on page 17](#)
- ♦ [Section 3.3, “CIS Requirements,” on page 17](#)

3.1 Open Enterprise Server 2018 SP1

Cloud Integrated Storage runs on OES servers with 64-bit processors. For information about installing and configuring OES, see the [OES 2018 SP1: Installation Guide](#).

3.2 Cloud Storage Requirements

CIS supports the following:

- ♦ Amazon S3 or
- ♦ Object storage that is S3 compatible

3.3 CIS Requirements

Before you start configuring the Cloud Integrated Storage (CIS) or infrastructure services, ensure that the following prerequisites are met:

- ♦ Ensure that a minimum of 16 GB of RAM is configured for CIS or infrastructure services to function normally.
- ♦ The eDirectory schema for CIS must be extended so that the CIS server is successfully configured. If eDirectory schema is not extended for CIS, execute the `cis.sch` file on the OES server to enable the schema. For more information about how to run the script, see [“CIS Configuration Fails With an Error” on page 55](#). If **Novell Storage Service (NSS)** pattern is selected during installation, the eDirectory schema is automatically updated.
- ♦ Ensure that `/etc/resolv.conf` is configured with the appropriate DNS entry so that the OES server, CIS, and its infrastructure services (Elasticsearch, ZooKeeper, and Kafka) are mutually resolvable.
- ♦ Ensure that the database is installed and configured. For information on how to install and configure MariaDB, see [Appendix B, “Installing and Configuring MariaDB,” on page 67](#). If you want to use already configured database (MariaDB or MS SQL) with CIS, ensure that the database is up and running.
- ♦ While upgrading the older OES versions to OES 2018 SP1, ensure that the CIS pattern is not installed.

4 Installing and Configuring Cloud Integrated Storage (CIS)

This topic describes how to install and configure CIS in different environments.

- ♦ [Section 4.1, “Installing CIS,” on page 19](#)
- ♦ [Section 4.2, “Configuring CIS,” on page 19](#)
- ♦ [Section 4.3, “Verifying the CIS Configuration,” on page 30](#)

4.1 Installing CIS

- 1 From the boot menu, select **Installation** and press enter, then continue with the installation as desired until you get to the Installation Settings page.

For detailed instructions, see [Installing OES 2018 SP1 as a New Installation](#) in the [OES 2018 SP1: Installation Guide](#).

- 2 On the **Installation Settings** page, click **Software** to open the Software Selection and System Tasks page.
- 3 Under **Open Enterprise Server**, select **Cloud Integrated Storage (CIS)** and continue with the installation process.

The following additional services are automatically selected:

- ♦ NetIQ eDirectory
 - ♦ Novell Linux User Management (LUM)
 - ♦ Novell Remote Manager (NRM)
 - ♦ Novell Backup / Storage Management Services (SMS)
- 4 Continue with [Section 4.2, “Configuring CIS,” on page 19](#).

4.2 Configuring CIS

The Cloud Integrated Storage (CIS) provides a console to configure CIS and its infrastructure components. This section covers the deployment configuration of CIS and its infrastructure components.

NOTE: Before configuring CIS or infrastructure services on any server, ensure to select CIS pattern using the YaST configuration.

4.2.1 Accessing the CIS Configuration Console

- 1 Point your browser to `https://<OES server IP address or the host name>:8105`.

- 2 Specify the user name or the FQDN of the eDirectory administrator in the username, specify the password, then click **Login**. For example, cn=admin,o=acme.
The CIS Configuration welcome page explains the configuration flow of CIS components.
- 3 Review the flow, and then select the type of deployment as per your requirement. Click **Show other deployment options** to view all the deployment types available.

IMPORTANT: Before configuring the CIS, ensure that there is sufficient disk space available on the root file system for CIS to function properly.

4.2.2 Deployment Types

- ♦ [“Configure Infrastructure Services” on page 21](#)
- ♦ [“Configure CIS Services” on page 22](#)
- ♦ [“Configure Data Scale” on page 23](#)
- ♦ [“Join this Node to an Existing CIS Cluster \(NCS\)” on page 25](#)
- ♦ [“Configure CIS as a Standalone Server” on page 29](#)

Configure Infrastructure Services

Choose this option to configure Apache Kafka, Apache ZooKeeper, and Elasticsearch in high availability (HA) mode.

A multi node high availability configuration of infrastructure server helps to increase the efficiency and availability of the infrastructure server. It is mandatory to configure atleast three HA nodes. You can configure up to seven nodes.

Prerequisites

- ♦ Before you start with infrastructure services configuration, ensure that the requirements mentioned in [Section 3.3, “CIS Requirements,” on page 17](#) are met.
- ♦ Ensure that you allocate sufficient disk space for the infrastructure server.
- ♦ Docker Swarm configuration is supported only on the ext4 file systems.

Procedure

- 1 To automatically make the server HA ready, click **Start**.

After successful configuration, click **OK**. Re-login to the console to view the steps to complete the Infrastructure service configuration (using CLI).

- 2 (Using CLI) To setup the Docker Swarm, perform the following on the terminal console of this server:

2a Open a terminal console, then log in as a `root` user.

2b Initialize a Docker Swarm using the following command:

```
docker swarm init
```

2c Create a token and add a manager to this swarm using the following command:

```
docker swarm join-token manager
```

Command output:

```
docker swarm join --token <token_value> <host_address:2377>
```

Make a note of this command output, because the same output must be executed on all other HA nodes to join this Docker Swarm.

- 2d** After successful configuration, go to next HA node, perform [step1](#) and then join this server to the Docker Swarm created on first node using the following command:

```
docker swarm join --token <swarm_token_generated_from_first_node>  
<first_node_hostname>:2377
```

Repeat this step on all the infrastructure server nodes.

2e On the last HA node, start infrastructure services using the following command:

```
sh /opt/novell/cis/bin/cis_ext_service.sh start
```

After successful configuration of infrastructure services, continue with [“Configure CIS Services” on page 22](#).

Configure CIS Services

Choose this option to configure CIS as a single node or a NCS (Novell Cluster Services) cluster resource.

Prerequisites

- ♦ Before you start with CIS configuration, ensure that the requirements mentioned in [Section 3.3, “CIS Requirements,” on page 17](#) are met.
- ♦ Ensure that the infrastructure services (in high availability mode) is configured.
- ♦ Ensure that the cluster resource host name or IP address is reserved for the cluster configuration.
- ♦ For CIS server to function in a cluster environment, ensure that all nodes are configured with OES 2018 SP1. Novell Cluster Services must be installed and running on the servers that have CIS installed. For information, see [Installing, Configuring, and Repairing Novell Cluster Services](#) in the [OES 2018 SP1: Novell Cluster Services for Linux Administration Guide](#).

Procedure

1 Database: Specify the following:

1a Select either **MariaDB** or **MS SQL** database.

1b Specify the database host name or IP address and port. By default, the database port for MariaDB is 3306 and MS SQL is 1433.

1c Specify the user name and password for the database.

1d Use secure connection: Enables or disables the database connection to be secure. By default, this option is disabled.

If **MariaDB** database is selected, specify the following:

NOTE: Ensure to copy MariaDB client certificates to the CIS server.

- ♦ **Client CA Certificate file path:** Specify the path of client Certificate Authority (CA) file in .pem format.
- ♦ **Client Certificate file path:** Specify the path of the client certificate file in .pem format.
- ♦ **Client Key file path:** Specify the path of the key file associated with the client certificate in .pem format.

2 Infrastructure Server Host name / IP address: Specify the host name or IP address of all the configured infrastructure server HA nodes. Separate multiple entries with a comma.

3 Cluster: Includes the following:

3a Configure CIS as a NCS cluster resource: Configures CIS in a cluster environment. By default, this option is enabled.

3b Cluster Resource Host name / IP address: Specify the virtual IP address or host name of the NCS cluster resource where the CIS server is part of.

4 Click **Validate**. If there are errors, ensure to resolve them before you proceed.

5 Certificates: Specify the following:

5a eDirectory Server: Displays the CIS server host name and port where the eDirectory server is configured. By default, eDirectory server port is 524.

5b Host name: Specify the fully qualified domain name (FQDN) of the server where CIS will be configured. For example, wdccisserver.labs.wdc.acme.com. Separate multiple entries with a comma.

Cluster Resource Host name: If the server is configured as a NCS cluster resource, specify the fully qualified domain name (FQDN) of a NCS cluster resource where the CIS server is part of.

5c IP Address: Specify the IP address of the server where CIS will be configured. Separate multiple entries with a comma.

Cluster Resource IP Address: If the server is configured as a NCS cluster resource, specify the virtual IP address of the NCS cluster resource where the CIS server is part of.

6 CIS Admin Name with Context: Specify the LDAP distinguished name (DN) of the user who administers the CIS server. For example, cn=admin,o=acme.

7 Admin Password: Specify the password for the CIS administrator.

8 Agent Search Context: Specify the LDAP distinguished name (DN) of the container object under which the NCP server objects of the OES server resides that connects to the CIS server. The OES server includes the agents that connects to the CIS server. The CIS admin user must have supervisory rights on this server context.

9 Click **Next**. Review the configuration summary and then click **Finish**.

10 To configure additional nodes to be part of an existing NCS, go to [“Join this Node to an Existing CIS Cluster \(NCS\)” on page 25](#).

Configure Data Scale

Choose this option to improve the latency of the data access.

Prerequisite

Before you start with CIS configuration, ensure that the requirements mentioned in [Section 3.3, “CIS Requirements,” on page 17](#) are met.

Data and Gateway

Choose this option to configure the data and gateway service on this server. It is recommended to select this option if this is the first data scale server getting configured, because the gateway service provides load balancing on the data service.

1 Host names: Specify the following:

1a Data Server: Displays the host name or IP address of the local server.

1b Configure gateway as a NCS cluster resource: Enables or disables the gateway as a NCS cluster resource. By default, this option is enabled.

- ♦ If this option is enabled, specify the IP address of the NCS cluster resource where gateway is configured.
- ♦ If this option is disabled, the host name or IP address of the local server is displayed.

NOTE: It is recommended to configure gateway as a cluster to avoid interruption of the service.

2 General: Specify the following:

2a CIS Server Address: Specify the host name or IP address where the CIS server is configured.

2b Infrastructure Server Host name: Specify the host name or IP address of all the configured HA nodes. Separate multiple entries with a comma.

3 Certificates: Specify the following:

3a eDirectory Server: Displays the CIS server host name and port where the eDirectory server is configured. By default, eDirectory server port is 524.

3b Cluster Resource Host name: Specify the fully qualified domain name (FQDN) of a NCS cluster resource where the CIS server is part of. Separate multiple entries with a comma.

3c Cluster Resource IP Address: Specify the virtual IP address of the NCS cluster resource where the CIS server is part of. Separate multiple entries with a comma.

4 Click **Next**. Review the configuration summary and then click **Finish**.

Data

Choose this option to configure the server as a standalone data server or connect the data server to an existing gateway server.

1 Host names: Specify the following:

1a Connect to Gateway server: Enables or disables the data server to connect to gateway. By default, this option is enabled.

- ♦ If this option is enabled, displays the host name or IP address of the local server that will be connected to gateway.

Gateway: Specify the host name or IP address of the server where gateway service is configured.

- ♦ If this option is disabled, the host name or IP address of the local server is displayed.

2 General: Specify the following:

2a CIS Server Address: Specify the host name or IP address of the server that is configured with CIS.

2b Infrastructure Server Host name: Specify the host name or IP address of all the configured HA nodes. Separate multiple entries with a comma.

3 Certificates: Specify the following:

3a eDirectory Server: Displays the CIS server host name and port where the eDirectory server is configured. By default, eDirectory server port is 524.

3b Cluster Resource Host name: Specify the fully qualified domain name (FQDN) of a NCS cluster resource where the CIS server is part of. Separate multiple entries with a comma.

3c Cluster Resource IP Address: Specify the virtual IP address of the NCS cluster resource where the CIS server is part of. Separate multiple entries with a comma.

4 Click **Next**. Review the configuration summary and then click **Finish**.

Gateway

Choose this option to configure only the gateway service on this server. You can connect multiple data servers to this gateway server for load balancing between the OES agents and data services.

1 Host names: Specify the following:

1a Configure gateway as a NCS cluster resource: Enables or disables the gateway as a NCS cluster resource. By default, this option is enabled.

- ♦ If this option is enabled, specify the IP address of the NCS cluster resource where the gateway is configured.
- ♦ If this option is disabled, the host name or IP address of the local server is displayed.

2 General: Specify the following:

2a CIS Server Address: Specify the host name or IP address where the CIS server is configured.

2b Infrastructure Server Host name: Specify the host name or IP address of all the configured HA nodes. Separate multiple entries with a comma.

3 Certificates: Specify the following:

3a eDirectory Server: Displays the CIS server host name and port where the eDirectory server is configured. By default, eDirectory server port is 524.

3b Cluster Resource Host name: If gateway is configured as a NCS clustered resource, specify the fully qualified domain name (FQDN) of a NCS cluster resource where the gateway server is configured. Separate multiple entries with a comma.

Host name: Specify the fully qualified domain name (FQDN) of the local server. Separate multiple entries with a comma.

3c Cluster Resource IP Address: If gateway is configured as a NCS clustered resource, specify the virtual IP address of a NCS cluster resource where the gateway server is configured. Separate multiple entries with a comma.

IP Address: Specify the IP address of the local server. Separate multiple entries with a comma.

4 Click **Next**. Review the configuration summary and then click **Finish**.

Join this Node to an Existing CIS Cluster (NCS)

Choose this option to configure additional nodes to be part of an existing CIS cluster.

Prerequisites

- ♦ Before you start with CIS configuration, ensure that the requirements mentioned in [Section 3.3, "CIS Requirements," on page 17](#) are met.
- ♦ Ensure to copy the certificates from `/etc/opt/novell/cis/certs` on the first node to this server.
- ♦ If MariaDB database is used, ensure to copy the client certificates from first node to the same location on this CIS server.

Procedure

- 1 On the deployment options page, click **Show other deployment options**, select the **Join this Node to an Existing CIS Cluster (NCS)** deployment type and then click **Next**.
- 2 **Infrastructure Service Host name / IP Address:** Specify the host name or IP address of all the configured infrastructure server HA nodes. Separate multiple entries with a comma and then click **Get Details**.

After successful verification, the database information is displayed. Specify the database password.
- 3 **Gateway Server Address:** Specify the virtual IP address of the NCS cluster resource where the CIS server is part of.
- 4 **Admin Context:** Includes the following:
 - 4a **CIS Admin Name with Context:** Specify the LDAP distinguished name (DN) of the user who administers the CIS server. For example, cn=admin,o=acme.
 - 4b **Admin Password:** Specify the password for the CIS administrator.
 - 4c **Agent Search Context:** Specify the LDAP distinguished name (DN) of the container object under which the NCP server objects of the OES server resides that connects to the CIS server. The OES server includes the agents that connects to the CIS server. The CIS admin user must have supervisory rights on this server context.
- 5 Click **Next**. Review the configuration summary and then click **Finish**.
- 6 Configure CIS server with Novell Cluster Service using CIS_Template in iManager.

IMPORTANT: CIS is installed and configured identically on the cluster servers where all the YaST configuration is obtained from the centralized Infrastructure services in the network. Therefore, CIS does not require shared storage to run with Novell Cluster Services.

The CIS_Template simplifies the process of creating a CIS cluster resource.

- 6a Start your Internet browser and enter the URL for iManager.

The URL is `https://server_ip_address/nps/iManager.html`. Replace `server_ip_address` with the IP address or DNS name of a server in the cluster.
- 6b Enter your user name and password.
- 6c In **Roles and Tasks**, select **Clusters > My Clusters**.

The list is initially empty.
- 6d Click **Add** to open the eDirectory browser pop-up window.
- 6e Browse the tree where you are currently logged in to locate and select a Cluster object, then click **OK**.

Newly selected cluster is added to your personalized list.
- 6f Click the cluster object and select the **Cluster Options** tab to access the templates.
- 6g Click the **New** link.
- 6h Specify **Resource** as the resource type you want to create by clicking the **Resource** radio button, then click **Next**.
- 6i In **Cluster Resource Name**, specify the name of the resource you want to create.
- 6j In **Inherit from Template**, browse to the Cluster object and select the existing resource template (CIS_Template) in the Cluster container.
- 6k Ensure that the **Define Additional Properties** check box is selected, then click **Next** to continue to the Load Script page.

6l Edit the load script for your specific configuration.

The default load script is:

```
#!/bin/bash
. /opt/novell/ncs/lib/ncsfuncs

# define the IP address
RESOURCE_IP=a.b.c.d

# add the IP address
exit_on_error add_secondary_ipaddress $RESOURCE_IP

# start the services
exit_on_error /usr/bin/systemctl start oes-cis-auth.service
exit_on_error /usr/bin/systemctl start oes-cis-data.service
exit_on_error /usr/bin/systemctl start oes-cis-metadata.service
exit_on_error /usr/bin/systemctl start oes-cis-policy.service
exit_on_error /usr/bin/systemctl start oes-cis-mgmt.service
exit_on_error /usr/bin/systemctl start oes-cis-aggregator.service
exit_on_error /usr/bin/systemctl start oes-cis-collector.service
exit_on_error /usr/bin/systemctl start oes-cis-repagggregator.service
exit_on_error /usr/bin/systemctl start oes-cis-repcollector.service
exit_on_error /usr/bin/systemctl start oes-cis-gateway.service

# wait before checking their status
sleep 5

# check the services
exit_on_error /usr/bin/systemctl is-active oes-cis-auth.service
exit_on_error /usr/bin/systemctl is-active oes-cis-data.service
exit_on_error /usr/bin/systemctl is-active oes-cis-metadata.service
exit_on_error /usr/bin/systemctl is-active oes-cis-policy.service
exit_on_error /usr/bin/systemctl is-active oes-cis-mgmt.service
exit_on_error /usr/bin/systemctl is-active oes-cis-aggregator.service
exit_on_error /usr/bin/systemctl is-active oes-cis-collector.service
exit_on_error /usr/bin/systemctl is-active oes-cis-repagggregator.service
exit_on_error /usr/bin/systemctl is-active oes-cis-repcollector.service
exit_on_error /usr/bin/systemctl is-active oes-cis-gateway.service

# restart firewall if its running
systemctl status SuSEfirewall2.service
if [ $? -eq 0 ]; then
    ignore_error systemctl restart SuSEfirewall2.service
fi

# return status
exit 0
```

IMPORTANT: For `RESOURCE_IP=a.b.c.d`, enter the Cluster Resource IP Address provided during the CIS configuration.

6m Click **Next** to continue to the Unload Script page.

6n Edit the unload script for your specific configuration.

The default unload script is:

```
#!/bin/bash
. /opt/novell/ncs/lib/ncsfuncs

# define the IP address
RESOURCE_IP=a.b.c.d

# request services stop
ignore_error /usr/bin/systemctl stop oes-cis-auth.service
ignore_error /usr/bin/systemctl stop oes-cis-data.service
ignore_error /usr/bin/systemctl stop oes-cis-metadata.service
ignore_error /usr/bin/systemctl stop oes-cis-policy.service
ignore_error /usr/bin/systemctl stop oes-cis-mgmt.service
ignore_error /usr/bin/systemctl stop oes-cis-aggregator.service
ignore_error /usr/bin/systemctl stop oes-cis-collector.service
ignore_error /usr/bin/systemctl stop oes-cis-repagggregator.service
ignore_error /usr/bin/systemctl stop oes-cis-repcollector.service
ignore_error /usr/bin/systemctl stop oes-cis-gateway.service

# del the IP address
ignore_error del_secondary_ipaddress $RESOURCE_IP

# return status
exit 0
```

IMPORTANT: For `RESOURCE_IP=a.b.c.d`, enter the Cluster Resource IP Address provided during the CIS configuration.

6o Click **Next** to continue to the Monitor Script page.

6p Edit the monitor script for your specific configuration.

The default monitor script is:

```
#!/bin/bash
. /opt/novell/ncs/lib/ncsfuncs

# define the IP address
RESOURCE_IP=a.b.c.d

# check the IP address
exit_on_error status_secondary_ipaddress $RESOURCE_IP

# check the services
exit_on_error /usr/bin/systemctl is-active oes-cis-auth.service
exit_on_error /usr/bin/systemctl is-active oes-cis-data.service
exit_on_error /usr/bin/systemctl is-active oes-cis-metadata.service
exit_on_error /usr/bin/systemctl is-active oes-cis-policy.service
exit_on_error /usr/bin/systemctl is-active oes-cis-mgmt.service
exit_on_error /usr/bin/systemctl is-active oes-cis-aggregator.service
exit_on_error /usr/bin/systemctl is-active oes-cis-collector.service
exit_on_error /usr/bin/systemctl is-active oes-cis-repagggregator.service
exit_on_error /usr/bin/systemctl is-active oes-cis-repcollector.service
exit_on_error /usr/bin/systemctl is-active oes-cis-gateway.service

# return status
exit 0
```

IMPORTANT: For `RESOURCE_IP=a.b.c.d`, enter the Cluster Resource IP Address provided during the CIS configuration.

6q Click **Next** to continue to the Resource Policies page, then click **Next**.

- 6r** On the Resource Preferred Nodes page, specify the node assignments for the resource, then click **Finish**.

The resource you created is saved to the Cluster container of the cluster you selected.

- 6s** Go to **Cluster Manager** tab to view the state of resource created. The Cluster state will be Offline.

- 6t** Select the check box next to the resource you created, then click **Online**.

- 6u** Select the cluster node where you want the resource to load, then click **OK**.

For more information on cluster configuration, see [OES 2018 SP1: Novell Cluster Services for Linux Administration Guide](#).

Configure CIS as a Standalone Server

Choose this option to configure Apache Kafka, Apache ZooKeeper, Elasticsearch, database and CIS services on the same server.

Prerequisites

Before you start with CIS configuration, ensure that the requirements mentioned in [Section 3.3, “CIS Requirements,” on page 17](#) are met.

Procedure

- 1** On the deployment options page, click **Show other deployment options**, select the **Configure CIS as a Standalone Server** deployment type and then click **Next**.

- 2 Database:** Specify the following:

Use external database: Enable this option to configure CIS with the already configured database server. By default, this option is disabled.

- ♦ If this option is disabled, specify the MariaDB password.
- ♦ If this option is enabled, specify the following:
 1. Select either **MariaDB** or **MS SQL** database.
 2. Specify the database host name or IP address and port. By default, the database port for MariaDB is 3306 and MS SQL is 1433.
 3. Specify the user name and password for the database.
- 4. Use secure connection:** Enables or disables the database connection to be secure. By default, this option is disabled.

If **MariaDB** database is selected, specify the following:

NOTE: Ensure to copy MariaDB client certificates to the CIS server.

- ♦ **Client CA Certificate file path:** Specify the path of client Certificate Authority (CA) file in .pem format.
 - ♦ **Client Certificate file path:** Specify the path of the client certificate file in .pem format.
 - ♦ **Client Key file path:** Specify the path of the key file associated with the client certificate in .pem format.
- 3 ZooKeeper:** By default, it is configured with the CIS server IP and ZooKeeper port is 2181.
- 4 Elasticsearch:** By default, it is configured with the CIS server IP and Elasticsearch port is 9400.
- 5 Kafka:** By default, it is configured with the CIS server IP and Kafka port is 9092.

- 6 Click **Next**.
- 7 **Certificates:** Specify the following:
 - 7a **eDirectory Server:** By default, it is configured with the CIS sever IP and eDirectory server port is 524.
 - 7b **Host name:** Specify the fully qualified domain name (FQDN) of the server where CIS will be configured. For example, wdccisserver.labs.wdc.acme.com. Separate multiple entries with a comma.
 - 7c **IP Address:** Specify the IP address of the server where CIS will be configured. Separate multiple entries with a comma.
- 8 **CIS Admin Name with Context:** Specify the LDAP distinguished name (DN) of the user who administers the CIS server. For example, cn=admin,o=acme.
- 9 **Admin Password:** Specify the password for the CIS administrator.
- 10 **Agent Search Context:** Specify the LDAP distinguished name (DN) of the container object under which the NCP server objects of the OES server resides that connects to the CIS server. The OES server includes the agents that connects to the CIS server. The CIS admin user must have supervisory rights on this server context.
- 11 Click **Next**. Review the configuration summary and then click **Finish**.

4.3 Verifying the CIS Configuration

After successful configuration of CIS and its infrastructure services, perform any one of the following:

- ♦ Point your browser to <https://<OES server IP address or host name>:8105> and click **Admin Console** link to go to CIS Administration login page.

++
++
++
++++
++++
++++

OES

CIS Configuration

cn=admin,o=microfocus

Password

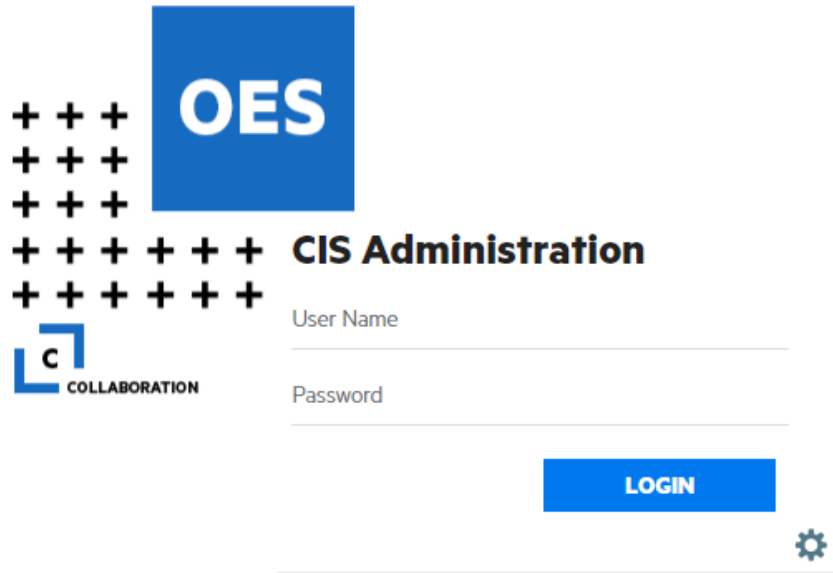
LOGIN

COLLABORATION

The server is successfully configured.
You can now access the [Admin Console](#) to manage CIS server.

OR

- ♦ Point your browser to <https://<OES server IP address or host name>:8344>.



The image shows the login interface for OES CIS Administration. On the left, there is a decorative graphic consisting of a grid of plus signs and a blue square with the letters 'OES' in white. Below this is a logo for 'C COLLABORATION' with a blue 'C' and the word 'COLLABORATION' in black. To the right of the graphic, the text 'CIS Administration' is displayed in bold. Below the title, there are two input fields: 'User Name' and 'Password'. A blue 'LOGIN' button is positioned to the right of the password field. In the bottom right corner, there is a small gear icon for settings.

OES

CIS Administration

User Name

Password

LOGIN

COLLABORATION

5 Management Tools for CIS

This section provides an overview of the management tools for Cloud Integrated Storage (CIS) in Open Enterprise Server (OES).

- ♦ [Section 5.1, “Managing CIS,” on page 33](#)

5.1 Managing CIS

Cloud Integrated Storage (CIS) management console allows you to move the NSS data to cloud storage. It also allows you to define policies for data migration and view statistic information on migration, files migrated and recalled.

IMPORTANT: The CIS management login page (<https://<OES server IP address or the host name>:8344>) works only if CIS is configured.

Prerequisites

Before you start using the CIS management console, ensure that the following prerequisites are met:

- ♦ Supported web browsers:
 - ♦ Mozilla Firefox
 - ♦ Google Chrome
 - ♦ Internet Explorer
 - ♦ Microsoft Edge
 - ♦ Apple Safari
- ♦ Ensure that a cloud account is created and you have details of the access key and secret key.
- ♦ If you use cloud account with SSL support and create certificate signed by different CA (other than eDirectory CA), copy the CA bundle (.pem format) in `/etc/opt/novell/cis/certs/rootCAs` and add the CA bundle file name in `CLOUD_CA_BUNDLE_NAME` in the `/etc/opt/novell/cis/config` file.

For example:

```
CLOUD_CA_BUNDLE_NAME="Cloud1-CA.pem"
```

NOTE: If you have multiple cloud accounts with SSL support, concatenate CAs (.pem format) of the cloud accounts and add the concatenated CA bundle name in `CLOUD_CA_BUNDLE_NAME` in the `/etc/opt/novell/cis/config` file.

After configuring the `/etc/opt/novell/cis/config` file, ensure to restart the data service using the following command:

```
systemctl restart oes-cis-data.service
```

In data scale scenario, repeat the same steps on all the servers where data service is running. The config file path in data scale is `/etc/opt/novell/cis-scale`.

After configuring the `/etc/opt/novell/cis-scale/config` file, ensure to restart the data scale service using the following command:

```
systemctl restart oes-cis-dataatscale.service
```

NOTE: This prerequisite is not applicable in AWS S3, as secure communication is taken care without the `CLOUD_CA_BUNDLE_NAME` parameter.

- ♦ Ensure that all the CIS services and its infrastructure services are up and running.
- ♦ Verify whether the CIS agents are up and running. The CIS agents includes the following:

```
oes-cis-agent.service
oes-cis-recall-agent.service
oes-cis-scanner.service
```

For example,

```
blr7-user1:/lib/modules/4.4.21-69-default/kernel # systemctl status oes-cis-agent.service
```

```
• oes-cis-agent.service - CIS agent for OES
  Loaded: loaded (/usr/lib/systemd/system/oes-cis-agent.service; enabled;
  vendor preset: disabled)
  Active: active (running) since Wed 2017-06-14 19:01:09 IST; 1 day 23h ago
  Main PID: 17177 (cisagents)
  Tasks: 107 (limit: 512)
  CGroup: /system.slice/oes-cis-agent.service
          └─17177 /opt/novell/cis/bin/cisagents
```

```
Jun 16 10:53:43 blr7-user1 cisagents[17177]: Entry name = /media/nss/TEST1/
DESKTOP.AFP/ICON/736F646D5458455
Jun 16 10:53:43 blr7-user1 cisagents[17177]: Entry name = /media/nss/TEST1/
DESKTOP.AFP/ICON/736F646D666C726
Jun 16 10:53:43 blr7-user1 cisagents[17177]: Entry name = /media/nss/TEST1/
~DFSINFO.8-P
Jun 16 11:07:26 blr7-user1 cisagents[17177]: 2017/06/16 11:07:26 Number of
Components: 3
Jun 16 11:07:26 blr7-user1 cisagents[17177]: Entry name = /media/nss/TEST1/BB/
krb5.conf
Jun 16 11:07:26 blr7-user1 cisagents[17177]: Entry name = /media/nss/TEST1/
DESKTOP.AFP/ICON/736F646D414E494
Jun 16 11:07:26 blr7-user1 cisagents[17177]: Entry name = /media/nss/TEST1/
DESKTOP.AFP/ICON/736F646D4C50504
Jun 16 11:07:26 blr7-user1 cisagents[17177]: Entry name = /media/nss/TEST1/
DESKTOP.AFP/ICON/736F646D5458455
Jun 16 11:07:26 blr7-user1 cisagents[17177]: Entry name = /media/nss/TEST1/
DESKTOP.AFP/ICON/736F646D666C726
Jun 16 11:07:26 blr7-user1 cisagents[17177]: Entry name = /media/nss/TEST1/
~DFSINFO.8-P
```

Similarly, verify the status of other two CIS agents.

If CIS agents are not running, restart all 3 agents by entering the following command:

```
systemctl start oes-cis-agent.service
systemctl start oes-cis-recall-agent.service
systemctl start oes-cis-scanner.service
```

Data Migration Using CIS Management Console

1. Configure the cloud account. For more information, see [Section 5.1.2, “Accounts,” on page 35](#).

2. Create a policy. For more information, see [Section 5.1.3, “Policies,” on page 36](#).
3. Configure the tier. For more information, see [Section 5.1.4, “Tiers,” on page 38](#).
4. View the status of data migration. For more information, see [Section 5.1.5, “Dashboard,” on page 42](#).


The CIS management console includes the following:

- ♦ [Section 5.1.1, “Insights,” on page 35](#)
- ♦ [Section 5.1.2, “Accounts,” on page 35](#)
- ♦ [Section 5.1.3, “Policies,” on page 36](#)
- ♦ [Section 5.1.4, “Tiers,” on page 38](#)
- ♦ [Section 5.1.5, “Dashboard,” on page 42](#)
- ♦ [Section 5.1.6, “Roles,” on page 42](#)
- ♦ [Section 5.1.7, “Agents,” on page 43](#)
- ♦ [Section 5.1.8, “Settings,” on page 45](#)
- ♦ [Section 5.1.9, “Data Servers,” on page 46](#)
- ♦ [Section 5.1.10, “Health Indicator,” on page 46](#)

5.1.1 Insights

The CIS welcome page provides the network level view of total number of volumes available on the OES servers that is configured with CIS, total number of files available, and total space used by those files. Based on the access time or modification time, the **Data Summary** section displays the percentage of hot and cold data available on all the volumes and lets you do the following:

- ♦ View the percentage of hot and cold data (based on access time or modification time) by moving the data slider.
- ♦ Set the age of the hot and cold data (based on access time and modification time) by moving the time slider.

Click  to view the updated scan details of all the CIS agents. You can use this page to discover the volumes that contain more cold data and the type of files available as part of that cold data. Overall, this page provides the user with the insights of data available in their organization and use this information to create policies.

Click any volume in **Top Cold Volumes** or the HOT/COLD chart to view the volume specific summary. Click on volumes count at the top to go to volume summary information page.


5.1.2 Accounts

Configure and manage the cloud account to which you are planning to migrate the data.

- ♦ [“Configuring Cloud Account” on page 36](#)
- ♦ [“Managing Cloud Accounts” on page 36](#)



Configuring Cloud Account

Click the **Accounts** tab, the **Cloud Accounts** page is displayed.

- 1 Click  to configure the cloud account.
- 2 Specify the following:
 - 2a **Account Name:** Specify the cloud account name.
 - 2b **Account Type:** Select one of the following:
 - ♦ AWS S3
 - ♦ S3 Compatible
 - Endpoint:** This parameter is displayed only if you select the S3 Compatible. Specify the URL of the cloud server.
 - 2c **Region:** Select the region name where the cloud server is available.
 - 2d **Access Key:** Specify the access key of the cloud account.
 - 2e **Secret Key:** Specify the secret key of the cloud account.
- 3 Click **SAVE**.

Managing Cloud Accounts

Click the **Accounts** tab to view all the configured cloud accounts.

- ♦ To modify the cloud account information:
 1. Click  on the cloud account you want to modify.
 2. Click **UPDATE**.
- ♦ To delete the cloud account:
 1. Click  on the cloud account you want to delete.

NOTE: You cannot delete the account on which the data migration is already performed.

2. Click **OK**.


5.1.3 Policies

The data is migrated using the policies that are created based on the last accessed time, modified time, file type, file size, and so on.

- ♦ [“Creating a Policy” on page 36](#)
- ♦ [“Managing Policies” on page 38](#)

Creating a Policy

Click the **Policies** tab, the **Policies** page is displayed.

- 1 Click  to create a policy.
- 2 Specify the name and description for the policy.
- 3 Select the required rule.

The following are sample use cases:

- ♦ **Use Case 1:** To migrate data that is not accessed for more than 120 days.

Rules	Value	Unit	Operation
Files not accessed since	120	days	End

OR

Rules	Value	Unit	Operation
Files not accessed since	4	months	End

- ♦ **Use Case 2:** To migrate data that is not modified for the last two years.

Rules	Value	Unit	Operation
Files not modified since	2	years	End

- ♦ **Use Case 3:** To migrate all the files with .doc and .pdf extension.

Rules	Value	Operation
File name matches	*.doc,*.pdf	End

- ♦ **Use Case 4:** Consider you have six files with names data, user1_data, 2017_data, 16-may_data, may-17_data, and data32. To migrate files with file names containing a matching string.

Rules	Value	Operation
File name matches	*data*	End

After running this policy, all the six files are successfully migrated.

- ♦ **Use Case 5:** To migrate all the files that are less than 1 MB in size.

Rules	Value	Unit	Operation
File size is less than	1	MB	End

- ♦ **Use Case 6:** To migrate all the files and folders that are available in a specific file path.

Rules	Value	Operation
File path contains	/data1/secret	End

NOTE: Ensure that the path provided is from the root of the volume.

4 (Optional) Create multiple rules for the same policy using the following:

- ♦ **And:** Performs **And** operation between the selected and next rule.
- ♦ **Or:** Performs **Or** operation between the selected and next rule.
- ♦ **New group:** Adds a new group and use **And** or **Or** option between these two groups. You can create any number of groups and add multiple rules for the same group.
- ♦ **Delete:** Deletes the selected rule.
- ♦ **End:** Deletes all the rules that follows the selected rule.



For example, to migrate all the data except PDF files larger than 10 MB and less than 6 months old:

Rule	Value	Unit	Operation
File not accessed since	6	months	And
File size is less than	10	MB	And
File name does not match	*.pdf	-	End

5 Click **SAVE**.

Managing Policies

Click the **Policies** tab to view all the policies.

- ♦ To modify the policy:
 1. Click policy name or  on the policy you want to modify.
 2. Click **UPDATE**.
- ♦ To delete the policy:
 1. Click  on the policy you want to delete.

NOTE: You cannot delete the policy that you have used to migrate data.

2. Click **OK**.

5.1.4 Tiers

It includes:

- ♦ [“Tiers” on page 39](#)
- ♦ [“Migrate from DST” on page 40](#)


Tiers

By configuring the cloud tier, you are associating the primary storage (data on OES server) and cloud storage to perform the data migration. Using tier configuration, you can run the policy at a scheduled time.

- ♦ [“Configuring Cloud Tiers” on page 39](#)
- ♦ [“Managing Cloud Tiers” on page 39](#)

Configuring Cloud Tiers




Click the **Tiers** tab, then click **Tiers**.

- 1 Click  to configure the tier.
- 2 Specify the following:
 - 2a Server:** Select the OES server. This lists the OES servers that are configured with CIS server where agent is running and also includes the cluster resources.
 - 2b Volume:** Select a volume.
 - 2c Endpoint:** Select the required cloud account name.
 - 2d Bucket Name:** Specify the bucket name used to store the migrated data. The bucket name can be obtained from your cloud account.
 - 2e Region:** Select the region where the specified bucket name is available.
 - 2f Encryption:** To enable this parameter, configure the encryption settings. If enabled, encrypts the migrated data in the cloud storage.
For more information on encryption settings, see [“Encryption” on page 46](#).
 - 2g Policy:** Select the required policy to be applied.
 - 2h Schedule:** Select the schedule type based on how frequently the policy should be run for the tier. It includes the following: Daily, Weekly, Monthly, Once, and None.
As a best practice, you can limit the duration of run to four hours everyday or run during the weekend to minimize the load on the OES servers. It is recommended that you do not migrate the data when users are accessing the data.
To limit the duration of the schedule run, select **Time duration for the schedule run** option and specify the time duration.
- 3 Click **SAVE**.

NOTE: The secondary volume or CBV (Cloud Backed Volume) is automatically created after the tier configuration.

Managing Cloud Tiers

Click the **Tiers** tab to view all the cloud tiers.

- ♦ If the schedule type is **None**, click  to start the data migration.
- ♦ To stop the data migration, click the rotating icon .
The next time, you start the data migration process for the same tier, the remaining data is migrated to the cloud storage.
- ♦ To rerun the policy for the tier, click .

- ♦ To view statistics for the tier:

1. Click .


Displays information of the migrated files from the previous job run (each time the schedule starts at a specified time, a new job run is created). The statistic information includes:

- ♦ **Status:** Provides the status of data migration.
- ♦ **Start Time:** Provides the data migration start time.
- ♦ **End Time:** Provides the data migration completion time.
- ♦ **Files Migrated:** The total number of files migrated.
- ♦ **Data Size:** Lists the overall size of the data migrated for each volume.

For more information on detailed reports, see [“Dashboard” on page 42](#).

2. If no files are migrated, click **Latest Migration** to view the statistic information for the previous job run.

- ♦ To modify the tier:

1. Click  on the tier you want to modify.
2. Select the required policy and policy type. The policy type options are:
 - ♦ **Migrate Policy:** Select this option to migrate files (that satisfies the policy) to the cloud.
 - ♦ **Recall Policy:** Select this option to recall files (that satisfies the policy) from the cloud.
3. Choose the schedule for tier run and then click **UPDATE**.

- ♦ To delete the tier:

1. Click  on the tier you want to delete.

If data migration is not performed on this tier, click **OK** to delete.

If data migration is performed on this tier, select the desired action:

- ♦ **Recall files and delete:** This recalls all files (migrated as part of this tier) from the cloud and automatically deletes the tier.
- ♦ **Force delete:** This deletes the tier and CBV volume associated with the tier without recalling files. The data (migrated as part of this tier) is lost and cannot be recovered.

2. If you select the **Recall files and delete** action, choose the schedule to recall files and then click **Recall**.

OR

If you select the **Force delete** action, click **Delete**.

Migrate from DST


Based on the DST migrate tier details, the data is migrated from the DST shadow volume to the cloud storage. By default, an internal policy is applied to migrate all files in the DST shadow volume.

- ♦ [“Configuring DST Migrate Tier” on page 40](#)
- ♦ [“Managing DST Migrate Tiers” on page 41](#)

Configuring DST Migrate Tier

Click the **Tiers** tab, then click **Migrate from DST**.

NOTE: Before configuring the DST tier, ensure to disable the DST policies. For more information, see [Chapter 6, “Migrating DST Volumes to Cloud,” on page 47](#).



- 1 Click  to configure the tier.
- 2 Specify the following:
 - 2a **Server:** Select the OES server. This lists the OES servers that are configured with CIS server where agent is running and also includes the cluster resources.
 - 2b **Volume:** Select a volume.
 - 2c **Endpoint:** Select the required cloud account name.
 - 2d **Bucket Name:** Specify the bucket name used to store the migrated data. The bucket name can be obtained from your cloud account.
 - 2e **Region:** Select the region where the specified bucket name is available.
 - 2f **Encryption:** To enable this parameter, configure the encryption settings. If enabled, encrypts the migrated data in the cloud storage.
For more information on encryption settings, see [“Encryption” on page 46](#).
 - 2g **Schedule:** Select the schedule type based on how frequently the policy should be run for the tier. It includes the following: Daily, Weekly, Monthly, Once, and None.
As a best practice, you can limit the duration of run to four hours everyday or run during the weekend to minimize the load on the OES servers. It is recommended that you do not migrate the data when users are accessing the data.
To limit the duration of the schedule run, select [Time duration for the schedule run](#) option and specify the time duration.
- 3 Click **SAVE**.

NOTE


- ♦ The secondary volume or CBV (Cloud Backed Volume) is automatically created after the tier configuration.
 - ♦ If the primary volume is AD enabled, ensure that the CBV created for the corresponding primary volume is also AD enabled using NSS tools or utilities.
-

Managing DST Migrate Tiers

Click the **Tiers** tab to view all the DST migrate tiers.

- ♦ If the schedule type is **None**, click  to start the DST migration.
- ♦ To stop the DST migration, click the rotating icon .

The next time, you start the DST migration process for the same tier, the remaining data is migrated to the cloud storage.

- ♦ To rerun the policy for the DST tier, click .
- ♦ To view statistics for the DST tier:



1. Click .


Displays information of the migrated files from the previous job run (each time the schedule starts at a specified time, a new job run is created). The statistic information includes:

- ♦ **Status:** Provides the status of data migration.

- ♦ **Start Time:** Provides the data migration start time.
- ♦ **End Time:** Provides the data migration completion time.
- ♦ **Files Migrated:** The total number of files migrated.
- ♦ **Data Size:** Lists the overall size of the data migrated for each volume.

For more information on detailed reports, see [“Dashboard” on page 42](#).

2. If no files are migrated, click **Latest Migration** to view the statistic information for the previous job run.
- ♦ To modify the DST tier:
 1. Click  on the DST tier you want to modify.
 2. Click **UPDATE**.
 - ♦ To move the DST tier to cloud tier, perform the following:
 1. After migrating all the files to cloud, remove the DST pair. For more information, see [Chapter 6, “Migrating DST Volumes to Cloud,” on page 47](#).
 2. Click  on the DST tier.
 3. Select the required policy and click **MIGRATE**.

The DST tier is no longer listed in **Migrate from DST**. Instead, it is listed in **Tiers**.
 - ♦ To delete the DST tier:
 1. Click  on the DST tier you want to delete.
 2. Click **OK**.

5.1.5 Dashboard

The **Dashboard** page displays the following:

- ♦ **File Size:** Total size of files migrated and recalled.
- ♦ **File Count:** Total number of files migrated and recalled.
- ♦ **Graphical Representation of Files Migrated and Recalled:** Displays a line graph for both files migrated and recalled. The horizontal axis (x-axis) represents the migrated or recalled time, whereas the vertical axis (y-axis) represents the data size. Click on the files migrated or recalled value and zoom in to view the exact time the individual files are moved.
- ♦ **Select Date:** Click on date icon at the top right corner to select a date and to view the information of files migrated and recalled on the selected dates. The date selection option is available on **Dashboard** and **Statistics** page.

Click the file size or file count to go to **Volumes** page. The **Volumes** page displays the total size of files migrated, recalled, and a graphical representation of the same in the form of pie graph for each volume.

Click on a volume or pie graph to go to **Statistics** page. The **Statistics** page displays the file size, file count, and a graphical representation of files migrated and recalled for a specific volume. Click **More Details** to view the detailed information of files migrated and recalled. The migrated files are displayed based on the run ID (ID generated for every policy/job run on each tier). Select the run ID to view the information of migrated files for a specific job (policy run for a specific volume).

5.1.6 Roles

Configure roles for the user or group objects that belongs to eDirectory to manage CIS.


NOTE: Active Directory user or group objects are not supported.

- ♦ [“Configuring Roles” on page 43](#)
- ♦ [“Managing Roles” on page 43](#)

Configuring Roles



NOTE: Before configuring the Roles, create a proxy user using iManager and specify that user in **Proxy User Name** under the **Settings > Proxy User and Context** tab. For more information, see [“Proxy User and Context” on page 45](#).

Click the **Roles** tab, the **Roles** page is displayed.

- 1 Click  to configure the role.
- 2 Specify the following:
 - 2a **Name:** Specify the eDirectory object name.
 - 2b **Type:** Select either User or Group.
 - 2c **Role:** Select the required access:
 - ♦ **Read Admin:** The user or group objects can only view the cloud account, policy and tier information.
 - ♦ **Execute Admin:** The user or group objects can configure cloud account, create policy, and configure cloud tier.
 - ♦ **Root Admin:** The user or group objects can configure cloud account, create policy, configure cloud tier, configure roles and modify the CIS server and agent settings.
- 3 Click **SAVE**.

Managing Roles

Click the **Roles** tab to view all the roles configured.

- ♦ To modify the role:
 1. Click  on the role you want to modify.
 2. Click **UPDATE**.
- ♦ To delete the role:
 1. Click  on the role you want to delete.
 2. Click **OK**.

5.1.7 Agents

This page allows you to set the configuration for OES server agents. Click the **Agents** tab, the **Agent Settings** page is displayed. It includes:

- ♦ [“Global Configuration for All Agents” on page 44](#)
- ♦ [“Configuration for Each Agent” on page 44](#)

Global Configuration for All Agents

This section lists the common configuration for all the CIS agents on OES servers that is connected to CIS server. It includes the following:

- ♦ **Port:** Specify the port through which all the CIS agents on OES servers communicate to CIS server. The default value is 8000.

NOTE: If you are modifying the port, ensure to close the existing port.

- ♦ **Log Level:** Select the log level for all the CIS agents. The options are: Panic, Fatal, Error, Warn, Info, and Debug. The default log level is Info.
- ♦ **Throttling:** Click toggle button (On) to regulate the data transfer rate of the recalled files. By default, it is Off. It includes:
 - ♦ **Duration:** Specify the time interval in seconds within which the specified number of files in **File Limit** should be recalled. The default value is 60 seconds.
 - ♦ **File Limit:** Specify the total number of files to be recalled within the specified **Duration**. The default value is 100.

For example, consider a scenario where the **Duration** as 30 seconds and **File Limit** as 60, which indicates maximum 60 files can be recalled at any given point in time depending on the file size and network bandwidth. Assuming that if 60 files are recalled in first 10 seconds, then the time taken to recall the remaining files is based on the following rule:

Recall rate per file = Duration/File Limit = "n" seconds, which means $30/60 = 0.5$ seconds.

NOTE: Ensure to restart the recall agent for throttling changes to take effect.

- ♦ **Online/Offline:** Enables or disables the data recall on all the CIS agents. By default, it is set to **Online**.
- ♦ **Enabled/Disabled:** Enables or disables the data migration and recall on all the CIS agents on OES server that is connected to CIS. By default, it is **Enabled**.

If disabled, it brings down all the CIS agents. To enable the CIS agents again, set toggle button to **Enabled**, click **SAVE** and then manually login to the OES servers and restart the CIS agent service

After setting the global configuration, click **SAVE**.

Configuration for Each Agent

This section lists all the CIS agents on OES server that is connected to the CIS server. It provides the setting parameters for individual CIS agent.

NOTE: The agents in the highlighted rows will be configured with the global agent configuration.

- ♦ **Agent Name:** Displays the CIS agent name on OES server that is connected to CIS.
- ♦ **Data Server:** Select the required CIS data server URI through which the CIS agent should communicate to. By default, the CIS server URI is displayed
- ♦ **Port:** Specify the port through which the CIS agent on OES server should communicate to CIS data server. The default value is 8000.

NOTE: If you are modifying the port, ensure to close the existing port.

- ♦ **Log Level:** Select the log level for the CIS agent. The options are: Panic, Fatal, Error, Warn, Info, and Debug. The default log level is Info.
- ♦ **Agent State:** This includes the following:
 - ♦ **Online/Offline:** Enables or disables the data recall on that CIS agent. By default, it is set to **Online**.
 - ♦ **Enabled/Disabled:** Enables or disables the data migration and recall on that CIS agent. By default, it is **Enabled**.
If disabled, it brings down the CIS agent. To enable the CIS agent again, set toggle button to **Enabled**, click **SAVE** and then manually login to the OES server and restart the CIS agent service.

After setting the agent configuration, click **SAVE**.

5.1.8 Settings

This page allows you to set the configuration for CIS server. Click the **Settings** tab, the **CIS settings** page is displayed. It includes:

- ♦ “[Proxy User and Context](#)” on page 45
- ♦ “[General](#)” on page 46
- ♦ “[Encryption](#)” on page 46

Proxy User and Context

Includes the following:

IMPORTANT: The root admin must have the following rights:

- ♦ Rights to modify the `cishost-info` attribute on the server context.
 - ♦ Supervisory rights on the proxy user of eDirectory object, if root admin needs to update the proxy DN.
-
- ♦ **CIS Server Context:** By default, it is obtained from the CIS configuration. Displays the fully distinguished name of the context under which the OES server objects that can connect to the CIS server reside. For example, `ou=wdc,o=acme` is set as context indicates that any server within this context can connect to CIS.
 - ♦ **Administrator Search Context:** Specify the context of the administrator user or group object where you can configure roles for a specific user or group. For example, if `o=acme` is set as search context, the authentication object is searched only within this context.
 - ♦ **Proxy User Name:** Specify the proxy user used by the CIS server for users or groups lookup. The proxy user must have read and compare permissions for CN attribute on the **Administrator Search Context** configured. CIS server resets and maintains the proxy user password. This proxy user must be used to manage only CIS.

After configuring the context settings, click **SAVE**.

General

Includes the following:

- ♦ **Secondary Volume Suffix Pattern:** Specify the name that needs to be suffixed with the secondary volume name. The default value is `_CBV`. For example, if the primary volume name is `VOL1`, the secondary volume name is `VOL1_CBV`.
- ♦ **Log Level:** Select the log level for CIS services. The options are: Panic, Fatal, Error, Warn, Info, and Debug. The default log level is Info.

After configuring the general settings, click **SAVE**.

Encryption

CIS supports pool-based encryption and generates a pool of keys for data encryption. It includes the following:

- ♦ **Key Size:** Select the AES encryption key size based on your requirement.
- ♦ **Pool Size:** Specify a valid integer. Based on the specified value, the corresponding pool of keys are generated and used for data encryption. The minimum pool size value is 127.

After configuring the encryption settings, click **SAVE** to generate the pool of keys. To again generate a new pool of keys for a different **Pool Size** values, click **REGENERATE**.

5.1.9 Data Servers

The data servers page displays the following:

- ♦ Lists all the gateway servers and the data servers that are connected to the individual gateway server. It also displays the corresponding CIS agents configured for all the gateway servers.
- ♦ Lists all the standalone data servers and corresponding CIS agents configured to a standalone data server.

5.1.10 Health Indicator

The CIS health indicator shows the current server health status as healthy, partially healthy, or not healthy. Click the server health icon at the top right corner to display the **CIS Health Status** window.

The CIS health status displays the status of the following:

- ♦ **Summary:** Displays the overall status of the CIS server.
- ♦ **Services:** Displays the status of all the CIS services.
- ♦ **Gateway:** Displays the connection status between the CIS gateway and CIS services.
- ♦ **Infrastructure:** Displays the status of ZooKeeper, Elasticsearch, Kafka, and Database.
- ♦ **Configuration:** Displays the status of docker daemon, docker network for CIS, CIS network in iptables - Firewall, network masquerading for CIS, CIS ports, and logging service.

If the server health status is not good, click **FIX** to fix the issues. Similarly, to get the updated health status of CIS server, click **REFRESH**.

6 Migrating DST Volumes to Cloud

This section describes about how to migrate DST local and cluster volumes to cloud storage.

The following video demonstrates how to migrate DST cluster volumes to the cloud using CIS:

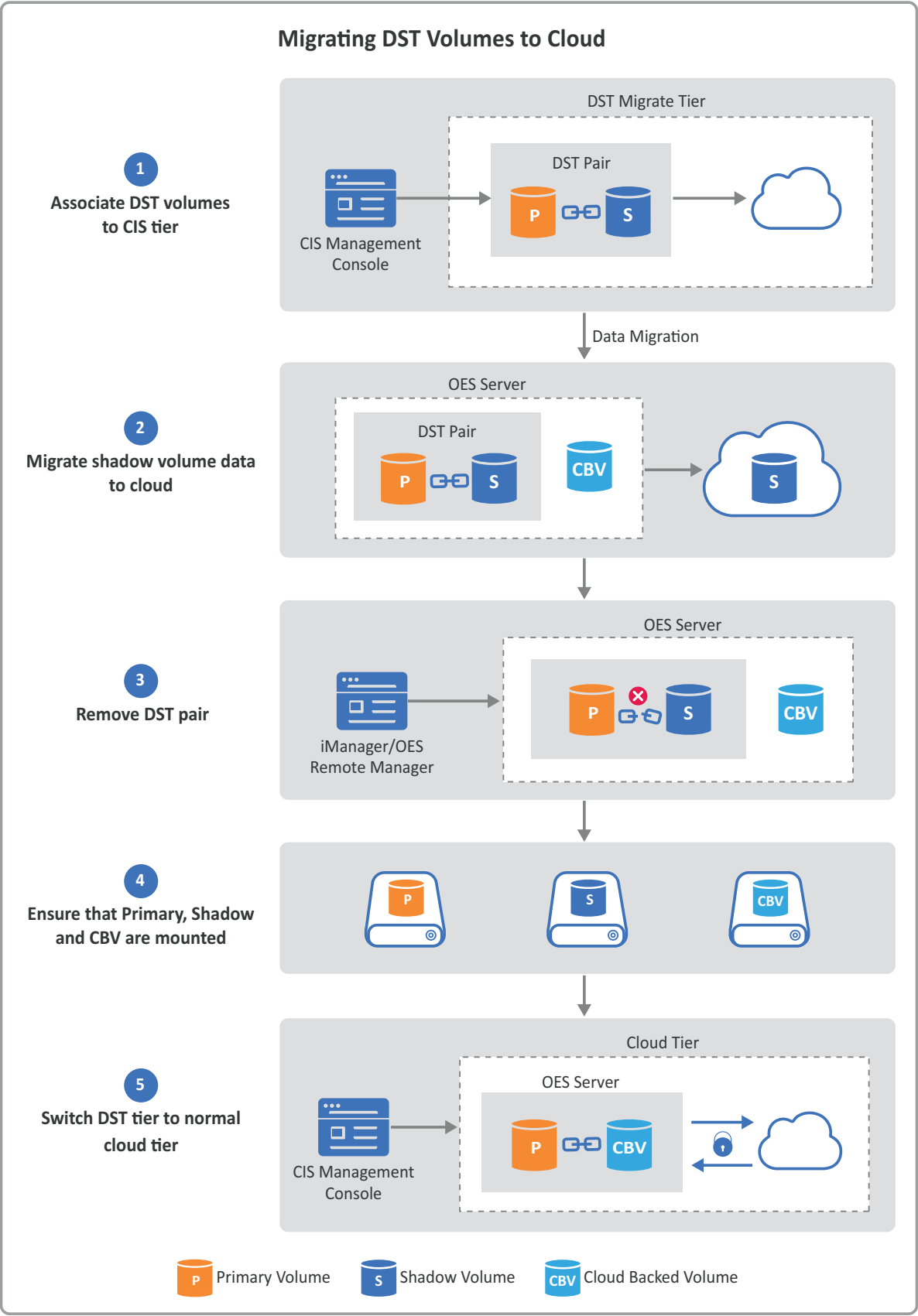
 <http://www.youtube.com/watch?v=3-A9wYtUQt8>

Prerequisites

- ♦ Ensure to salvage the required files available in the DST shadow volume. Otherwise, the salvageable files are not migrated to cloud during the tier run.
- ♦ It is recommended to take a backup of the DST shadow volume before performing the DST migration.
- ♦ Ensure that all the active and running DST policies are completed or stopped.
- ♦ In OES Remote Manager, under **Manage NCP Services > Manage Server**, ensure to set the DST parameter information as follows:

```
REPLICATE_PRIMARY_TREE_TO_SHADOW: 1
SHIFT_ACCESSED_SHADOW_FILES: 0
SHIFT_DAYS_SINCE_LAST_ACCESS: 0
SHIFT_MODIFIED_SHADOW_FILES: 1
DUPLICATE_SHADOW_FILE_ACTION: 0
DUPLICATE_SHADOW_FILE_BROADCAST: 0
```

Figure 6-1 Migrating DST Volumes to Cloud



Procedure

- 1 Using CIS management console, associate the DST volumes to CIS tier. For more information, see [“Migrate from DST” on page 40](#).
- 2 Migrate the DST shadow volume data to cloud.
- 3 Remove the DST pair.
 - 3a To remove the shadow relationship for local DST volume pair, see [Removing the Shadow Relationship for a Non-Clustered DST Shadow Volume](#) in the [OES 2018 SP1: Dynamic Storage Technology Administration Guide](#).
 - 3b To remove the shadow relationship for clustered DST volume pair, perform the following:
 - 3b1 Remove the shadow definition for the DST shadow volume pair and NCP bindings exclusion for the secondary volume on each node. For more information, see [Removing the Shadow Definition and NCP/NSS Bindings Exclusion on All Nodes](#) in the [OES 2018 SP1: Dynamic Storage Technology Administration Guide](#).
 - 3b2 In the primary pool cluster resource scripts, remove (or comment out) the lines for the management of the secondary pool and secondary volume. For more information, see [Preparing the Primary Pool Cluster Resource for Independent Use](#) in the [OES 2018 SP1: Dynamic Storage Technology Administration Guide](#).
 - 3b3 Online the pool with shadow volume. For more information, see [Modifying the Secondary Pool Cluster Resource](#) in the [OES 2018 SP1: Dynamic Storage Technology Administration Guide](#).
- 4 Ensure that the primary volume, shadow volume, and CBV are mounted.
- 5 Using CIS management console, perform switch operation to move the DST tier to cloud tier. For more information, see [“Managing DST Migrate Tiers” on page 41](#).

7 Troubleshooting CIS

This section describes some issues you might experience with Cloud Integrated Storage and provides suggestion for resolving or avoiding them.

- [Section 7.1, “Upgrade Issue,” on page 51](#)
- [Section 7.2, “Mac Issue,” on page 52](#)
- [Section 7.3, “Unable to Configure Kafka Service During CIS Configuration,” on page 52](#)
- [Section 7.4, “CIS Agents Stops Randomly During the Data Migration,” on page 53](#)
- [Section 7.5, “Health Indicator on CIS Management Console Displays CIS Health as Not Healthy,” on page 53](#)
- [Section 7.6, “Infrastructure Services Fails to Come Up After Cleaning Up the Disk Space in HA Node,” on page 54](#)
- [Section 7.7, “/var/lib/docker/containers in Infrastructure Server Consumes More Disk Space,” on page 54](#)
- [Section 7.8, “Agent Is Not Being Listed During the Tier Creation,” on page 54](#)
- [Section 7.9, “CIS Management Console Fails to Display Summary Page,” on page 54](#)
- [Section 7.10, “Scanner Fails to Scan the New Volume,” on page 55](#)
- [Section 7.11, “Agent Fails to Display the Volumes During Tier Configuration,” on page 55](#)
- [Section 7.12, “Agents Unable to Communicate with CIS and CIS Management Console Does not Work,” on page 55](#)
- [Section 7.13, “CIS Services Fails to Come Up,” on page 55](#)
- [Section 7.14, “CIS Configuration Fails With an Error,” on page 55](#)
- [Section 7.15, “CIS Fails to Communicate with External Entities,” on page 56](#)
- [Section 7.16, “Docker Services Fails With an Error,” on page 56](#)

7.1 Upgrade Issue

After upgrading OES 2015 SP1 or older OES versions to OES 2018 SP1, during tier creation in CIS management console, the server option fails to list the OES server and displays an error "Certificate is not valid for any names, but tried to match with <host>". Because the eDirectory certificates in OES 2015 SP1 and older versions do not add DNS name in the Subject Alternative Name (SAN).

To resolve this issue, repair the eDirectory certificates on the upgraded CIS server:

- 1 Log in to iManager as Admin.
- 2 Go to **Roles and Tasks > NetIQ Certificate Server > Repair Default Certificates**.
- 3 Select the server(s) that own the certificates and click **Next**.

- 4 Choose the default certificate options and then click **Next**.
 - 4a Select **Yes All Default Certificates will be overwritten**.
 - 4b Select **Create SSL Certificate** and click the other option to specify the IP address you want to use.
 - 4c Under **Default DNS Address**, click the other option to specify the DNS address you want to use.
- 5 Review the tasks to be performed and select **Finish**.
- 6 Restart eDirectory service on the CIS server.

For more information on repairing server certificates, see [Micro Focus knowledge base article 7013080](#).

7.2 Mac Issue

On Mac OS X, when you browse through the folders or preview the files uploaded to the cloud on the Finder window, the files get recalled from the cloud. This unwanted recall of files fills up your local storage. To avoid this, Open Enterprise Server CIFS provides a feature that can be enabled by using the `novcifs` utility. Enabling this feature with the CIS Client on Mac OS X allows you to preview the files uploaded to the cloud.

Enabling the CIFS feature with the CIS Client on Windows workstation allows you to access the files uploaded to the cloud. This client also provides an enhancement to the overlay icon on the files uploaded to the cloud. This overlay icon helps to differentiate the local files and the files uploaded to the cloud.

To use the CIS client, ensure to enable the `--block-unmanaged-cis-reads` option by using the `novcifs` utility. If the client is not installed then you cannot access the files uploaded to the cloud. Only the administrator can modify this feature on the OES server.

The CIS client solves all these problems:

- ♦ Allows you to display cloud overlay icon on the files uploaded to the cloud (Windows workstation).
- ♦ Access to the files uploaded to the cloud (Windows and Mac workstation).

For more information on how to use the CIS client, contact Micro Focus Technical Support.

7.3 Unable to Configure Kafka Service During CIS Configuration

CIS configuration fails with an error "Kafka configuration failed: ErrInternalError: eth0: error fetching interface information: Device not found" while configuring Kafka service. This is because the server has a network device with 'em0' as identifier instead of 'eth0'.

To avoid this issue, perform the following:

- 1 Login to the server as a `root` user.
- 2 Run the following command:

```
yast2 lan
```
- 3 On **Network Settings** page under **Overview** tab, select a network device with `em0` and click **Edit**.

- 4 On **Network Card Setup** page under **Hardware** tab, click **Change** and rename the **Device Name** to 'eth0' from 'em0'.
- 5 Click **Next** and then click **OK**.

7.4 CIS Agents Stops Randomly During the Data Migration

When migrating the data to cloud, CIS agents stops randomly with an error "socket: too many open files". This is because the `Max open files` resource is set with the lower 'soft limit' and 'hard limit' values. In SLES 12, the default values of 'soft limit' and 'hard limit' for `Max open files` resource are 1024 and 4096 respectively.

To resolve this issue, increase the 'soft limit' and 'hard limit' values for `Max open files` resource:

- 1 Login to OES server as a `root` user.
- 2 Obtain CIS agents process ID using the following command:
- 3 For `Max open files` resource, set the 'soft limit' and 'hard limit' values to 65535 using the following command:

```
pgrep cisagents
```

```
prlimit --pid <pid_of_cisagent_obtained_in_step2> --nofile=65535:65535
```

- 4 Verify the 'soft limit' and 'hard limit' values using the following command:

```
cat /proc/<pid_of_cisagent_obtained_in_step2>/limits | grep "open files"
```

NOTE: When you restart the OES server or CIS agents, the process ID for CIS agents changes and thereby the 'soft limit' and 'hard limit' values are set to default. So, repeat the procedure from [step 2](#) to increase the 'soft limit' and 'hard limit' values.

7.5 Health Indicator on CIS Management Console Displays CIS Health as Not Healthy

After successfully configuring CIS in a cluster environment, the health indicator icon on CIS management console displays the CIS health status as not healthy.

To resolve this issue, restart the CIS configuration service on OES server using the following command:

```
systemctl restart oes-cis-configuration.service
```

7.6 Infrastructure Services Fails to Come Up After Cleaning Up the Disk Space in HA Node

After cleaning up all the container data on the infrastructure HA nodes where there was no free disk space available, the infrastructure services on that node still does not come up. This is because the docker services are not running.

To resolve this issue, perform the following on all HA nodes where the issue occurs:

- 1 Open a terminal console, then log in as a `root` user.
- 2 Cleanup the old container data using the following command:

```
docker system prune -a -f
```

- 3 On any HA node, execute the following command:

```
sh /opt/novell/cis/bin/cis_ext_service.sh prepare
```

For more information on this issue, see <https://github.com/moby/moby/issues/31254>.

7.7 /var/lib/docker/containers in Infrastructure Server Consumes More Disk Space

The `/var/lib/docker/containers` path in Infrastructure server configured in high availability (HA) consumes more space which results in disk getting filled. For more information, see <https://github.com/docker/distribution/blob/master/ROADMAP.md#deletes>.

To avoid this issue, ensure to provide sufficient disk space while deploying the Infrastructure server in HA.

7.8 Agent Is Not Being Listed During the Tier Creation

In CIS Management Console, during the tier creation the **Server** parameter does not display the OES servers that are configured with CIS server.

To resolve this issue, ensure that the agent is up and running. Also, if firewall is enabled, ensure that the agent port 8000 is open.

7.9 CIS Management Console Fails to Display Summary Page

When you login to CIS management console, the **Insights** page displays Welcome to Cloud Integrated Storage page instead of the Summary page where all the hot and cold data information should be displayed. This might be because the scanner has not scanned the volumes on the OES server.

To resolve this issue, start the scanner on the OES server using the following command:

```
systemctl start oes-cis-scanner.service
```

7.10 Scanner Fails to Scan the New Volume

When you add a new volume to the OES server, the **Insights** page under CIS management console does not display the statistic information of that volume. This might be because the scanner has not scanned the new volume added.

To resolve this issue, restart the scanner on the OES server using the following command:

```
systemctl start oes-cis-scanner.service
```

7.11 Agent Fails to Display the Volumes During Tier Configuration

During the tier configuration, agent does not display the list of volumes when you click on drop-down menu on the **Volume** parameter in the CIS management console.

To resolve this issue, ensure that the `/etc/resolv.conf` is configured with the appropriate DNS entry so that the OES server and CIS server are mutually resolvable.

7.12 Agents Unable to Communicate with CIS and CIS Management Console Does not Work

The CIS services are up and running, also the agent and CIS management console is working fine. Because of modification done on firewall settings on the CIS server, the agent fails to communicate with the CIS server and CIS management console URL does not work.

To resolve this issue, restart the docker services using the following command:

```
systemctl restart docker.service
```

7.13 CIS Services Fails to Come Up

When you execute `docker ps` command to verify the CIS server configuration, the command does not list any of the CIS services or lists only the collector and aggregator service.

To resolve this issue, perform the following:

- ♦ Ensure that the mariadb and elasticsearch service is up and running with the CIS service that is configured with.
- ♦ If firewall is running, ensure that the MariaDB port 3306 and Elasticsearch port 9400 is open.

7.14 CIS Configuration Fails With an Error

If CIS is the first server installed on the tree, the schema is not updated. Therefore, while configuring CIS an "Undefined Attribute Type" error is displayed. To resolve this issue, extend the eDirectory schema for the CIS server.

To extend the eDirectory schema, perform the following:

- ♦ If eDirectory and CIS is installed on the same server, run the following command:

```
/opt/novell/eDirectory/bin/ndssch -h <IP address or hostname where eDirectory  
or CIS is running> 'cn=admin.o=novell' <file path of cis.sch>
```

For example,

```
/opt/novell/eDirectory/bin/ndssch -h 192.168.0.1 'cn=admin.o=novell' /opt/  
novell/cis/schema/cis.sch
```

OR

- ♦ If eDirectory and CIS is installed on different servers, perform the following:

1. Copy the `cis.sch` file from `/opt/novell/cis/schema` to eDirectory server.
2. Run the following command:

```
/opt/novell/eDirectory/bin/ndssch -h <IP address or hostname where  
eDirectory is running> 'cn=admin.o=novell' <file path of cis.sch>
```

For example,

```
/opt/novell/eDirectory/bin/ndssch -h 192.168.0.1 'cn=admin.o=novell' /root/  
cis.sch
```

7.15 CIS Fails to Communicate with External Entities

All docker services are up and running and CIS is working fine. If firewall is stopped, the docker services are still up and running, but CIS management console fails to launch and communication with agent fails.

To resolve this issue, either start the firewall or restart all CIS and infrastructure services on the server where firewall is stopped.

7.16 Docker Services Fails With an Error

All docker services are up and running and CIS is working fine. If hard reboot is performed on server, the docker services fails to come up and displays an error "failed to cleanup ipc mounts".

To resolve this issue, restart all CIS and infrastructure docker services.

8

Best Practices and Common Questions

This section contains recommendations about the following topics.

- [Section 8.1, “Backup and Restore Options for Cloud Backed Volumes \(CBV\),” on page 57](#)
- [Section 8.2, “Client Recommendation,” on page 57](#)
- [Section 8.3, “Recalling Files from the Cloud Storage to the Source NSS Volume,” on page 58](#)
- [Section 8.4, “Log Level Settings,” on page 59](#)
- [Section 8.5, “Scanner Settings,” on page 60](#)
- [Section 8.6, “Using Distributed File Services \(DFS\) with Cloud Backed Volume,” on page 61](#)

8.1 Backup and Restore Options for Cloud Backed Volumes (CBV)

If Novell Storage Management Service (SMS) or third-party backup software based on SMS is used to backup and restore, it takes care of backing up only the metadata information of the files that are migrated to cloud storage or object store without recalling the actual file data. If third-party backup software that supports the standard Linux Extended Attributes (xattr) is used, ensure that on CBV you backup only metadata for the cloud migrated files. However, if third-party backup software does not provide any option to backup only metadata for the cloud migrated files, then perform the following to disallow recall of migrated files from cloud storage:

- 1 Open a terminal console, then log in as a `root` user.
- 2 Add the `RECALL_OFFLINEMODE` environment variable and set to `TRUE` in `/usr/lib/systemd/system/oes-cis-recall-agent.service` on all the agents.
For example, add the following in `oes-cis-recall-agent.service`.
`Environment="RECALL_OFFLINEMODE=TRUE"`
- 3 To ensure system has read any changes, run the following command:
`systemctl daemon_reload`
- 4 Restart the recall agent on all OES servers where backup and restore need to be done.
`systemctl restart oes-cis-recall-agent.service`

8.2 Client Recommendation

For CIS agents to scale up during the data migration, it is recommended to increase the 'soft limit' and 'hard limit' values for `Max open files` resource. For more information, see [Section 7.4, “CIS Agents Stops Randomly During the Data Migration,” on page 53](#).

8.3 Recalling Files from the Cloud Storage to the Source NSS Volume

You can control how files in the cloud storage are recalled automatically to the source NSS volume. When a file is migrated to cloud storage and replaced with a CBV file on the source NSS volume, the CBV file should look and behave like the original file. The size on the disk for the CBV file will be in KBs. File recall is the process by which the user clicks the CBV file and quickly accesses the original file available in the cloud storage.

The CBV file contains the information required to find the original file. When a user attempts to read the CBV file, NSS sends a recall request to CIS, which then executes the recall and passes the file to the NSS.

Use Cases for Recalling Files from the Cloud

Table 8-1 describes use cases for recalling files based on the user access.

Table 8-1 Recall Behaviors for Files in the Cloud

	Source NSS Volume	Cloud Storage
When the file is modified	The file gets recalled from the cloud storage and will be available for the duration based on the value configured in the <code>MOVE_ON_MODIFY_DURATION</code> parameter. After that duration, the file retains in the NSS volume.	A copy of the file is available on the cloud for the duration based on the value configured in the <code>MOVE_ON_MODIFY_DURATION</code> parameter. After that duration, the file copy gets deleted, and it is no longer available.
When the file is accessed but not modified	The file gets recalled from the cloud storage and will be available for the duration based on the value configured in the <code>MOVE_ON_MODIFY_DURATION</code> parameter. After that duration, a new CBV file is created, and the recalled file gets deleted to free up space.	A copy of the file is available on the cloud for the duration based on the value configured in the <code>MOVE_ON_MODIFY_DURATION</code> parameter. After that duration, the file copy retains in the cloud.

The recalled files are available on both the source NSS volume and cloud storage for a specific time duration based on the value configured in the `MOVE_ON_MODIFY_DURATION` parameter. To modify this time duration, perform the following on the CIS server:

- 1 Open a terminal console, then log in as a `root` user.
- 2 Go to the `/etc/opt/novell/cis/config` file and configure the `MOVE_ON_MODIFY_DURATION` parameter with the required time duration. The default value is 3 days. The available range is 1 to 3 days.

For example:

```
MOVE_ON_MODIFY_DURATION=1
```

- 3 Restart the metadata service.

```
systemctl restart oes-cis-metadata.service
```

8.4 Log Level Settings

It includes following sections:

- ♦ [Section 8.4.1, “CIS Server,” on page 59](#)
- ♦ [Section 8.4.2, “CIS Agents,” on page 59](#)
- ♦ [Section 8.4.3, “Infrastructure Services,” on page 60](#)

8.4.1 CIS Server

The CIS services log level is configured using CIS management console. For more information, see [“General” on page 46](#).

8.4.2 CIS Agents

The CIS agents log level can be set at global configuration (all OES server agents) and individual OES server agents.

- ♦ **For All Agents:** The log level for all OES server agents is configured using CIS management console. For more information, see [“Global Configuration for All Agents” on page 44](#).
- ♦ **For Each Agent:** The log level settings for individual OES server agent should be done manually. It cannot be done using CIS management console.

To set the log level on OES server agent, perform the following:

1. Open a terminal console, then log in as a `root` user.
2. Configure log level for the following agent services:
 - ♦ **CIS Agent:** Add the `AGENT_LOGLEVEL` environment variable and configure the required log level in `/usr/lib/systemd/system/oes-cis-agent.service`.
 - ♦ **Recall Agent:** Add the `RECALL_LOGLEVEL` environment variable and configure the required log level in `/usr/lib/systemd/system/oes-cis-recall-agent.service`.
 - ♦ **CIS Scanner:** Add the `SCANNER_LOGLEVEL` environment variable and configure the required log level in `/usr/lib/systemd/system/oes-cis-scanner.service`.

The available log levels are: Panic, Fatal, Error, Warn, Info and Debug. The default value is Info.

For example, to set `Debug` log level for CIS agent, add the following in `oes-cis-agent.service`.

```
Environment="AGENT_LOGLEVEL=Debug"
```

3. To ensure system has read any changes, run the following command:

```
systemctl daemon_reload
```
4. Use `systemctl` command to restart the agent service configured for log level on OES server.

8.4.3 Infrastructure Services

The infrastructure services includes ZooKeeper, Elasticsearch, and Kafka services configured in high availability nodes. You must login to all the nodes and then configure the log level for each infrastructure services separately.

- 1 Open a terminal console, then log in as a `root` user.
- 2 Configure log level for the following infrastructure services:
 - ♦ **ZooKeeper:** Go to `/etc/opt/novell/cis/zk/log4j.properties` and configure the required log level in `rootLogger.level` parameter.
For example, to set Debug log level for ZooKeeper, add the following in `/etc/opt/novell/cis/zk/log4j.properties`.

```
zookeeper.root.logger=DEBUG, CONSOLE  
zookeeper.console.threshold=WARN
```
 - ♦ **Elasticsearch:** Go to `/etc/opt/novell/cis/es/log4j2.properties` and configure the required log level in `rootLogger.level` parameter.
For example, to set Debug log level for Elasticsearch, add the following in `/etc/opt/novell/cis/es/log4j2.properties`.

```
rootLogger.level = debug
```
 - ♦ **Kafka:** Go to `/etc/opt/novell/cis/kafka/log4j.properties` and configure the required log level in `log4j.rootLogger` parameter.
For example, to set Debug log level for Kafka, add the following in `/etc/opt/novell/cis/kafka/log4j.properties`.

```
log4j.rootLogger=DEBUG, stdout
```The log levels supported are: Trace, Debug, Info, Warn, and Error. The default value is Warn.
- 3 Restart docker services on all the infrastructure HA nodes using the following command:

```
systemctl restart docker.service
```

8.5 Scanner Settings

After configuring the CIS server, the scanner agent associated to CIS server scans all the volumes. To rescan the OES server at a scheduled time, add the environment variable in `oes-cis-scanner.service` on all the OES server agents. Based on the value configured, the scanner scans the OES server to get the updated volumes information. The default value is 7 days.

To set the configuration to scan OES server volumes, perform the following:

- 1 Configure the `SCAN_INTERVAL_DAYS` environment variable in `/usr/lib/systemd/system/oes-cis-scanner.service` on all the agents.
For example, add the following in `oes-cis-scanner.service`.

```
Environment="SCAN_INTERVAL_DAYS=2"
```
- 2 To ensure system has read any changes, run the following command:

```
systemctl daemon-reload
```
- 3 Restart the scanner agent.

```
systemctl restart oes-cis-scanner.service
```

8.6 Using Distributed File Services (DFS) with Cloud Backed Volume

Distributed File Services (DFS) is installed automatically as part of the NSS file system. Cloud Integrated Storage supports using DFS junctions on the primary NSS volume. The primary volume can also be the target of a junction. Primary NSS volumes that contain DFS junctions or are junction targets can reside in a Novell Cluster Services cluster.

DST does not support using DFS junctions on the CBV. The CBV cannot be the junction target.

[Table 8-2 on page 61](#) summarizes the supported CIS configurations for use with DFS:

Table 8-2 CIS support for DFS Features

| DFS Features | Primary NSS Volume | Cloud Backed Volume | Cluster | File Access Protocol |
|--------------------|--------------------|---------------------|---------|--|
| Junctions | Yes | No | Yes | NCP

Novell CIFS. DFS support must be enabled in CIFS. See DFS Junction Support in CIFS Linux in the OES 2018 SP1: Novell CIFS for Linux Administration Guide .

Linux Samba does not support DFS junctions for NSS volumes. |
| Junction targets | Yes | No | Yes | Not applicable |
| Move/split volumes | No | No | No | Not applicable |

9 Limitations for CIS

This section lists the known issues in Cloud Integrated Storage.

- ♦ CIS works with only the default NSS mount volume path. The support for different NSS volume mount path would be provided in the upcoming release.
- ♦ If MS SQL server is configured with a time zone different from the CIS server, the migration time stamp on CIS **Dashboard** page will be in sync with the MS SQL server.

A

Configuration and Log Files

This section provides information on all CIS and infrastructure components configuration and log files location.

Table A-1 CIS Configuration Files

| Path | Description |
|--|---|
| /etc/opt/novell/cis/config | CIS server configuration |
| /etc/opt/novell/cis/fluentbit/config | CIS server log configuration |
| /etc/opt/novell/cis/fluentbit/fluentd.conf | Fluent Bit configuration for CIS server |
| /etc/opt/novell/cis/certs/rootCAs | If secure communication is used with the target cloud or object store, copy the CA bundle in PEM format to this location. |

Table A-2 CIS Log Files

| Path | Description |
|--|--|
| /var/log/messages | CIS server logs |
| /var/opt/novell/log/cis/microservices | Common log location of all the CIS services |
| /var/opt/novell/log/cis/agent.log | Contains log messages of OES server agent |
| /var/opt/novell/log/cis/recallagent.log | Contains log messages of OES server recall agent |
| /var/opt/novell/log/cis/cisscanner.log | Contains log messages of OES server scanner |
| /var/log/mysql/mysqld.log | MariaDB server logs |
| /var/log/elasticsearch/elasticsearch.log | Elasticsearch logs |

B Installing and Configuring MariaDB

This section describes how to install and configure the MariaDB database to use with CIS.

- ♦ [Section B.1, “Installing MariaDB,” on page 67](#)
- ♦ [Section B.2, “Configuring MariaDB,” on page 67](#)

B.1 Installing MariaDB

- 1 Ensure you have access to your operating system installation media.
- 2 In YaST, click **Software > Software Management**.
- 3 In the **Search** field, type `mariadb`, then click **Search**.
- 4 Select **mariadb**, then click **Accept**.
The MariaDB is successfully installed.
- 5 Continue with [Section B.2, “Configuring MariaDB,” on page 67](#).

B.2 Configuring MariaDB

When MariaDB is initially installed, it is not configured with an administrator password, nor is it configured to start automatically. To set up the MariaDB database server for use with CIS, perform the following:

- 1 In a terminal window, become the root user.
- 2 To start the database server, run the following command:

```
systemctl restart mysql.service
```
- 3 To enable the database server, run the following command:

```
systemctl enable mysql.service
```
- 4 To verify the database server has started, run the following command:

```
systemctl status mysql.service
```
- 5 To set the root password and enable root access from remote machines, run the following command:

```
mysql_secure_installation
```

 - 5a It prompts for `current password for root user`, press 'Enter' to continue.
 - 5b It prompts to `Set root password?`, enter 'y' to continue and then enter password.
The password is updated successfully.
 - 5c It prompts to `Remove anonymous users?`, press 'Enter' to continue with the default configuration.
 - 5d It prompts to `Disallow root login remotely?`, enter 'n' to continue.

- 5e** It prompts to Remove test database and access to it?, press 'Enter' to continue with the default configuration.
- 5f** It prompts to Reload privilege tables now?, enter 'y' to continue.
- 6** Login to MariaDB.
- ```
mysql -u root -p
```
- It prompts for password.
- 7** To grant permissions for the superuser account, run the following commands:
- ```
> GRANT ALL PRIVILEGES ON *.* TO '<username>'@'%' IDENTIFIED BY '<password>';  
> FLUSH PRIVILEGES;
```
- For example:
- ```
GRANT ALL PRIVILEGES ON *.* TO 'root'@'%' IDENTIFIED BY 'password';
```
- 8** To enable the firewall, run the following command:
- ```
yast2 firewall
```
- The **Firewall Configuration: Start-Up** window is displayed.
- 9** In the left menu, click **Allowed Services** and then click **Advanced** option.
- The **Additional Allowed Ports** window is displayed.
- 10** Add 3306 port under the **TCP Ports** and then click **OK**.
- 11** Click **Next** and **Finish**.