

OpenText Open Enterprise Server 24.4 Distributed File Services Administration Guide

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About This Guide

This document describes how to configure and manage Distributed File Services for Storage Services (NSS) volumes on a Open Enterprise Server (OES) 24.4 server.

- ♦ [Chapter 1, “Overview of Distributed File Services,” on page 11](#)
- ♦ [Chapter 2, “What’s New or Changed in Distributed File Services,” on page 29](#)
- ♦ [Chapter 3, “Installing and Configuring Distributed File Services,” on page 31](#)
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- ♦ [Chapter 5, “Business Continuity Clustering Distributed File Services,” on page 47](#)
- ♦ [Chapter 6, “Migrating DFS from NetWare to OES 2018 or Later,” on page 51](#)
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Audience

This guide is intended for network administrators. [Chapter 17, “Security Considerations,” on page 153](#) describes key security issues for security 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` feature at the bottom of each page of the online documentation.

Documentation Updates

For the most recent version of the *Distributed File Services Administration Guide*, see the latest [Open Enterprise Server 24.4 documentation](https://www.microfocus.com/documentation/open-enterprise-server/23.4/) (<https://www.microfocus.com/documentation/open-enterprise-server/23.4/>).

Additional Documentation

For information about DFS XML options, see the *Novell Developer Kit: Virtual File Services* (<https://www.microfocus.com/documentation/open-enterprise-server-developer-documentation/virtual-file-services/>).

For information about OES services referenced in this guide, see the following:

- ◆ *NetIQ eDirectory Administration Guide*
- ◆ *NCP Server for Linux Administration Guide*
- ◆ *OES CIFS for Linux Administration Guide*

1 Overview of Distributed File Services

Distributed File Services (DFS) for the Storage Services (NSS) file system provides location transparency of file data to end users. With DFS, you can create a single virtual file system for data on NSS volumes that spans multiple machines to maximize the use and performance of storage resources.

- ♦ [Section 1.1, “Benefits of DFS,” on page 11](#)
- ♦ [Section 1.2, “DFS Components,” on page 12](#)
- ♦ [Section 1.3, “Services and Components Used by DFS,” on page 19](#)
- ♦ [Section 1.4, “Examples of DFS Management Contexts,” on page 20](#)

1.1 Benefits of DFS

Distributed File Services helps you modify the underlying physical organization of data on NSS volumes to maximize the use and performance of available storage resources.

- ♦ [Section 1.1.1, “Data Distribution,” on page 11](#)
- ♦ [Section 1.1.2, “Backup,” on page 12](#)
- ♦ [Section 1.1.3, “Data Migration,” on page 12](#)

1.1.1 Data Distribution

DFS preserves the logical file organization from the user perspective by maintaining a Volume Location Database (VLDB) for all volumes in a DFS management context. When you move an NSS volume to a new volume in a different pool, the VLDB helps redirect queries to the new location.

When you split an NSS volume to relocate a directory’s data to a newly created NSS volume, DFS places a junction file in place of the directory at the source location. The junction contains a hint about the destination location of the data. When a user attempts to access the data, DFS uses that information to look up the location of the destination volume in the VLDB, then automatically redirects queries so that the session connection can be made transparently from the user’s point of view by going directly to the data. After the connection is made, the junction itself is no longer involved in the session.

Using junctions and the VLDB eliminates the user’s need to know the path to the physical location of the data. Not only does it decrease administration costs by allowing you to move a volume to a different server without making any announcements or needing to reeducate users, but it also simplifies the number of paths a user needs to remember if the data is spread among different volumes or servers.

For example, if John’s data is located on servers X, Y, and Z, you can create junctions on server X that point to all of his data on servers Y and Z. That way, John only needs to remember the path to server X, because with junctions, it appears as if the data is all located in one place.

1.1.2 Backup

DFS provides a solution to the common problem of storage volumes growing too big to back up within the desired or required time period. A too-large volume can be split into two (or more) volumes, and the resulting volumes backed up separately as required. You can split a volume at any directory to a new NSS volume without changing the logical path to files. You and your users can continue to use the logical paths when mapping network drives or creating login scripts. The physical location of data can change over time, and that change is completely transparent to the end user.

1.1.3 Data Migration

DFS can also provide a migration path for customers moving NSS volumes from NetWare 6.5 SP8 or OES to OES 2018 or later. The **Move Volume** task for DFS can be used on a NetWare or OES server to move file data on an NSS volume to a target NSS volume or an NCP volume on an OES 2018 server or later. This allows you to gradually move data to an OES 2018 or later environment, without committing to a turnkey change of operating environment. For an example, see [Chapter 6, “Migrating DFS from NetWare to OES 2018 or Later,”](#) on page 51.

1.2 DFS Components

- ♦ [Section 1.2.1, “DFS Management Context,”](#) on page 12
- ♦ [Section 1.2.2, “Volume Location Database,”](#) on page 14
- ♦ [Section 1.2.3, “VLDB Service,”](#) on page 15
- ♦ [Section 1.2.4, “VLDB Service Replica Sites,”](#) on page 15
- ♦ [Section 1.2.5, “DFS Junctions,”](#) on page 16
- ♦ [Section 1.2.6, “Move Volume Jobs,”](#) on page 17
- ♦ [Section 1.2.7, “Split Volume Jobs,”](#) on page 18
- ♦ [Section 1.2.8, “DFS Management Tools,”](#) on page 19

1.2.1 DFS Management Context

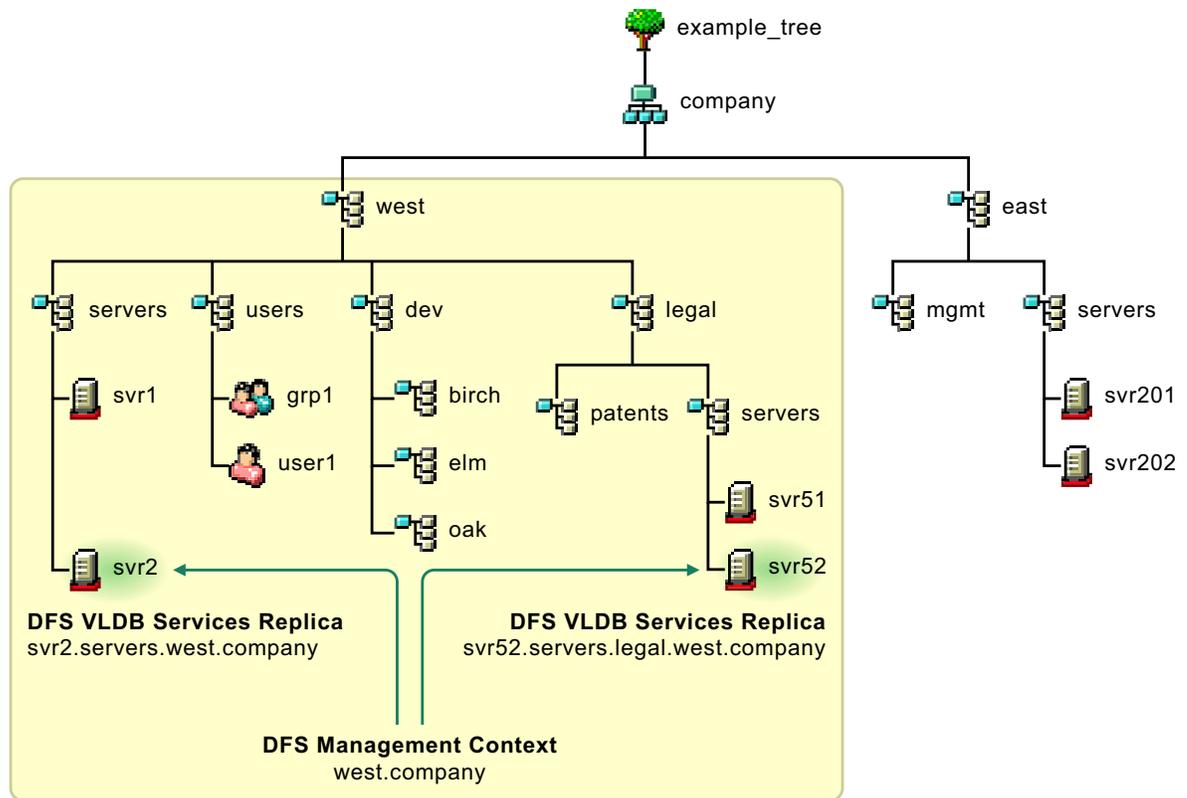
DFS operates within a management context. The management context is a preexisting O or OU container that you choose from your eDirectory tree. When you define the management context, two attributes are added to the O or OU container object that you select:

- ♦ **DFS-VLDB-Hosts:** A multiple-valued attribute that contains the distinguished names of the one or two servers that host the VLDB service replica for this management context.
- ♦ **VLDB-BackEnd-ID:** The name of the back-end database plug-in for this management context. Currently, this is `vdqad`, and the plug-in is not modifiable.

The presence of these attributes is what indicates to the DFS software that the container is a DFS management context.

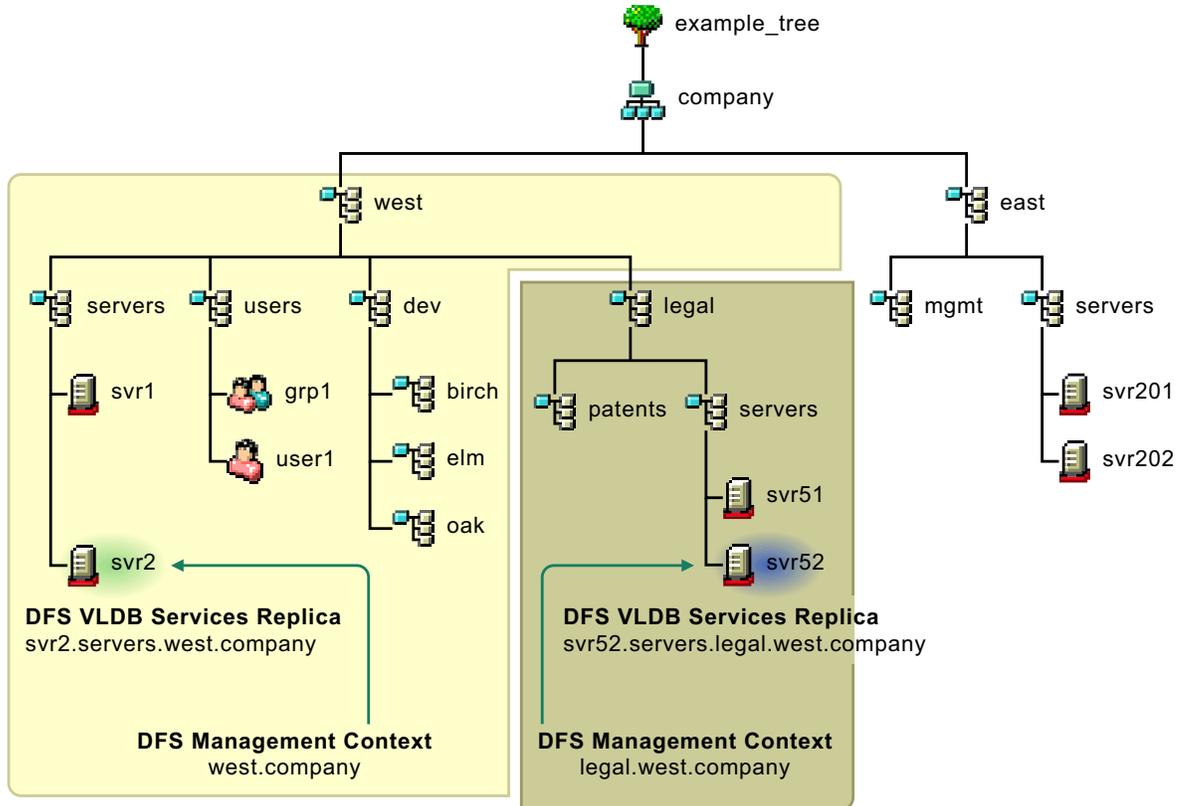
The management context can have one or two Volume Location Database services replicas. The servers that host replicas of the VLDB service can exist anywhere in the management context, as shown below.

Figure 1-1 A Single DFS Management Context



Multiple management contexts can be defined in a single eDirectory tree. The management contexts function independently. If the management contexts are defined in different subtrees, adding and removing one of the contexts has no effect on the other one. If a management context is defined at a different level in the tree, the higher-level management context does not include the subtree of the lower-level management context, as shown below. Each management context is responsible for only those volumes that are in its subtree but are not in a lower-level management context.

Figure 1-2 Multiple DFS Management Contexts in the Same Subtree



For an explanation of these management contexts and for more examples, see [Section 1.4, “Examples of DFS Management Contexts,”](#) on page 20.

1.2.2 Volume Location Database

The Volume Location Database provides a mapping of the physical location of all volumes within a DFS management context that have an object in eDirectory. Typically, this includes NSS volumes and NCP volumes. When you create a management context, DFS walks the subtree to locate the Volume objects for NSS volumes to add an entry to the VLDB.

Each volume has a DFS GUID (globally unique identifier) that junctions use when targeting a volume. Whenever you create an NSS volume, NSS automatically creates a DFS GUID for the volume, and writes it as an attribute of the Volume object. In order to allow a VLDB repair to correct the information in eDirectory if the Volume object is lost, the volume’s DFS GUID is also stored in the `~DFSINFO.8-P` file in the root directory of the volume. For an NCP volume on Linux that might be a junction target, the DFS GUID is generated by DFS whenever you add the volume entry to the VLDB or if you run a VLDB repair. The NCP volume’s DFS GUID only exists in the eDirectory Volume object; the `~DFSINFO.8-P` file does not exist on an NCP volume. DFS automatically generates a DFS GUID for a Volume object only if the DFS GUID does not exist in the Volume object or in the `~DFSINFO.8-P` file. If the eDirectory Volume object for an NCP volume is lost, VLDB repair generates a new DFS GUID for that volume.

The VLDB tracks volumes on the following platforms in its management context:

- ◆ OES 24.4

- ◆ OES 2023
- ◆ OES 2018 SP3
- ◆ OES 2018 SP2
- ◆ OES 2018 SP1
- ◆ OES 2018
- ◆ OES 2015 SP1
- ◆ OES 2015
- ◆ OES 11 SP2
- ◆ OES 11 SP1
- ◆ OES 2 SP3
- ◆ NetWare 6.5 SP8

Any volume that has a Volume object in the O or OU container belongs to the management context, unless the volume belongs to a management context that is defined at a lower level in the container. NSS automatically creates a Volume object in eDirectory when you create a volume with NSS tools. NCP Server automatically creates a Volume object in eDirectory when you create the NCP share for an NCP volume (an NCP share on a Linux POSIX volume).

1.2.3 VLDB Service

The Volume Location Database service provides the framework for locating volumes in the management context. Managing the VLDB service involves the creation, day-to-day management, maintenance, and repair of the VLDB.

1.2.4 VLDB Service Replica Sites

A replica site is the server that hosts an instance of the VLDB service and its VLDB file for a DFS management context. Each management context has one or two replicas. The replicas can be on any combination of operating platforms that support DFS. The servers can be at the same level or below the management context in the eDirectory tree, but they must not be in a lower-level DFS management context.

When two replica sites are deployed for the management context, each instance of the VLDB service is an equal replica that automatically synchronizes its data with the other replica site. The two instances exchange databases (the entire database, not just the changes) any time a change is made to an instance. Upon receipt of the other replica's database, each replica merges the received database with its own, determining which entries have been added, deleted, or modified.

Use the **Distributed File Services > Manage Replica Sites** task in iManager to configure replica sites, monitor their status, and repair the VLDB as needed. You can also manage the VLDB service from the server console with VLDB commands.

1.2.5 DFS Junctions

A DFS junction is a logical placeholder for data that is stored on a different NSS volume. One junction points to only one target location. A junction is a virtual directory that points to the root of a target NSS volume. In some configurations, the junction can point to a subdirectory on the target volume. For details, see [Section 9.1.1, “Supported Combinations for Junctions,” on page 73](#).

The DFS junction stores the DFS GUID of the target volume, not its physical location. This allows volumes to be moved without rectifying the change in every junction. The VLDB contains information about the physical location of volumes. When the junction receives a query, DFS-aware client (Client for Open Enterprise Server, CIFS server, or NetStorage) presents the target DFS GUID to the VLDB to get the physical location of the volume, and the query is transparently redirected to the target location.

To the user, a DFS junction appears to be a normal subdirectory; only its directory properties identify it as a junction. Users can continue to access their data without modifying the familiar logical paths.

DFS supports junctions for NSS volumes. The junction can be located anywhere in the source NSS volume, including the root of the volume. Multiple levels of junctions are allowed when a junction points to the root of a target volume and the file access protocol supports multiple levels of junctions. For details of supported relationships, see [Section 9.1, “Guidelines for Combining Platforms, Volumes, and Protocols,” on page 73](#).

A junction can point to a target location on the following types of volumes that are in the same DFS Management Context. File access is controlled by file system trustees and trustee rights:

- ◆ NSS volumes

The source server and target server must have the same communication protocol configured for file access, such as NCP to NCP, NetWare CIFS to NetWare CIFS, OES CIFS to OES CIFS, or NetWare CIFS to Samba.

IMPORTANT: Samba does not support DFS junctions themselves, so if the target volume contains junctions, they do not work.

- ◆ NCP volumes (NCP shares on Linux POSIX volumes)

This requires the NCP Server to be running on the source and target servers.

- ◆ CIFS/SMB shares on Windows/NetApp servers

This requires that Windows/NetApp servers are part of the same AD tree as the OES server's NSS volume where the junction resides.

Target volumes can reside on the following operating systems:

- ◆ OES 24.4
- ◆ Windows Server 2019
- ◆ Windows Server 2022
- ◆ NetApp 9.12.1
- ◆ OES 2023
- ◆ OES 2018 SP3
- ◆ OES 2018 SP2

- ◆ OES 2018 SP1
- ◆ OES 2018
- ◆ OES 2015 SP1
- ◆ OES 2015
- ◆ OES 11 SP2
- ◆ OES 11 SP1
- ◆ OES 2 SP3
- ◆ NetWare 6.5 SP8

When you split an NSS volume, DFS copies the data to a newly created volume, creates a junction to replace the directory, and deletes all content below that point in the original volume. For instructions on how to split a volume, see [Chapter 13, “Using DFS to Split NSS Volumes,”](#) on [page 125](#).

You can also create a junction manually. The following tables describe the rules for manually creating junctions.

Table 1-1 Rules for Manually Creating Junctions

Source Volume	Source Volume’s DFS Management Context	Target Volume	Target Volume’s DFS Management Context
An existing NSS volume on a supported system.	None required.	An existing volume on a supported system.	Required.
It must be in the same eDirectory tree as the target volume.	It must be in the same eDirectory tree as the target volume, but is not required to be in the target’s DFS management context.	It must be in the same eDirectory tree as the source volume.	It can be in any management context in the same eDirectory tree as the source volume.

1.2.6 Move Volume Jobs

A **Move Volume** job helps you to do the following:

- ◆ Move an NSS volume to a newly created NSS volume in a different pool that has space available or that is expandable.
- ◆ Move NSS volumes to different servers in the same DFS management context to balance associated traffic and workload across multiple servers.
- ◆ Move data between volumes faster than with a normal copy because it uses Storage Management Services to transfer the data.

Use the **Move Volume** task in the Storage plug-in to iManager to define **Move Volume** jobs.

After a successful move, the physical location of the volume is automatically updated in the VLDB. If the volume is on a different server, existing junctions that point to the source volume are not broken. They simply point to the new volume location by using the updated VLDB mapping. Scripts need to be modified in order to access the volume by its new pathname if you move the volume to a different server or rename it.

The following table describes the rules for moving volumes with DFS. For instructions, see [Chapter 12, “Using DFS to Move NSS Volumes,” on page 117](#).

Table 1-2 Rules for Moving Volumes

Source Volume	Source Volume’s DFS Management Context	Target Volume	Target Volume’s DFS Management Context
NSS volume on a supported system.	Required. The source and target volume must be in the same management context.	A newly created volume on a supported system	Required. The source and target volume must be in the same management context.

1.2.7 Split Volume Jobs

With DFS, you can split an NSS volume at a specified directory and relocate the directory contents to a new volume on the same server, or to a different server anywhere in the same eDirectory management context. The new volume typically resides in a different pool. After a successful relocation of directory contents, DFS automatically creates a DFS junction at the split point, which replaces the original directory and its content. The DFS junction contains information used to redirect queries to the new location. Users can continue to access their data on the new volume, without modifying the familiar logical paths.

The following table describes the rules for splitting volumes. For instructions, see [Chapter 13, “Using DFS to Split NSS Volumes,” on page 125](#).

Table 1-3 Rules for Splitting Volumes

Source Directory	Source Volume’s DFS Management Context	Target Location	Target Volume’s DFS Management Context
Any directory in an NSS volume on a supported system.	Required. The source and target volume must be in the same management context.	A newly created NSS volume on a supported system. The target location must be at the root of the volume.	Required. The source and target volume must be in the same management context.

1.2.8 DFS Management Tools

The primary management tool for Distributed File Services is iManager. Use the following plug-ins:

- ♦ **Distributed File Services:** This plug-in allows you to create or delete DFS contexts, manage VLDB replica sites and their VLDB service, and control move and split volume jobs. For an overview of the available tasks, see [Section 8.1.5, “Distributed File Services Plug-In,” on page 65.](#)
- ♦ **Storage:** This plug-in allows you to define **Move Volume** jobs and **Split Volume** jobs from its Volumes page. For an overview of the available tasks, see [Section 8.1.6, “Storage Plug-In,” on page 69.](#)

For more information about using iManager, see [Section 8.1, “iManager and DFS-Related Plug-Ins,” on page 63.](#)

1.3 Services and Components Used by DFS

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

- ♦ [Section 1.3.1, “Storage Services,” on page 19](#)
- ♦ [Section 1.3.2, “NCP Server and NCP Volumes,” on page 19](#)
- ♦ [Section 1.3.3, “Storage Management Services,” on page 19](#)
- ♦ [Section 1.3.4, “eDirectory DClient,” on page 20](#)
- ♦ [Section 1.3.5, “JetStream,” on page 20](#)

1.3.1 Storage Services

DFS junctions can reside only on NSS volumes. The DFS volume move and split options are available only where both the source and destination volumes are NSS volumes.

1.3.2 NCP Server and NCP Volumes

On OES 2015 or later, DFS junctions can also point to NCP volumes (NCP shares for Linux POSIX volumes). NCP Server must be installed and running on the target server in order to support NCP volumes. It enforces secure file access on NCP volumes for Linux-enabled eDirectory users, using the OES Trustee Model of trustees and trustee rights.

When you define an NCP share (mount point) for the NCP volume, NCP Server creates a Volume object in eDirectory. DFS assigns a DFS GUID as an object attribute for the NCP volume. The physical server location of the NCP volume is tracked in the VLDB. The VLDB tracks volumes by their DFS GUIDs and does not contain information that distinguishes whether a given volume is an NSS volume or an NCP volume.

1.3.3 Storage Management Services

DFS uses Storage Management Services to copy files to the new location in a DFS volume move or split. An SMS copy is faster than for a normal copy utility, and it can be restarted as needed.

1.3.4 eDirectory DClient

The VLDB code is written to eDirectory, not LDAP, and uses the low-level DClient interfaces for eDirectory. This requires that eDirectory be running on servers that contain junctions or on both the source and target servers when using the DFS volume moves or splits. However, an eDirectory replica is not required to be co-located on the server.

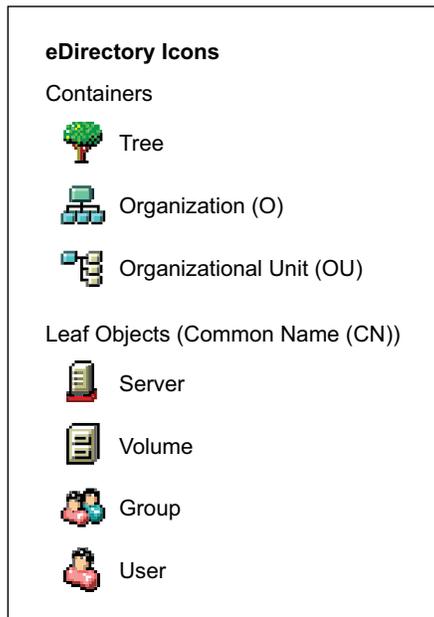
1.3.5 JetStream

JetStream provides a transport-independent interprocess communication facility. DFS uses JetStream for interprocess communications by DFS modules. JetStream uses an unregistered TCP port 6901 (0x1AF5). This port assignment is not configurable. Using DFS through a firewall requires this port to be opened on the OES servers by the network administrator. DFS components that interact with JetStream use eDirectory names (such as dfstest.east.example) for names of target hosts. The DFS JetStream-related code uses the low-level DClient interfaces for eDirectory.

1.4 Examples of DFS Management Contexts

This section describes multiple examples of DFS management contexts. The following icons represent eDirectory containers and objects in the examples.

Figure 1-3 Icons for eDirectory Containers and Objects

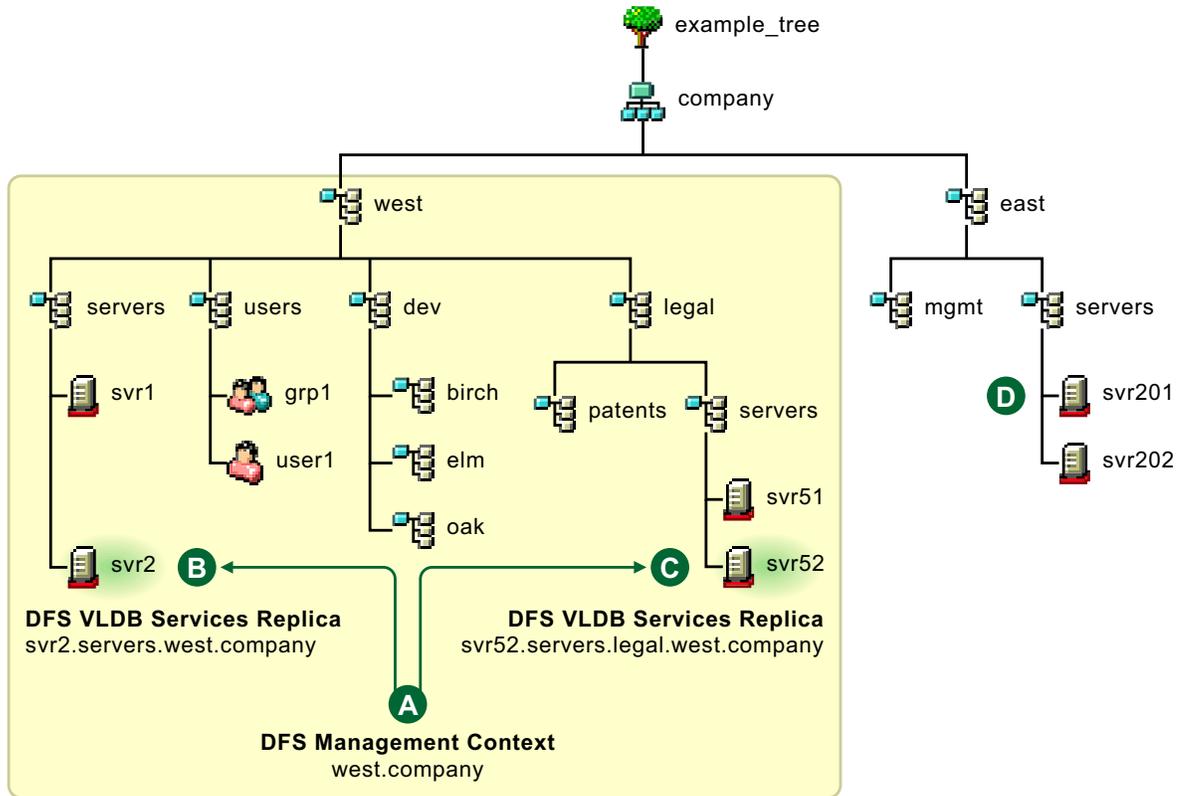


- ◆ [Section 1.4.1, “A Single DFS Management Context,” on page 21](#)
- ◆ [Section 1.4.2, “Multiple DFS Management Contexts in Different Subtrees,” on page 22](#)
- ◆ [Section 1.4.3, “Multiple DFS Management Contexts in the Same Subtree,” on page 23](#)

1.4.1 A Single DFS Management Context

In the following example, a single DFS management context is shown by a shaded box.

Figure 1-4 A Single DFS Management Context

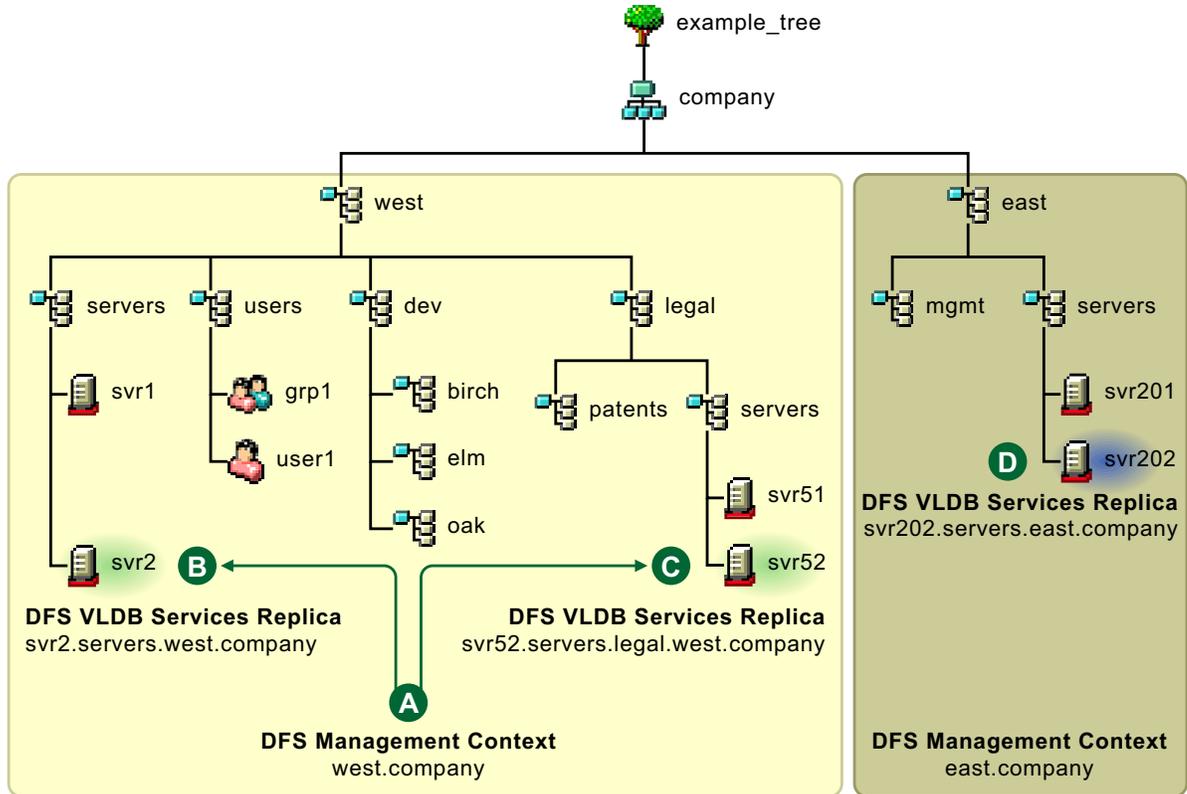


Feature	Description
A	The management context is defined at the eDirectory container called west.company (ou=west.o=company). Junctions can point to any supported volume in the management context.
B	Two replica servers each host an instance of the VLDB service for the management context. Its VLDB maps the location of the volumes at all levels in the subtree defined by the west.company eDirectory container.
C	
D	Volume objects in the east.company (ou=east.o=company) subtree are not in a management context in this example, so it is not possible to create a junction to any supported volumes in this part of the tree.

1.4.2 Multiple DFS Management Contexts in Different Subtrees

In the following example, two management contexts in different subtrees are shown by shaded boxes.

Figure 1-5 DFS Management Contexts in Different Subtrees

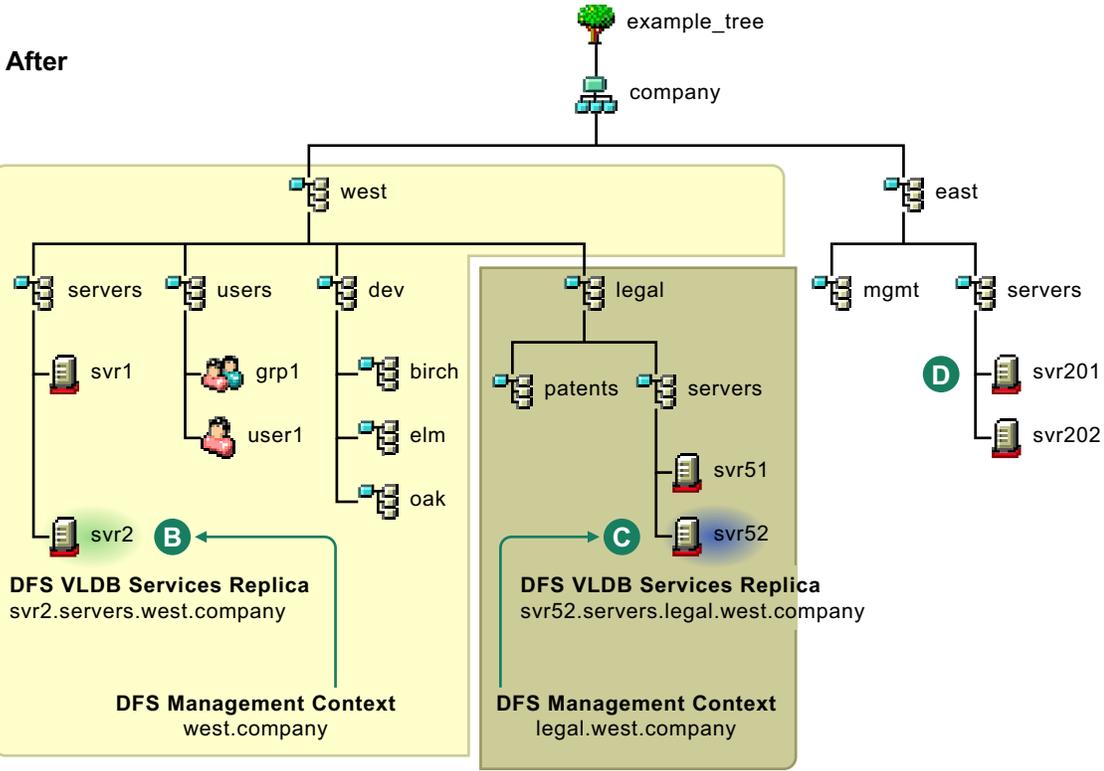
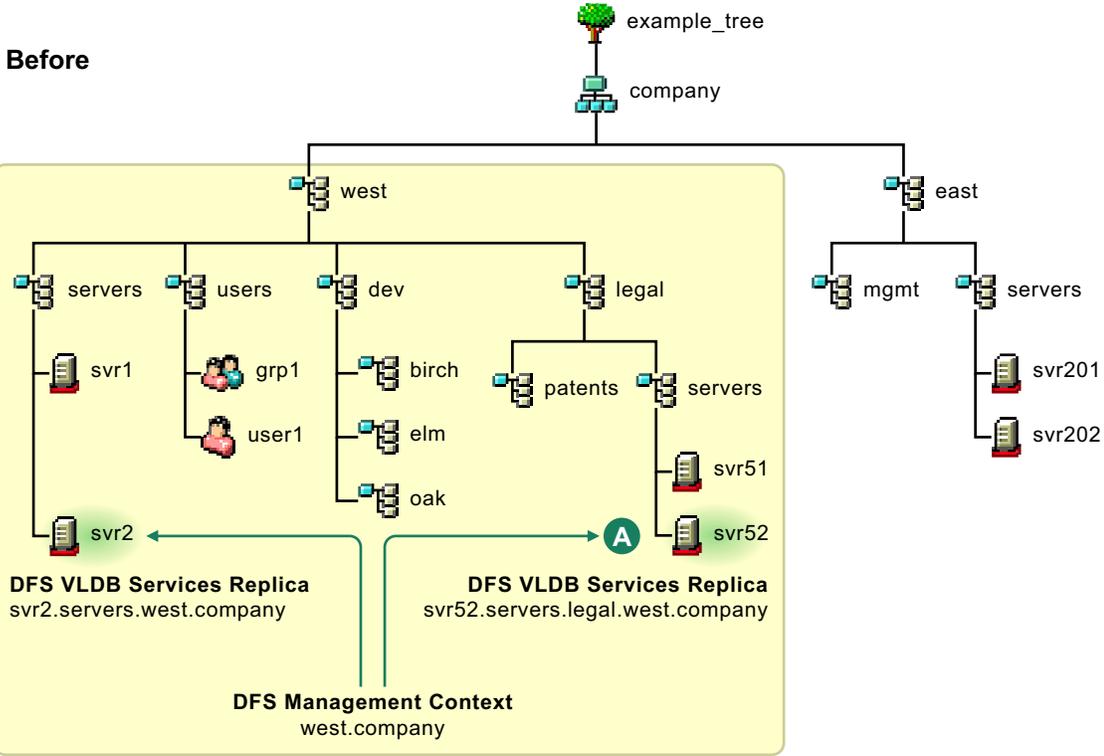


Feature	Description
A	<p>The management context defined at west.company (ou=west.o=company) functions in a different subtree than the management context defined at east.company (ou=east.o=company).</p> <p>Replica sites for each context must reside within their respective management context.</p> <p>Junctions can point to any supported volumes in either of the management contexts.</p> <p>Move volume and split volume jobs can be defined only for source and target volumes within the same management context.</p>
B	<p>Two replica servers each host an instance of the VLDB service for the west.company management context. The VLDB maps the location of the volumes at all levels in the subtree defined by the west.company eDirectory container. In this example, the replicas are located in different organizational units in the subtree, but they could be in the same one.</p>
C	<p>A single replica server hosts the VLDB service for the east.company management context. Its VLDB maps the location of the volumes at all levels in the subtree defined by the east.company eDirectory container.</p>

1.4.3 Multiple DFS Management Contexts in the Same Subtree

In the following example, a second management context is added at a lower level in the same subtree. The two management contexts are shown by shaded boxes in the After figure.

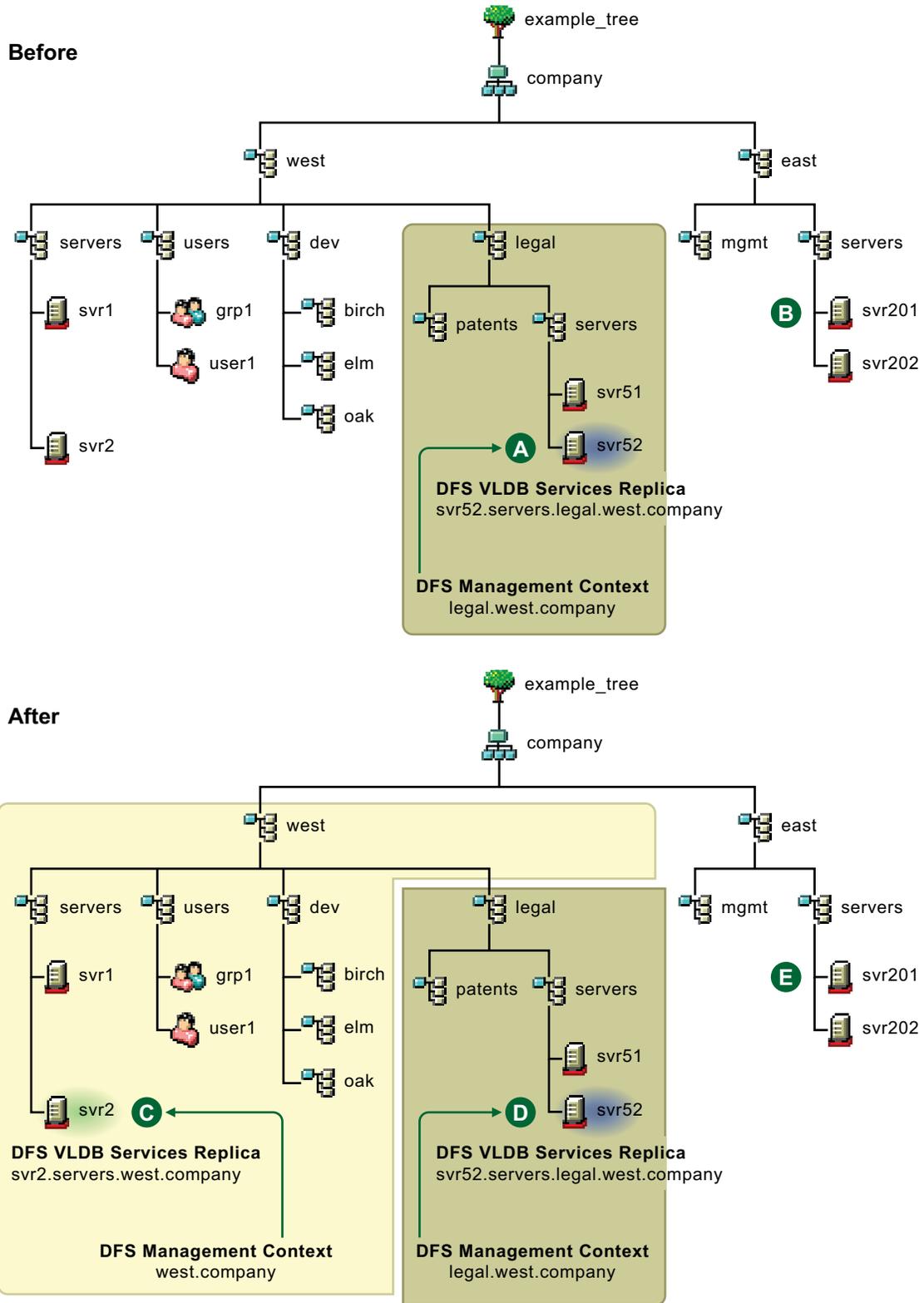
Figure 1-6 Adding a DFS Management Contexts at a Lower Level in the Subtree



Feature	Description
A	<p>The management context is defined at west.company (ou=west.o=company). One of its two replica servers resides in the subtree legal.west.company where you want to create a second DFS management context. You must delete this replica from the west.company management context before you create the DFS management context for legal.west.company.</p> <p>If the replica in legal.west.company is the only replica server for west.company, you must create a second replica server in a different subtree of west.company, synchronize the VLDB on the second replica server, delete the replica in legal.west.company, then create the second DFS management context.</p>
B	<p>The management context defined at west.company (ou=west.o=company) does not contain legal.west.company (ou=legal.ou=west.o=company).</p> <p>A single replica server hosts the VLDB service for the west.company management context. Its VLDB maps the location of the volumes at all levels in the subtree defined by the west.company eDirectory container, except for those volumes in the legal.west.company subtree. You can optionally add a second replica in the subtree, but not under the legal.west.company subtree.</p> <p>Replica sites for each context must reside within their respective management context.</p> <p>Junctions can point to any supported volumes in either of the management contexts.</p> <p>Move volume and split volume jobs can be defined only for source and target volumes within the same management context.</p>
C	<p>The management context defined at legal.west.company (ou=legal.ou=west.o=company) functions independently of the management context defined above it.</p> <p>A single replica server hosts the VLDB service for the legal.west.company management context. Its VLDB maps the location of the volumes at all levels in the subtree defined by the legal.west.company eDirectory container. You can optionally add a second replica in the legal.west.company subtree.</p>
D	<p>Volume objects in the east.company (ou=east.o=company) subtree are not in a management context in this example, so it is not possible to create a junction to any volumes in this part of the tree.</p>

In the following example, a second management context is added at a higher level in the same subtree. The two management contexts are shown by shaded boxes in the After figure.

Figure 1-7 Adding a DFS Management Contexts at a Higher Level in the Subtree



Feature	Description
A	The management context is defined at legal.west.company (ou=legal.ou=west.o=company). Its replica server is not affected by the management context you want to add at a higher level in the eDirectory tree.
B	Volume objects in the east.company (ou=east.o=company) subtree are not in a management context in this example, so it is not possible to create a junction to any volumes in this part of the tree.
C	<p>The management context defined at west.company (ou=west.o=company) does not contain legal.west.company (ou=legal.ou=west.o=company).</p> <p>A single replica server hosts the VLDB service for the west.company management context. Its VLDB maps the location of the NSS volumes at all levels in the subtree defined by the west.company eDirectory container, except for those NSS volumes in the legal.west.company subtree. You can optionally add a second replica in the subtree, but not under the legal.west.company subtree.</p> <p>Replica sites for each context must reside within their respective management context.</p> <p>Junctions can point to any supported volumes in either of the management contexts.</p> <p>Move volume and split volume jobs can be defined only for source and target volumes within the same management context.</p>
D	<p>The management context defined at legal.west.company (ou=legal.ou=west.o=company) functions independently of the management context defined above it.</p> <p>A single replica server hosts the VLDB service for the legal.west.company management context. Its VLDB maps the location of the volumes at all levels in the subtree defined by the legal.west.company eDirectory container. You can optionally add a second replica in the legal.west.company subtree.</p>
E	The east.company subtree is not affected by the addition of a DFS management context in a different subtree even though it is at the same level in the tree.

In both of the same-subtree examples, if you delete the higher-level DFS management context (west.company), the VLDB service on its replica server (svr2.servers.west.company) is stopped and its VLDB is deleted. Any junctions that point to volumes in the deleted management context are broken. Deleting the west.company management context has no effect on the lower-level DFS management context at legal.west.company.

In both of the same-subtree examples, if you delete the lower-level DFS management context (legal.west.company), the VLDB service on its replica server (svr52.servers.legal.west.company) are stopped and its VLDB is deleted. The higher-level management context automatically expands to include the lower-level subtree. A VLDB repair adds the volumes in the subtree to the VLDB. When the repair is completed, junctions that point to volumes in the legal.west.company subtree continue to work normally.

2 What's New or Changed in Distributed File Services

This section describes enhancements and changes in Distributed File Services (DFS).

- ♦ [Section 2.1, “What’s New or Changed in DFS \(OES 24.4\),” on page 29](#)

2.1 What's New or Changed in DFS (OES 24.4)

Managing DFS Operations

Enhanced `dfstool` command line utility to include the following DFS operations:

- ♦ Schedule Move or Split job
- ♦ List job
- ♦ Pause job
- ♦ Resume job
- ♦ Cancel job
- ♦ Reschedule job
- ♦ View skipped files

For more information, see [Section A.3, “DFSTOOL,” on page 159](#).

3 Installing and Configuring Distributed File Services

This section describes how to install and configure Distributed File Services on a Open Enterprise Server (OES) server.

- ◆ [Section 3.1, “Requirements for OES Services,” on page 31](#)
- ◆ [Section 3.2, “Installing DFS,” on page 36](#)
- ◆ [Section 3.3, “Upgrade,” on page 36](#)
- ◆ [Section 3.4, “Enabling DFS Junction Support for CIFS,” on page 37](#)
- ◆ [Section 3.5, “What’s Next,” on page 37](#)

3.1 Requirements for OES Services

Distributed File Services is a consumer of the OES services identified in this section. These services must be installed and running as noted in order for DFS to function as designed.

- ◆ [Section 3.1.1, “Storage Services,” on page 31](#)
- ◆ [Section 3.1.2, “Storage Management Services,” on page 32](#)
- ◆ [Section 3.1.3, “NetIQ eDirectory,” on page 33](#)
- ◆ [Section 3.1.4, “SLP,” on page 33](#)
- ◆ [Section 3.1.5, “Linux User Management,” on page 33](#)
- ◆ [Section 3.1.6, “NCP Server,” on page 34](#)
- ◆ [Section 3.1.7, “File Access Protocols \(NCP, CIFS, Samba\),” on page 34](#)
- ◆ [Section 3.1.8, “iManager,” on page 35](#)
- ◆ [Section 3.1.9, “Logical Volume Management System,” on page 36](#)

3.1.1 Storage Services

Distributed File Services is an integrated component of Storage Services (NSS). In addition, DFS is a consumer of other NSS features described in this section:

- ◆ [“NSS Volumes” on page 32](#)
- ◆ [“Event File List for NSS Volumes” on page 32](#)
- ◆ [“_Admin Volume for NSS” on page 32](#)

For information about installing NSS, see [“Installing and Configuring OES Storage Services”](#) in the *Storage Services File System (NSS) Administration Guide for Linux*.

NSS Volumes

DFS junctions can reside only on NSS volumes. The DFS move volume and split volume options are available only where both the source and destination volumes are NSS volumes.

Event File List for NSS Volumes

When using DFS to move or split an NSS volume, the DFS Volume Manager uses the NSS Event File List (EFL) to track which files have changed while it was busy copying data from that volume. This allows DFS to recopy files as necessary after the initial copying of data is complete.

_Admin Volume for NSS

DFS provides an XML interface through the NSS `_Admin` volume for management. This provides support for iManager, and allows administrators to create scripts (such as in Perl) to automate tasks or to provide a command line interface.

3.1.2 Storage Management Services

Distributed File Services uses Storage Management Services (SMS) to move and split volumes. SMS must be installed and running on your system to use these DFS options.

Installing SMS

SMS is automatically selected and installed when you select Storage Services to be installed on the OES system. For information about installing SMS, see [“Installing and Configuring SMS”](#) in the *Storage Management Services Administration Guide for Linux*.

Configuring SMS

The NetWare Emulation Mode option (`--tsamode`) on OES for the TSAFS (File System Target Service Agent) must be set to *linux* when moving or splitting an NSS volume from Linux to Linux. The default setting is *linux*.

The NetWare Emulation mode must be set to *dual* when moving or splitting an NSS volume from NetWare to Linux. In dual mode, the TSA exposes both NSS and Linux file systems on a target OES Linux server. When the move or split from NetWare to Linux is complete, reset the TSAFS mode to *linux*.

To set the TSAFS mode to *dual*:

- 1 Open a terminal console, then log in as the `root` user.
- 2 At a terminal console prompt, enter

```
smsconfig -l tsafs --tsaMode=dual
```

To reset the TSAFS mode to *linux*:

- 1 Open a terminal console, then log in as the `root` user.
- 2 At a terminal console prompt, enter

```
smsconfig -l tsafs --tsaMode=linux
```

For more information about the NetWare Emulation Mode on OES, see “[NetWare Emulation Mode](#)” in the [Storage Management Services Administration Guide for Linux](#).

3.1.3 NetIQ eDirectory

NetIQ eDirectory must be configured and running on the server where you are using Distributed File Services.

The eDirectory replica can be on any server that is the same eDirectory tree as the DFS management context. However, if the eDirectory replica is not on the same server where you are using DFS, the server must be configured for SLP. For more information about SLP, see [Section 3.1.4, “SLP,” on page 33](#).

Users that access data via a DFS junction must be eDirectory users. That is, the user must have a User object defined in eDirectory.

For eDirectory, usernames are case insensitive. For Linux users, usernames are case sensitive. To avoid potential login conflicts and confusion, we recommend that usernames be lowercase, which is the convention for usernames on Linux.

IMPORTANT: Use lowercase when creating usernames for administrators and users.

3.1.4 SLP

SLP (Service Location Protocol) is typically required to resolve tree names in networks with three or more servers. SLP must be correctly configured for NetIQ eDirectory on the server where you are using Distributed File Services if that server does not host a NetIQ eDirectory replica, or if there are three or more servers in the tree.

For instructions on configuring SLP for use with eDirectory, see “[Specifying SLP Configuration Options](#)” in the [Installation Guide](#).

3.1.5 Linux User Management

Linux User Management is a technology for OES Linux that coordinates a user’s authentication identity in NetIQ eDirectory with a Linux local user identity on the server. When a user is Linux-enabled, a Linux UID is automatically created for the user. The UID is stored as an attribute for the user’s User object in eDirectory.

The administrator user identity in eDirectory is Linux-enabled by default for the server. An administrator user has access rights equivalent to the `root` user.

Users must be Linux-enabled if they are using Samba to access files. When NCP or OES CIFS is not available to control file access, NSS enforces user access based on file system trustees and trustee rights for the Linux-enabled users.

When using NCP only, Linux-enabling users is optional.

IMPORTANT: Other products and services might require users to be Linux-enabled.

The case you use for usernames matters. For eDirectory, usernames are case insensitive. For Linux users, usernames are case sensitive. To avoid potential login conflicts and confusion, we recommend that usernames be lowercase, which is the convention for usernames on Linux.

IMPORTANT: Use lowercase when creating usernames for administrators and users.

3.1.6 NCP Server

NCP Server must be installed and running on the source and target server in order for DFS junctions to work. Even if users are not using NCP to access files, NCP Server must be running when the **Move Volume** and **Split Volume** jobs are configured and until the jobs are completed. You can install NCP Server during the install, or use **YaST > Software Install** to install and enable NCP Server at any time. For information, see “[Installing and Configuring NCP Server for Linux](#)” in the *NCP Server for Linux Administration Guide*.

3.1.7 File Access Protocols (NCP, CIFS, Samba)

Distributed File Services junctions support file access with the NCP and CIFS/Samba protocols. Both the source volume and target volume for any given DFS junction must reside on servers that are configured to share the same file access protocol.

The following table provides an overview of the protocols supported for DFS functions. For details and guidelines, see [Section 9.1, “Guidelines for Combining Platforms, Volumes, and Protocols,”](#) on [page 73](#).

Table 3-1 *Protocols Supported for DFS Functions*

Junction Server			Junction Target Server			Target Location		DFS Functions
Platform	Volume	Protocol	Platform	Volume	Protocol	Root	Subdir	(Junction, Move, Split)
NetWare or Linux	NSS	NCP	NetWare or Linux	NSS	NCP	Yes	Yes (no junctions)	Junction
NetWare or Linux	NSS	NCP	Linux	NCP Volume	NCP	Yes	Yes (no junctions)	Junction
NetWare	NSS	CIFS	NetWare	NSS	CIFS	Yes	No	Junction
Linux	NSS	CIFS	Linux	NSS	CIFS	Yes	Yes	Junction
Linux	NSS	CIFS	NetWare	NSS	CIFS	Yes	No	Junction
NetWare or Linux	NSS	NCP	NetWare or Linux	NSS	NCP	Yes	No	Move and Split

Client for Open Enterprise Server

The Client for Open Enterprise Server for Windows must be installed on user workstations in order for users to access data seamlessly via a DFS junction. You can use the Novell Client for Windows 4.9 or higher for junctions that point to the target volume root. You must use Novell Client for Windows 4.91 SP4 or later for junctions that point to subdirectories on the target volume.

The Novell Client 2.0 for Linux supports DFS junctions. It works for junctions that target the root of the volume and subdirectories on the target volume. If the junction breaks, there is no Junction Properties page to identify which junction is broken as there is for the Windows client.

IMPORTANT: Earlier version of the Novell Client for Linux do not support DFS junctions.

CIFS

For OES CIFS servers, you must enable DFS junction support in the CIFS configuration. For instructions, see [Section 3.4.2, “Enabling DFS Support CIFS,” on page 37](#)

IMPORTANT: Junctions to subdirectories are supported with OES CIFS on Linux servers.

Use the following guidelines for configuring CIFS:

- ◆ DFS is available only if Unicode (UTF8 format) is enabled. By default, Unicode is enabled.
- ◆ DFS must be enabled for CIFS on all the source and target servers. Both source and target CIFS servers must be running.
- ◆ VLDB server must be running.
- ◆ The user must have access rights for the source and target CIFS share.

IMPORTANT: The CIFS clients accessing DFS junctions must be DFS aware. smbclient on Linux may not work appropriately in case of junctions as it is not DFS aware.

Samba

Linux Samba does not support DFS junctions, so you cannot use Samba as the file access protocol for volumes that contain junctions. However, OES 2015 or later servers running Samba can be the target of junctions on servers that are running CIFS.

3.1.8 iManager

Distributed File Services requires iManager 3.2.6 for managing DFS management contexts, the VLDB service, junctions, move volume, and split volume. iManager must be available somewhere in the network.

NOTE: iManager 2.7.5 or later is required for managing Distributed File Services on Netware 6.5 SP8 and OES 2 or later servers.

DFS requires the Distributed File Services plug-in (`dfsmgmt.npm`) and Storage plug-in (`nssmgmt.npm`). You must also install the Storage Management plug-in (`storagemgmt.npm`). For more information, see [Chapter 8, “Management Tools for DFS,”](#) on page 63.

3.1.9 Logical Volume Management System

DFS junctions can be created only on NSS volumes. For OES 2015 or later, DFS is supported only on NSS volumes that reside on devices that are managed by the Logical Volume Manager (NLVM). NLVM is installed automatically when you select OES Storage Services to be installed on your OES 2015 or later servers. Ensure to use NSSMU or iManager to create the NSS volumes so that the NLVM is automatically configured.

3.2 Installing DFS

DFS is delivered as part of the Storage Services (`novell-nss`) userspace package on OES 2015 or later. NSS must be installed and enabled on VLDB replica servers for the DFS management context and on any server where you want to create junctions.

In the YaST install, use the **Software Selection and Systems Tasks** menu to select **OES Storage Services** from the OES Services menu. This choice automatically selects these additional OES services that are used by DFS:

- ◆ OES Storage Services
- ◆ OES Backup/Storage Management Services (SMS)
- ◆ NetIQ eDirectory
- ◆ OES Linux User Management

3.3 Upgrade

- ◆ [Section 3.3.1, “Upgrading to OES 24.4,”](#) on page 36

3.3.1 Upgrading to OES 24.4

Distributed File Services is not supported for NSS on OES 1 servers. Thus, there are no existing DFS services installed on OES 1. After upgrading the OES server to OES 2 or later, the DFS capability is available when NSS is installed.

- ◆ If NSS is installed on an OES server, the DFS capability is added automatically as part of the NSS services upgrade.
- ◆ If NSS is not installed on the OES server, you must install NSS on the OES server after the upgrade by using the **Software Management** option in YaST.

Ensure that the OES server meets the requirements as specified in [Section 3.1, “Requirements for OES Services,”](#) on page 31 before you add the server as a replica site or create junctions on its NSS volumes.

IMPORTANT: Verify that the `/var/opt/novell/dfs` directory was created during the upgrade process. If the directory does not exist, create the directory as the `root` user, and set its POSIX permissions to mode 755 (`rxwxr-xr-x`).

3.4 Enabling DFS Junction Support for CIFS

CIFS for OES 2 SP2 or later supports DFS junctions, but you must enable DFS support and configure it. By default, DFS junction support is disabled.

- ◆ [Section 3.4.1, “Limitations,” on page 37](#)
- ◆ [Section 3.4.2, “Enabling DFS Support CIFS,” on page 37](#)

3.4.1 Limitations

- ◆ Junctions from Linux to NetWare system work only when the junction target is the root of the volume. However if both the source and target is on a Linux system, then junctions to subdirectories also work.
- ◆ Unicode must be enabled. By default, Unicode is enabled on your Linux servers.
- ◆ DFS support is enabled only at server-level.

3.4.2 Enabling DFS Support CIFS

For CIFS on OES 2015 or later servers, you can map to CIFS shares using either the IP address or server name. Junctions that point to subdirectories are now supported.

- 1 In iManager, click **File Protocols > CIFS**.
For instructions, see [Section 8.1.2, “Accessing iManager,” on page 64](#).
- 2 Browse to locate and select the Linux server you want to manage.
For instructions, see [Section 8.1.4, “Selecting a Server to Manage,” on page 65](#).
- 3 On the **Server** properties page, select the **Distributed File Services (DFS) Support** check box to enable DFS for CIFS on the selected server.
- 4 Click **OK** to save the setting.

NOTE: You can also enable DFS support for the CIFS server with the `novcifs` command line utility `--dfs-support=yes|no`.

3.5 What’s Next

You must create a DFS management context before you can create junctions, move volumes, or split volumes. For information, see [Section 10.1, “Creating a DFS Management Context,” on page 85](#).

4 Clustering Distributed File Services

This section describes how to cluster Distributed File Services on a Open Enterprise Server (OES) server using Cluster Services.

- ♦ [Section 4.1, “Guidelines for Using DFS in a Cluster Environment,” on page 39](#)
- ♦ [Section 4.2, “Clustering the VLDB Service,” on page 40](#)
- ♦ [Section 4.3, “Modifying VLDB Settings in the Cluster Load Script,” on page 44](#)

4.1 Guidelines for Using DFS in a Cluster Environment

DFS supports clusters based on Cluster Services. Consider the guidelines in this section when using DFS in a cluster environment.

- ♦ [Section 4.1.1, “Guidelines for Using DFS Junctions in a Cluster Environment,” on page 39](#)
- ♦ [Section 4.1.2, “Guidelines for Using DFS Move and Split in a Cluster Environment,” on page 39](#)
- ♦ [Section 4.1.3, “Guidelines for Clustering the VLDB Service,” on page 40](#)

4.1.1 Guidelines for Using DFS Junctions in a Cluster Environment

When clustering servers with Cluster Services in a DFS management context, consider the following guidelines:

- ♦ Volumes that contain DFS junctions or are junction targets can reside in an NCS cluster.
- ♦ Clustering does not break junctions. DFS automatically updates the VLDB when clusters are created in a DFS management context.

4.1.2 Guidelines for Using DFS Move and Split in a Cluster Environment

When clustering servers with NCS in a DFS management context, consider the following guidelines:

- ♦ For OES 2 SP2 and earlier versions, move and split operations are supported where both the source volume and the target volume are unshared (that is, their pools are not cluster-enabled).
- ♦ For OES 2 SP3 and later versions, DFS supports move and split operations from a shared volume to another shared volume in a clustered environment. DFS also supports these operations from an unshared volume to another unshared volume.

NOTE: When moving or splitting volumes, perform the move or split only from an active node.

4.1.3 Guidelines for Clustering the VLDB Service

When planning your NCS cluster solution for VLDB services, consider the following guidelines:

- ♦ The two replica servers for a DFS management context can reside on different clusters in the management context.
- ♦ If you create two replicas in the same cluster, then two instances cannot be mounted on the same node in the cluster at the same time. To ensure this, use the cluster configuration settings to configure which nodes to use for failover for each of the replicas or configure Resource Mutual Exclusion (RME) group in such way that two VLDB instances do not run on the same node at the same time. For more information on RME, see [Configuring Resource Mutual Exclusion Groups](#).
- ♦ DFS does not support mixed-platform clusters.

4.2 Clustering the VLDB Service

Use the procedure in this section to configure the DFS management context's VLDB service in a cluster with Cluster Services.

To cluster an instance of the VLDB service:

- 1 Install and configure OES Cluster Services on the server where you want to host the VLDB service.

For information, see the [OES Cluster Services for Linux Administration Guide](#).

- 2 Create a clustered NSS pool on the server.

This creates a clustered resource that is called a cluster virtual server based on the IP address you specify. For information, see "Creating a Pool" in the [Storage Services File System \(NSS\) Administration Guide for Linux](#).

- 3 Create a shared NSS volume on the clustered pool.

For information, see "Creating Unencrypted NSS Volumes using iManager" in the [Storage Services File System \(NSS\) Administration Guide for Linux](#).

- 4 Configure a DFS management context with the following settings:

Parameter	Description
Replica site	Specify the cluster virtual server that you created in Step 2 as the replica site.

Parameter	Description
VLDB path	<p>Specify the location of the VLDB file as a path on the clustered pool's volume that you created in Step 3.</p> <p>The default path is <code>/var/opt/novell/dfs</code>, which is on the node and not in the clustered resource. In order to be able to be failed over, the path must be changed to a volume on the clustered resource.</p> <p>For OES 2015 or later clusters, specify the path in either the Linux format (<code>/media/nss/clus_volname/vldbpath</code>) or NetWare format (<code>clus_volname:\vldbpath</code>).</p> <p>For example, for a clustered volume named <code>DFSVOL</code> and a path of <code>/dfs</code>, the Linux format is</p> <pre>/media/nss/DFSVOL/dfs</pre> <p>and the NetWare format is</p> <pre>DFSVOL:\dfs</pre>
VLDB startup	Deselect (disable) the Run VLDB service when the server restarts option.

5 Edit the cluster load script.

5a Make sure that the script mounts the volume that contains the VLDB file before you issue the `vldb` command.

5b Add the `vldb` or `dfstool` command at the end.

```
exit_on_error /sbin/vldb -dir /vldbpath
```

or

```
exit_on_error /sbin/dfstool --start-vldb -P /vldbpath
```

This command starts the VLDB service for the cluster. Replace `vldbpath` with the path to the VLDB file that you entered for the DFS management context in [Step 4](#). The path must match exactly with what you entered for the DFS management context.

Example of Cluster Load Script:

Variable	Your Value
Cluster resource's virtual server name	CLUSTER-POOL1-SERVER
Resource IP address	192.168.100.71
Pool name	POOL1
Volume name	DFSVOL
Volume ID	253 (valid values are 0 to 254)
vldbpath	/media/nss/DFSVOL/dfs

```

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

exit_on_error nss /poolact=POOL1
exit_on_error ncpcon mount DFSVOL=253

exit_on_error add_secondary_ipaddress 192.168.100.71

exit_on_error ncpcon bind --ncpservername=CLUSTER-POOL1-SERVER --
ipaddress=192.168.100.71

exit_on_error /sbin/vldb -dir /media/nss/DFSVOL/dfs

exit 0

or

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

exit_on_error nss /poolact=POOL1
exit_on_error ncpcon mount DFSVOL=253

exit_on_error add_secondary_ipaddress 192.168.100.71

exit_on_error ncpcon bind --ncpservername=CLUSTER-POOL1-SERVER --
ipaddress=192.168.100.71

exit_on_error /sbin/dfstool --start-vldb -P /vldbpath

exit 0

```

IMPORTANT: If you ever modify the VLDB file location, you must also modify the path in the cluster load script. For information, see [Section 4.3, “Modifying VLDB Settings in the Cluster Load Script,”](#) on page 44.

6 Edit the cluster unload script.

- 6a** Add `vldb exit` or `dfstool --stop-vldb` command before the `ncpcon unbind` line.

Example of Cluster Unload Script:

Variable	Your Value
Cluster resource’s virtual server name	CLUSTER-POOL1-SERVER
Resource IP address	192.168.100.71
Pool name	POOL1
vldbpath	/media/nss/dfsvol/dfs

```

#!/bin/bash
. /opt/novell/ncs/lib/ncsfuncs
ignore_error /sbin/vldb exit

ignore_error ncpcon unbind --ncpservername=CLUSTER-POOL1-SERVER --
ipaddress=192.168.100.71

ignore_error del_secondary_ipaddress 192.168.100.71

ignore_error nss /pooldeact=POOL1

exit 0

or

#!/bin/bash
. /opt/novell/ncs/lib/ncsfuncs
ignore_error /sbin/dfstool --stop-vldb

ignore_error ncpcon unbind --ncpservername=CLUSTER-POOL1-SERVER --
ipaddress=192.168.100.71

ignore_error del_secondary_ipaddress 192.168.100.71

ignore_error nss /pooldeact=POOL1

exit 0

```

7 Edit the cluster monitor script.

Example of Cluster Monitor Script:

Variable	Your Value
Cluster resource's virtual server name	CLUSTER-POOL1-SERVER
Resource IP address	192.168.100.71
Pool name	POOL1
Volume name	DFSVOL

```

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

exit_on_error status_fs /dev/pool/POOL1 /opt/novell/nss/mnt/.pools/
POOL1 nsspool

exit_on_error ncpcon volume DFSVOL

exit_on_error status_secondary_ipaddress 192.168.100.71

exit_on_error rcnovell-dfs status

exit 0

```

8 Add the nss admin user of every Linux node in the cluster on which VLDB is expected to run as a trustee to the container configured as the Management Context in [Step 4](#). The nssadmin user object must be in the same container as its server and the username format is *servernameadmin.context*. For example, if the server name is server1.ou1.mycompany, the nssadmin username is server1admin.ou1.mycompany

8a In iManager, select **Rights > Modify Trustees**.

8b Select the container configured as the Management Context in [Step 4](#), then click **OK**.

8c List of trustees for the selected container are displayed.

Ensure that the nssadmin user for each node in the cluster is listed as a trustee with a minimum of Read and Compare Rights to the **[All Attribute Rights]** property.

8d (Conditional) If the nssadmin user for a node on which the VLDB service runs is not set as a trustee of the container, add it as a trustee and assign the required rights. To add trustee and assign rights, perform the following steps:

8d1 Click **Add Trustee**, select the nssadmin object, then click **OK**.

8d2 Click **Assigned Rights** for the nssadmin object.

8d3 Assign **Read** and **Compare** to **[All Attribute Rights]** property, then click **Done**.

8d4 Click **Apply**.

Repeat [Step 8d](#) for the nssadmin user for each cluster node.

NOTE: If the Management Context is the container in which the server object for the cluster node exists, the nssadmin object for that server is a trustee of the container with Supervisor rights. Do not modify these rights for the nssadmin user.

9 Stop VLDB using the following command:

```
rcnovell-dfs stop
```

or

```
systemctl stop novell-dfs.service
```

10 For the script changes to take effect, make the resource offline and then bring it online on the same node.

For more information, see [Onlining and Offlining \(Loading and Unloading\) Cluster Resources from a Cluster Node](#) and [Applying Updated Resource Scripts by Offline/Offline, Failover, and Migration](#) in the [OES Cluster Services for Linux Administration Guide](#).

4.3 Modifying VLDB Settings in the Cluster Load Script

You must modify the cluster load script for the clustered VLDB service whenever you change the location of the replica site or the path on a replica site.

1 Offline the cluster resource that contains the VLDB.

2 Modify the replica site or VLDB database location as desired.

For instructions, see [Chapter 10, “Managing VLDB Services,” on page 85](#).

IMPORTANT: Make sure that the **Run VLDB service when the server restarts** option is disabled (deselected).

- 3 Edit the cluster load script by modifying the existing `vldb` command to use the new `vldbpath`.

```
vldb -dir /vldbpath
```

This command starts the VLDB service for the cluster. Replace `vldbpath` with the path to the VLDB file. The path must exactly match what you entered for the DFS management context.

- 4 Make sure that the script mounts the volume that contains the VLDB file before issuing the `vldb` command.
- 5 Online the cluster resource that contains the VLDB.

5 Business Continuity Clustering Distributed File Services

This section describes how to enable Distributed File Services on a Open Enterprise Server (OES) when used with Cluster Services and Business Continuity Clustering (BCC).

- ♦ [Section 5.1, “Guidelines for Enabling DFS Using BCC,” on page 47](#)
- ♦ [Section 5.2, “BCC Enabling the VLDB Service,” on page 47](#)

5.1 Guidelines for Enabling DFS Using BCC

When clustering servers with BCC in a DFS management context, consider the following guidelines:

- ♦ All clusters that are BCC peers must be within same tree in order for DFS to be enabled on the BCC clusters. DFS does not function across trees.
- ♦ The DFS MC must be at a container level which contains all the BCC peer clusters.
- ♦ BCC enabled resources which are junction targets must use virtual IP addresses which remain the same across the BCC peer clusters to allow clients to access them as they migrate across clusters.

For information on virtual IP, see [Using Virtual IP Addresses with BCC](#) in the [OES 23.4: BCC Administration Guide](#).

- ♦ To BCC enable the VLDB service, do the following:
 - ♦ The VLDB path must be on a BCC enabled cluster resource.
 - ♦ The VLDB replica server must be the cluster virtual server for the volume. This virtual server must use a virtual IP which remains the same across all the BCC peer clusters.

5.2 BCC Enabling the VLDB Service

Use the procedure in this section to configure the DFS management context’s VLDB service in a BCC setup (cluster with OES Cluster Services).

To setup an instance of the VLDB service in BCC:

- 1 Install and configure Cluster Services and BCC on the server where you want to host the VLDB service.

For information, see the [OES Cluster Services for Linux Administration Guide](#) and [BCC Documentation](#) (<http://www.novell.com/documentation/bcc/>).

- 2 Create a clustered NSS pool on the server.

This creates a clustered resource that is called a cluster virtual server based on the IP address you specify. For information, see “[Creating a Pool](#)” in the [Storage Services File System \(NSS\) Administration Guide for Linux](#).

- 3 BCC enable the clustered NSS pool.
- 4 Create a shared NSS volume on the clustered pool.
For information, see “[Creating Unencrypted NSS Volumes using iManager](#)” in the *Storage Services File System (NSS) Administration Guide for Linux*.
- 5 Configure a DFS management context with the following settings:

Parameter	Description
Management Context	This container must be of type o or ou which contains all the BCC peer cluster containers.
Replica Site	Specify the cluster virtual server for the BCC enabled pool that you created in Step 2 as the replica site.
VLDB Path	Specify the location of the VLDB file as a path on the BCC enabled clustered pool’s volume that you created in Step 3 . The default path is <code>/var/opt/novell/dfs</code> , which is on the node and not in the clustered resource. In order to be able to be failed over, the path must be changed to a volume on the clustered resource. For OES 2 SP2 or later Linux clusters, specify the path in Linux format (<code>/media/nss/clus_volname/vldbpath</code>). For example, for a clustered volume named <code>dfsvol</code> and a path of <code>/dfs</code> , the Linux format is <code>/media/nss/dfsvol/dfs</code>
VLDB startup	Deselect (disable) the Run VLDB service when the server restarts option.

- 6 Edit the cluster load script.
 - 6a Make sure that the script mounts the volume that contains the VLDB file before you issue the `vldb` command.
 - 6b Add the `vldb` command at the end.

For Linux clusters, use the Linux form of the switch:

```
vldb -dir /vldbpath
```

This command starts the VLDB service for the cluster. Replace `vldbpath` with the path to the VLDB file that you entered for the DFS management context in [Step 5](#). The path must match exactly with what you entered for the DFS management context.

In iManager, use the Clusters plug-in to edit the resource load script to comment out the `add_secondary_ipaddress` line, and add the virtual IP address information for the `dummy0` adapter.

Example of Cluster Load ---Script:

```
#!/bin/bash
. /opt/novell/ncs/lib/ncsfuncs
exit_on_error nss /poolact=POOL1
exit_on_error ncpcon mount DFSVOL=253

###exit_on_error add_secondary_ipaddress 192.168.100.71

exit_on_error ip addr add 10.50.0.101/32 dev dummy0

exit_on_error ncpcon bind --ncpservername=CL1-POOL1-VS --
ipaddress=10.50.0.101
vldb -dir /media/nss/DFSVOL/dfs

exit 0
```

IMPORTANT: If you ever modify the VLDB file location, you must also modify the path in the cluster load script. For information, see [Section 4.3, “Modifying VLDB Settings in the Cluster Load Script,”](#) on page 44.

- 7** Edit the cluster unload script to Add `vldb exit` command before `ncpcon unbind` line. In iManager, use the Clusters plug-in to edit the resource unload script to comment out the `del_secondary_ipaddress` line, and add a line that deletes the virtual IP address information for the `dummy0` adapter.

Example of Cluster Unload Script:

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

vldb exit
ignore_error ncpcon unbind --ncpservername=CL1-POOL1-VS --
ipaddress=10.50.0.101

###ignore_error del_secondary_ipaddress 192.168.100.71

ignore_error ip addr del 10.50.0.101/32 dev dummy0

ignore_error nss /pooldeact=POOL1
exit 0
```

- 8** Add the nss admin user of every Linux node in the cluster on which VLDB is expected to run as trustees to the container configured as the Management Context in [Step 5](#). The nssadmin user object must be in the same container as its server and the username format is `servername.admin.context`. For example, the server name is `server1.ou1.mycompany` and the nssadmin username is `server1admin.ou1.mycompany`

8a In iManager, select **Rights > Modify Trustees**.

8b Select the container configured as the Management Context in [Step 5](#), then click **OK**.

8c List of trustees for the selected container are displayed.

Ensure that the nssadmin user for each node in the cluster is listed as a trustee with a minimum of Read and Compare Rights to the **[All Attribute Rights]** property.

8d (Conditional) If the nssadmin user for a node on which the VLDB service runs is not set as a trustee of the container, add it as a trustee and assign the required rights. To add trustee and assign rights, perform the following steps:

8d1 Click **Add Trustee**, select the nssadmin object, then click **OK**.

8d2 Click **Assigned Rights** for the nssadmin object.

8d3 Assign **Read** and **Compare** to **[All Attribute Rights]** property, then click **Done**.

8d4 Click **Apply**.

Repeat [Step 8d](#) for the nssadmin user for each cluster node.

NOTE: If the Management Context is the container in which the server object for the cluster node exists, the nssadmin object for that server is a trustee of the container with Supervisor rights. Do not modify these rights for the nssadmin user.

6 Migrating DFS from NetWare to OES 2018 or Later

This section provides scenarios for using Distributed File Services tools to migrate the DFS VLDB service and NSS data from a NetWare 6.5 SP8 to an Open Enterprise Server (OES) 2018 or later server.

- ♦ [Section 6.1, “Migration Issues for DFS,” on page 51](#)
- ♦ [Section 6.2, “Planning Your Migration in a DFS Management Context,” on page 55](#)
- ♦ [Section 6.3, “Migrating the DFS VLDB Service,” on page 56](#)
- ♦ [Section 6.4, “Migrating NSS Volumes with the DFS Move Volume or Split Volume Task,” on page 58](#)

6.1 Migration Issues for DFS

Consider the issues in this section when planning migration for NSS volumes.

- ♦ [Section 6.1.1, “Caveats for Junctions,” on page 51](#)
- ♦ [Section 6.1.2, “Caveats for Protocol Compatibility,” on page 51](#)
- ♦ [Section 6.1.3, “Caveats for Mounting NSS Volumes on Different Servers,” on page 52](#)
- ♦ [Section 6.1.4, “Caveats for Migrating Data with the OES File System Migration Tool,” on page 54](#)

6.1.1 Caveats for Junctions

There is no change in format between junctions created on NSS volumes on NetWare and those created on NSS volumes on Linux. The junctions that are created on a NetWare NSS volume continue to work if that volume is later mounted on Linux, and vice versa.

6.1.2 Caveats for Protocol Compatibility

DFS on Linux requires the NCP or CIFS protocol for the junction’s server because Samba and AFP do not support DFS junctions.

For NSS volumes that contain junctions, NCP server must be running on the Linux server and users must access the junction via the Novell Client or CIFS server running on the Linux server and users must access the junction via the CIFS client.

An NSS volume on an OES server running Samba can be the target of a junction that resides on an NSS volume that is on a server that is running CIFS.

In an NCP or CIFS environment, junctions can point to the root of a target volume or to a subdirectory on it. For junctions pointing to subdirectories, users must use the latest version of the Novell Client or CIFS in order for junctions to work.

In a CIFS/Samba environment on NetWare, junctions can point to the root of a target volume, but not to a subdirectory on it.

6.1.3 Caveats for Mounting NSS Volumes on Different Servers

If you move devices with NSS volumes cross-platform, make sure your migration plan considers the following caveats:

- ♦ [“DFS Support for Remounting Shared Volumes on Different Servers” on page 52](#)
- ♦ [“DFS Support for Remounting Unshared Volumes on Different Servers” on page 52](#)
- ♦ [“DFS Support for Remounting Volumes” on page 53](#)
- ♦ [“Remounting NSS Volumes When Move and Split Jobs Are In Progress” on page 53](#)
- ♦ [“Mounting an NSS Volume on a Server in the Same DFS Management Context” on page 53](#)
- ♦ [“Mounting an NSS Volume on a Server in a Different DFS Management Context in the Same Tree” on page 53](#)
- ♦ [“Mounting an NSS Volume on a Server in a Different Tree” on page 54](#)

DFS Support for Remounting Shared Volumes on Different Servers

DFS supports using junctions on shared volumes when used in clusters using Cluster Services. DFS must be installed and running on each server. When the NSS volume fails over to a different node, its junctions work.

DFS Support for Remounting Unshared Volumes on Different Servers

NSS supports moving non-clustered devices between servers with compatible operating platforms and access protocols. If any NSS volume on the device contain junctions, the destination server must be in the same tree in order for junctions to continue to work. In addition, the destination server’s operating system and access protocols must support DFS, and DFS must be installed and running. When the volume is mounted on the destination server, the junctions work.

If the volume is a junction target, the destination server must be in a DFS management context. It can be the same or different context as the original server. Any junctions pointing to a remounted volume are broken until the VLDB for the destination server is repaired.

You must repair the VLDB for any DFS management contexts that are affected by the relocation of the volume. For example, if the new location is in the same DFS management context, a VLDB repair updates the volume location. If the destination is a different context, the VLDB repair in the original location removes the volume information from its database, and the VLDB repair in the destination location adds the volume information to its database.

For information about updating the VLDB, see the following:

- ♦ [Section 10.14, “Repairing the VLDB,” on page 98.](#)
- ♦ [Section 10.12, “Adding a Volume Entry to the VLDB,” on page 96.](#)
- ♦ [Section 10.13, “Deleting a Volume Entry from the VLDB,” on page 97.](#)

For instructions on how to move NSS devices cross-platform, see [“Migrating NSS Devices to OES 24.4”](#) in the *Storage Services File System (NSS) Administration Guide for Linux*.

DFS Support for Remounting Volumes

DFS supports remounting NSS volumes on different servers in the same tree. DFS stores a copy of a volume's DFS GUID in a file (called `~DFSINFO.8-P`) at the root directory of the NSS volume. When a new Volume object is created in the same tree, DFS checks for the existence of the file, then writes the existing DFS GUID as an attribute for the new object. Keeping the same DFS GUID allows NSS volumes to be found in the same tree, independently of the actual DFS management context they are in at any given time.

- ◆ If the NSS volume contains junctions, but it is not a junction target, then the destination server can be anywhere in the same tree.
- ◆ If the NSS volume is a junction target, the destination server can be in the same or different DFS management context in the same tree.

Remounting NSS Volumes When Move and Split Jobs Are In Progress

An NSS volume cannot be remounted from a NetWare to a Linux server, or vice versa, while a **Move Volume** or **Split Volume** job is in progress. Wait until the move or split job is completed to attempt remounting. Early in a job's progress, it is also possible to stop the job and delete it.

Mounting an NSS Volume on a Server in the Same DFS Management Context

If a volume is a junction target (that is, it has junctions pointing to it), and if you mount the volume on a different server in the same DFS management context, you must run a VLDB repair so that the volume's new physical location can be recorded in the VLDB.

If the volume is shared in a cluster, a VLDB repair should not be necessary when a volume is mounted on a different node as part of the cluster failover. The VLDB maps the location to the clustered virtual server's IP, not to a specific node in the cluster.

For instructions on VLDB repair, see [Section 10.14, "Repairing the VLDB," on page 98](#).

Mounting an NSS Volume on a Server in a Different DFS Management Context in the Same Tree

After changes have been made in NetIQ eDirectory, run VLDB repair in the original and destination DFS management contexts. You must run VLDB repair in the original DFS management context to remove the volume entry. You must run VLDB repair in the destination DFS management context to add the volume entry. For instructions on VLDB repair, see [Section 10.14, "Repairing the VLDB," on page 98](#).

Mounting an NSS Volume on a Server in a Different Tree

DFS does not work across trees. After the migration, all junctions on the volume are broken. Junctions on the moved volume cannot point to volumes in the original tree. All junctions in the original tree that point to the moved volume are broken.

If you move all of the volumes that are involved to the new tree, you must create a new DFS management context in the new tree, wait until the VLDB is built, and then modify the target location for each of the broken junctions to point to the volumes in their new location.

6.1.4 Caveats for Migrating Data with the OES File System Migration Tool

The OES File System Migration Tool does not consider the consequences to DFS junctions of moving data on NSS volumes. If you use the OES File System Migration Tool, make sure your migration plan considers the following caveats:

- ♦ [“Migrating Data from NSS Volumes to Non-NSS Volumes” on page 54](#)
- ♦ [“Migrating NSS Volumes to a Different Server in the Same DFS Management Context” on page 54](#)
- ♦ [“Migrating NSS Volumes to a Different Server in the Same Tree but in a Different DFS Management Context” on page 55](#)
- ♦ [“Migrating NSS Volumes to a Different Server in a Different Tree” on page 55](#)

Migrating Data from NSS Volumes to Non-NSS Volumes

If the NSS volume contains junctions, the junctions do not work if you migrate data from the NSS volume to a non-NSS volume. If an NSS volume is a junction target, junctions that point to it do not work if you migrate the data from an NSS volume to a Linux traditional volume. The junction target volume can be migrated to an NCP volume if the NCP volume has a Volume object in eDirectory and you add an entry to the VLDB for it.

Migrating NSS Volumes to a Different Server in the Same DFS Management Context

After migrating an NSS volume to an NSS volume on a different server in the same management context, you must run VLDB repair for the DFS management context. This updates the VLDB with the new physical location of the volume. For instructions on VLDB repair, see [Section 10.14, “Repairing the VLDB,” on page 98](#).

In a DFS environment, we recommend that you use the DFS **Move Volume** or **Split Volume** tasks to migrate data from the NetWare server to an OES 2018 or later server. This is an NSS to NSS migration that avoids breaking junctions and automatically updates the VLDB. For information about moving and splitting NSS volumes, see [Section 6.4, “Migrating NSS Volumes with the DFS Move Volume or Split Volume Task,” on page 58](#).

Migrating NSS Volumes to a Different Server in the Same Tree but in a Different DFS Management Context

After migrating an NSS volume to an NSS volume to a server in a different DFS management context, you must run VLDB repair in the original DFS management context to remove the volume entry. You must run VLDB repair in the destination DFS management context to add the volume entry. For instructions on VLDB repair, see [Section 10.14, “Repairing the VLDB,” on page 98](#).

Migrating NSS Volumes to a Different Server in a Different Tree

DFS does not work across trees. After the migration, all junctions on the volume are broken. They cannot point to volumes in the original tree. All junctions in the original tree that pointed to the volume are broken.

If you move all of the volumes that are involved to the new tree, you must create a new DFS management context in the new tree, wait until the VLDB is built, and then modify the target location for each of the broken junctions to point to the volumes in their new location.

6.2 Planning Your Migration in a DFS Management Context

Consider the guidelines in this section as you plan your migration.

- ♦ [Section 6.2.1, “Supported Migration Platforms,” on page 55](#)
- ♦ [Section 6.2.2, “System Credential Requirements,” on page 55](#)
- ♦ [Section 6.2.3, “Supported Migration Scenarios,” on page 55](#)

6.2.1 Supported Migration Platforms

The migration procedures support migration from NetWare 6.5 SP8 to OES 24.4.

6.2.2 System Credential Requirements

- ♦ The administrator user must have file system trustee rights for the NetWare and Linux servers involved in the migration.
- ♦ All iManager tasks are run with the administrator’s NetIQ eDirectory credentials (username and password) for the servers.
- ♦ All terminal console commands on the Linux server are run as the `root` user or user with equivalent Linux rights.

6.2.3 Supported Migration Scenarios

It is the nature of Distributed File Services that junctions and the VLDB service reside within the same tree. This means that you cannot use migration procedures that are described in this section for moving data and VLDB services across eDirectory trees. Supported migration scenarios are:

- ♦ Migrating VLDB services between servers in the same DFS management context.

- ♦ Migrating nonencrypted NSS volumes between servers in the same DFS management context, using the DFS **Move Volume** and **Split Volume** tasks.

If an NSS volume that you want to migrate is not currently in a DFS management context, you must create a new DFS management context in the eDirectory tree that includes both the NetWare server and the Linux server. The servers must reside in the same DFS management context until the move or split process is complete.

We strongly advise against using the **Move Volume** and **Split Volume** tasks for encrypted NSS volumes because the data is not secure in the new location. For more information, see [Section 9.5.2, “Moving or Splitting Encrypted NSS Volumes,” on page 79.](#)

6.3 Migrating the DFS VLDB Service

This section describes how to migrate the control files and VLDB from a DFS replica site on a NetWare server to an OES 2018 or later server, along with the prerequisites for migration.

- ♦ [Section 6.3.1, “Prerequisites for Migrating the VLDB Service,” on page 56](#)
- ♦ [Section 6.3.2, “Migrating a VLDB Service by Adding It as a Replica Site,” on page 57](#)

6.3.1 Prerequisites for Migrating the VLDB Service

Make sure your setup addresses the requirements in this section before you attempt to migrate the VLDB service.

DFS Management Context

The NetWare server and Linux server must reside within the same DFS management context.

NetWare Server

- ♦ The NetWare server is running NetWare 6.5 SP8.
- ♦ The NetWare server hosts an instance of the VLDB service for the DFS management context.
- ♦ The VLDB is up-to-date.
- ♦ The VLDB service is running.

OES Linux Server

The administrator must install and configure DFS and other OES 2018 or later services that are needed for using DFS on the OES 2018 or later server:

- ♦ Linux User Management
- ♦ NCP Server
- ♦ NetIQ eDirectory
- ♦ OES Storage Services (includes DFS)
- ♦ OES Storage Management Services
- ♦ SLP (Service Location Protocol)

For details, see [Section 3.1, “Requirements for OES Services,”](#) on page 31.

The Linux server cannot currently be the host of a VLDB service.

6.3.2 Migrating a VLDB Service by Adding It as a Replica Site

Adding the OES server as a replica site is the simplest way to migrate an instance of the VLDB service from a NetWare server to an OES 2018 or later server. Generally, you follow the same procedure as you might use to modify the replica sites for a DFS management context. You add the OES server as a replica site, let the VLDB synchronize, then remove the replica site on the NetWare server. If you already have two replica sites defined, you must remove one of them before you can add the OES server as a replica site.

A DFS management context can have only one or two replica sites. The procedure in this section assumes that you are beginning with two replica sites that are hosted on NetWare servers.

- 1 Make sure that the instances of the VLDB service are loaded and running properly on the current DFS replica sites.

For instructions on how to view the replica site status, see [Section 10.7, “Monitoring the Health of the VLDB Service,”](#) on page 91.

- 2 If you have two replica sites currently configured for the DFS management context, remove one of the two instances.

WARNING: Do not remove the last remaining replica site because removing it also deletes the DFS management context.

Removing a replica site deactivates and unloads the VLDB service on the replica server, deletes the VLDB database file on the replica server, then updates the DFS-VLDB-Hosts attribute for the DFS management context (that is, its O or OU container object) in Novell eDirectory.

2a In iManager, select **Distributed File Services > Manage Replica Sites**.

2b Select any server with an NSS volume that is located in the DFS management context that you want to manage.

This action locates the DFS management context, lists the replica servers in that context that host an instance of its VLDB service, and reports the current status of the VLDB service on each replica.

2c Visually verify that this is the DFS management context you want to manage.

2d Select the check box next to the replica site you want to remove, then click **Delete**.

This process can take up to 5 minutes. Do not click again on the page or elsewhere in the browser until the page refreshes with a message that confirms whether the delete was successful or not.

2e Click **OK** to dismiss the confirmation message.

- 3 Add the OES server as a replica site for the DFS management context.

3a In iManager, select **Distributed File Services > Manage Replica Sites**.

3b Select any server with an NSS volume that is located in the DFS management context that you want to manage.

The NSS volume will have an entry in the VLDB, and this information allows DFS to walk the eDirectory tree to discover its management context.

3c Visually verify that this is the DFS management context that you want to manage.

3d Click **New**.

3e Browse to locate and select the OES server where you want to host a VLDB service for the selected DFS management context.

3f Specify the location where you want to put the VLDB file.

The default location is the `/var/opt/novell/dfs` directory.

3g Do one of the following:

- ♦ Select **Run VLDB service on server restart** if you want the service to start automatically when you start the server.
- ♦ Deselect **Run VLDB service on server restart** if you want to start the service manually or in a cluster environment.

3h Click **OK**.

This process can take up to 5 minutes. Do not click again on the page or elsewhere in the browser until the page refreshes with a message that confirms whether the delete was successful or not.

3i Click **OK** to dismiss the confirmation message.

The existing replica site automatically begins to synchronize the VLDB on the new site.

4 Verify that the new site's VLDB is synchronized with the existing instance of the replica site.

For instructions on how to view the replica site status, see [Section 10.7, "Monitoring the Health of the VLDB Service,"](#) on page 91.

5 Remove the NetWare 6.5 instance of the replica site.

Use the same steps as outlined in [Step 8a](#) through [Step 2e](#).

6.4 Migrating NSS Volumes with the DFS Move Volume or Split Volume Task

Distributed File Services provides the **Move Volume** and **Split Volume** tasks for NSS volumes so you can relocate data with trustees and quotas intact, without moving the physical device to the other server.

Both the source and destination servers must be in the same DFS management context. If an NSS volume that you want to migrate is not currently in a DFS management context, you must create a new DFS management context in the eDirectory tree that includes both the NetWare server and the Linux server. The servers must reside in the same DFS management context until the move or split process is complete.

You might consider this gradual migration option under the following conditions:

- ♦ NSS volumes on a NetWare server reside in a DFS management context, and they are the targets of one or multiple junctions.
- ♦ NSS volumes on a NetWare server contain junctions.
- ♦ You want to gradually migrate data from the NSS volumes on the NetWare server to one or more NSS volumes on the same or different OES servers.

- ◆ The NSS volume is not encrypted.

We strongly advise against using the **Move Volume** or **Split Volume** tasks for encrypted NSS volumes because the data is not secure in the new location. For more information, see [Section 9.5.2, “Moving or Splitting Encrypted NSS Volumes,” on page 79](#).

The **Move Volume** option (**Storage > Volumes > Move Volume**) can be used to move data from a NSS volume on the NetWare server to an NSS volume on an OES server. The NSS volume continues to support any DFS junctions it contains after the move. It moves the data, trustees, and quotas. DFS uses Storage Management Services to copy the data, which is faster than a regular copy function. When the move is complete, the Volume Location Database automatically updates the location of the volume to its new location. The relocation of the data is transparent to existing junctions that pointed to the source volume.

The **Split Volume** option (**Storage > Volumes > Split Volume**) can be used to move the contents of a directory on an NSS volume on the NetWare server to a new NSS volume on an OES server. The **Split Volume** command moves the data, trustees, and quotas of the data beneath that directory to the new volume. When the split is complete, DFS replaces the old directory with a DFS junction that points to the new location. You must Linux-enable users on the target server before you allow users to access the data in order for quotas to be enforced.

With the **Split Volume** option, you can relocate the data in a single volume to multiple volumes on one or more servers so that data is gradually migrated to the OES Linux environment. Afterwards, you can keep the NetWare server running with the old junction-filled volume. Alternately, you can create an OES server with the same name as the old server and mount the old volume on it, remove the old server from the network, and rebuild the VLDB to recognize the new server. The relocation of the data is transparent to all the users' and scripts' drive mappings to the location of the DFS junction.

You can schedule any number of **Move Volume** or **Split Volume** jobs. Only four jobs can run concurrently. They are usually scheduled for non-peak hours.

For planning guidelines, see [Section 9.6, “Guidelines for Moving or Splitting NSS Volumes,” on page 79](#). For instructions, see the following:

- ◆ [Chapter 12, “Using DFS to Move NSS Volumes,” on page 117](#)
- ◆ [Chapter 13, “Using DFS to Split NSS Volumes,” on page 125](#)

7 Running DFS in a Virtualized Environment

Distributed File Services works and behaves exactly the same whether it is running on a physical machine or a virtual machine. Use the information in this section to plan and use DFS in a virtual environment.

- ♦ [Section 7.1, “Guidelines for Managing DFS in a Virtualized Environment,” on page 61](#)
- ♦ [Section 7.2, “Guidelines for Using DFS Junctions in a Virtualized Environment,” on page 61](#)
- ♦ [Section 7.3, “What’s Next,” on page 61](#)

7.1 Guidelines for Managing DFS in a Virtualized Environment

Consider the following guidelines when planning a DFS management context in a virtualized environment:

- ♦ DFS is not supported to run on the virtualization host server.
- ♦ Install DFS on the guest server just as you do on a physical server.
- ♦ When selecting a guest server as a replica site, select the Server object of the virtual machine from among the available servers, not the host server’s Server object.

7.2 Guidelines for Using DFS Junctions in a Virtualized Environment

Consider the following guidelines when planning for DFS junctions in a virtualized environment:

- ♦ You can create, modify, and delete DFS junctions on NSS volumes on guest servers just as you do for NSS volumes on physical servers.
- ♦ NSS volumes and NCP volumes (that have a Volume object and an entry in the VLDB) on guest servers can be targets of junctions.
- ♦ NSS and NCP Server are not supported in the virtualization host server environment.

7.3 What’s Next

To get started with Xen virtualization, see [Virtualization Guide](#).

To get started with third-party virtualization platforms, such as Hyper-V from Microsoft and the different VMware product offerings, refer to the documentation for the product that you are using.

8

Management Tools for DFS

This section identifies the various tools for managing your Distributed File for the Storage Services (NSS) file system.

- ♦ [Section 8.1, “iManager and DFS-Related Plug-Ins,” on page 63](#)
- ♦ [Section 8.2, “NSS Utilities \(Rights Utility\),” on page 71](#)
- ♦ [Section 8.3, “DFS Commands,” on page 71](#)

8.1 iManager and DFS-Related Plug-Ins

iManager is a Web browser-based tool used for configuring, managing, and administering NetIQ eDirectory objects on your network.

- ♦ [Section 8.1.1, “Installing the DFS-Related Plug-Ins in iManager,” on page 63](#)
- ♦ [Section 8.1.2, “Accessing iManager,” on page 64](#)
- ♦ [Section 8.1.3, “Accessing Roles and Tasks in iManager,” on page 64](#)
- ♦ [Section 8.1.4, “Selecting a Server to Manage,” on page 65](#)
- ♦ [Section 8.1.5, “Distributed File Services Plug-In,” on page 65](#)
- ♦ [Section 8.1.6, “Storage Plug-In,” on page 69](#)
- ♦ [Section 8.1.7, “Files and Folders Plug-In,” on page 70](#)
- ♦ [Section 8.1.8, “SFCB,” on page 70](#)

8.1.1 Installing the DFS-Related Plug-Ins in iManager

The Storage related plug-ins for iManager contains the Distributed File Services (`dfsmgmt.npm`) role for Linux and NetWare, `nssmgmt.npm` and `storagemgmt.npm` files. You must install all the three plug-ins. For information about installing NPM files for iManager, see the [NetIQ iManager Installation Guide](#).

Table 8-1 NPM Files for iManager

Storage-Related Plug-In	NPM File	Use to Manage	Role in iManager
Distributed File Services Management	<code>dfsmgmt.npm</code>	Distributed File Services	Distributed File Services
NSS Management	<code>nssmgmt.npm</code>	Storage Services to Move Volume and Split Volume tasks for DFS	Storage
Storage Management	<code>storagemgmt.npm</code>	Contains common code for all storage-related plug-ins	Required when using any combination of storage-related plug-ins

IMPORTANT: The DFS and NSS Management plug-ins share code in common with other storage-related plug-ins in the `storagemgmt.npm` file. For more information, see “[iManager and Storage-Related Plug-Ins](#)” in the *Storage Services File System (NSS) Administration Guide for Linux*.

8.1.2 Accessing iManager

- 1 Launch a Web browser.
- 2 Click **File > Open**, then enter

`https://server-IP-address/nps/iManager.html`

The URL is case sensitive. Replace *server-IP-address* with the actual server DNS name or IP address. For example:

`https://192.168.1.1/nps/iManager.html`

The iManager Login page opens.

- 3 Use your administrator username and password to log in to the NetIQ eDirectory tree that contains the server you want to manage.

In iManager, you can access only the roles and tasks you are authorized to manage. For full access to all available iManager features, you must log in as Supervisor of the tree.

8.1.3 Accessing Roles and Tasks in iManager

- 1 Access iManager, then log in to the eDirectory tree where the server you want to manage resides.

For information, see [Section 8.1.2, “Accessing iManager,” on page 64](#).

- 2 In **Roles and Tasks**, do one of the following:
 - ◆ Expand the **Distributed File Services** role to reveal its main tasks.



- ◆ Expand the **Storage** role to reveal its main tasks. The DFS **Move Volume** and **Split Volume** tasks are located on the Volumes page.



As you work in the storage-related plug-ins, use the navigation links at the top of the page, referred to as “breadcrumbs,” to return to pages you recently visited, or use the links in **Roles and Tasks**. If you use the **Refresh** and **Back** features of your Web browser to navigate, iManager returns you to the initial page you encountered after login.

- 3 To activate the options on the selected page, select a server to manage.
For information, see [Section 8.1.4, “Selecting a Server to Manage,” on page 65](#).

8.1.4 Selecting a Server to Manage

Before you can access the management options on a selected task page, you must select a server to manage that is in the same NetIQ eDirectory tree where you are currently logged in.

- 1 Use one of the following methods to select a server in the tree where you are logged in:

Server:  

- ◆ Type the NetIQ eDirectory distinguished server name for the server you want to manage, then press **Tab** or click somewhere on the page outside of the **Server** field to enter your selection. For example: `svr1.company`.
 - ◆ Click the **Search** icon to open the eDirectory Object Selector. Browse or search the list to locate the server you want to manage, then click the server name.
 - ◆ Click the **Object History** icon to select a server you have recently managed.
- 2 Wait for iManager to retrieve information about that server and display the appropriate information to the task page you are in.

It might take several seconds to retrieve the information, depending on the size and complexity of your storage solution.

8.1.5 Distributed File Services Plug-In

The Distributed File Services plug-in for iManager provides the tasks described in this section.

- ◆ “Volume Job Control” on page 66
- ◆ “Create Junction” on page 66
- ◆ “Delete Junction” on page 66
- ◆ “Modify Junction” on page 66

- ◆ “Manage Replica Sites” on page 67
- ◆ “Create Management Context” on page 68
- ◆ “Delete Management Context” on page 68
- ◆ “Manage Junctions” on page 69

Volume Job Control

After you use the **Move Volume** or **Split Volume** tasks on the **Storage > Volumes** page, use **Distributed File Services > Volume Job Control** to manage those jobs. For information about the **Move Volume** and **Split Volume** tasks, see [Section 8.1.6, “Storage Plug-In,”](#) on page 69.

Table 8-2 Volume Job Control Tasks

Subtask	Description	Reference
Create a Move/Split Job	Move or split an NSS volume.	Planning for DFS
Move/Split Job Report	After creating a move volume or split volume job, view the job’s status report.	Managing Move Volume or Split Volume Jobs
Pause	Pause active move and split jobs.	Pausing a Move or Split Job
Resume	Resume previously paused move and split jobs.	Resuming a Move or Split Job
Reschedule	Reschedule pending move and split jobs.	Rescheduling a Move or Split Job
Delete	Cancel and delete pending move and split jobs.	Deleting a Move or Split Job
Finish	Manually force a job completion to occur for a selected move or split job that cannot complete without manual intervention. Typically, this occurs if files are open during the move or split process and cannot be copied to the new location.	Finishing a Move or Split Job

Create Junction

Create junctions anywhere on an NSS volume.

Delete Junction

Locate and delete existing junctions.

Modify Junction

Locate and modify the following settings for an existing DFS junction:

- ◆ Junction name

- ◆ Target location
- ◆ Junction rights
- ◆ Target rights on NSS volumes

To modify target rights on NCP volumes go to the **File Manager** role, select **Properties**, then set the rights on the target location.

Manage Replica Sites

Use the **Manage Replica Sites** task to add, remove, or modify settings for replica sites that host the VLDB service for a DFS management context.

IMPORTANT: On Linux, adding or removing a replica server requires SFCB (CIMOM) to be running on the iManager server and the server you are managing in order to pass information securely to eDirectory. Otherwise, the iManager plug-in does not perform the task.

Table 8-3 Manage Replica Sites Tasks

Subtask	Description	Reference
Replica Sites	Select a server to find the DFS management context it is in, and view information about its replica sites.	Monitoring the Health of the VLDB Service
New	Add a replica site for the selected DFS management context.	Adding a Replica Site
Delete	Remove a replica site. If it is the last replica site, this action also deletes the management context.	Removing a Replica Site
Refresh	Refreshes the replica site list.	
Actions > Details	View more information about the selected replica site. Optionally configure the back-end database location and number of threads to use when services are running.	Viewing VLDB Service Details for a Replica Site
Actions > Activate	Start the VLDB Service that is already loaded on the selected replica site.	Starting or Activating the VLDB Service
Actions > Start	Load the VLDB service on each of the selected replica sites, then activate them. If a VLDB service is already loaded, this command simply activates it.	Starting or Activating the VLDB Service
Actions > Stop	Deactivate the VLDB service on each of the selected replica sites, then unload them.	Stopping the VLDB Service
Actions > Repair	Configure a repair of the VLDB on the selected replica site.	Repairing the VLDB

Create Management Context

Create and configure a DFS management context where you plan to use Distributed File Services for NSS volumes.

IMPORTANT: On Linux, creating a DFS management context requires SFCB (CIMOM) to be running on the iManager server and the server you are managing in order to pass information securely to eDirectory. Otherwise, the iManager plug-in does not perform the task.

Table 8-4 Create Management Context Tasks

Subtask	Description	Reference
Management Context	<p>Specify the O or OU level in the eDirectory tree where you want to create the management context.</p> <p>Specify one or two servers where you want to host an instance of the VLDB service for the context.</p> <p>Specify the directory path where you want to locate the VLDB database file on the replica sites.</p>	Creating a DFS Management Context
Run VLDB service on server restart	<p>Select this option if you want the VLDB service to start automatically whenever you reboot its replica server.</p> <p>Disable this option when clustering the VLDB service, or if you want to start the service manually.</p>	Creating a DFS Management Context Clustering the VLDB Service

Delete Management Context

Locate and delete a DFS management context. This removes the context and its VLDB service from the replica sites.

IMPORTANT: On Linux, deleting a DFS management context requires SFCB (CIMOM) to be running on the iManager server and the server you are managing in order to pass information securely to eDirectory. Otherwise, the iManager plug-in does not perform the task.

Table 8-5 Delete Management Context Tasks

Subtask	Description	Reference
Delete a DFS Management Context	Select a server to find the DFS management context it is in. Visually verify that the management context and its VLDB replica sites are the ones you intend to delete, then click OK to delete the context.	Deleting a Management Context

Manage Junctions

Locate and modify or delete junctions. You can also export the list of junctions to a .csv file.

Table 8-6 Manage Junction Tasks

Subtask	Description	References
Junctions	Select a volume, server, or cluster to display the list of junctions.	Managing Junctions
Scan	Scan all the volumes, in order to store the junction information in the cache.	Scanning a Volume
Scan Details	Displays the scan details of the selected server, volume, or cluster.	Viewing Scan Details
Delete	Deletes a junction and removes the junction file and any explicitly set trustees, trustee rights, and inherited rights filter on the junction.	Deleting a DFS Junction
Refresh	Click Refresh to update the cache and display the newly added junctions in the Junctions list.	Refreshing the Junction List
Export	Export the junctions to a .csv file.	Exporting Junctions

8.1.6 Storage Plug-In

The Storage plug-in for iManager provides the **Move Volume** and **Split Volume** tasks on the Volumes page:

Table 8-7 Volume Management Tasks

Subtask	Description	Reference
Move	<p>Move a selected volume to reorganize and redistribute storage on the same server (or to other servers) in response to changing business needs.</p> <p>Use the DFS plug-in to manage Move Volume jobs.</p>	Using DFS to Move NSS Volumes
Split	<p>Split a selected volume to reorganize and redistribute storage on the same server (or to other servers) in response to changing business needs.</p> <p>Use the DFS plug-in to manage Split Volume jobs.</p>	Using DFS to Split NSS Volumes

8.1.7 Files and Folders Plug-In

You can optionally use the **Files and Folders > Properties > Rights** page to view and modify trustees, trustee rights, and the inherited rights filter on either the junction or the target location. There is no ability to copy between the two locations as there is in the **Distributed File Services > Modify Junction** page. For a quick reference for the Files and Folders plug-in, see “[Files and Folders Plug-In Quick Reference](#)” in the *Storage Services File System (NSS) Administration Guide for Linux*.

8.1.8 SFCB

You must make sure CIMOM is running on the server you want to manage if the task you are performing changes values in eDirectory. If CIMOM is not running, the plug-in does not perform the task.

For DFS for Linux, this affects the following tasks:

- ♦ Creating or deleting an DFS Management context
- ♦ Adding or removing a Replica server

SFCB is loaded and runs automatically when you start the server.

IMPORTANT: If you receive file protocol errors, it might be because SFCB is not running.

To check the status of SFCB:

- 1 As `root` in a console shell, enter

```
systemctl status sblim-sfcb.service
```

To start SFCB:

- 1 As `root` in a console shell, enter

```
systemctl start sblim-sfcb.service
```

For information on WBEM using SFCB, about installing WBEM, see the [SLES 12 Administration Guide \(https://documentation.suse.com/sles/15-SP4/html/SLES-all/book-administration.html\)](https://documentation.suse.com/sles/15-SP4/html/SLES-all/book-administration.html).

8.2 NSS Utilities (Rights Utility)

You can use the Rights command line utility to view and assign trustee rights on the junctions for eDirectory users and Active Directory users.

Lists Trustees on the Junctions

Syntax: `rights -Sf <junction_name> show`

Example: `rights -Sf junc_map_dir show`

This command displays a list of trustees for the junction `junc_map_dir`.

Assign Trustees to Junctions for eDirectory Users

Syntax: `rights -r <trustee_rights> -f <junction_name> trustee <username_FDN format> -a -S`

Example: `rights -r rwcf -f junc_map_dir trustee joe.engineer.acme_tree -a -S`

This command assigns Read, Write, Create rights, and File Scan on the junction `junc_map_dir` for user Joe in the engineer context of the `acme_tree` eDirectory tree.

Assign Trustees to Junctions for Active Directory Users

Syntax: `rights -r <trustee_rights> -f <junction_name> trustee <ADdomain/username> -a -S`

Example: `rights -r rwcf -f junc_map_dir trustee NETBIOSNameOfDomain\\joe -a -S`

This command adds Read, Write, Create rights, and File Scan on the junction `junc_map_dir` for the active directory user named Joe with the domain whose netbios name is `NETBIOSNameOfDomain`.

8.3 DFS Commands

Command line instructions are available to control the VLDB service. For information about DFS commands, see [Appendix A, "DFS Commands and Utilities," on page 155](#).

9 Planning for DFS

This section describes guidelines for using Distributed File Services for Open Enterprise Server.

- ♦ [Section 9.1, “Guidelines for Combining Platforms, Volumes, and Protocols,” on page 73](#)
- ♦ [Section 9.2, “Guidelines for DFS Management Contexts,” on page 76](#)
- ♦ [Section 9.3, “Guidelines for VLDB Services,” on page 76](#)
- ♦ [Section 9.4, “Guidelines for Junctions,” on page 76](#)
- ♦ [Section 9.5, “Guidelines for Using DFS with Encrypted NSS Volumes,” on page 78](#)
- ♦ [Section 9.6, “Guidelines for Moving or Splitting NSS Volumes,” on page 79](#)
- ♦ [Section 9.7, “Guidelines for Managing Move Volume or Split Volume Jobs,” on page 82](#)
- ♦ [Section 9.8, “Guidelines for Using DFS and Dynamic Storage Technology,” on page 83](#)
- ♦ [Section 9.9, “Guidelines for DFS and Volume Attributes,” on page 84](#)
- ♦ [Section 9.10, “Guidelines for Using DFS and Nearline Storage,” on page 84](#)

9.1 Guidelines for Combining Platforms, Volumes, and Protocols

When planning your DFS environment, consider the guidelines in this section for the supported combinations of platforms, volumes, and protocols.

- ♦ [Section 9.1.1, “Supported Combinations for Junctions,” on page 73](#)
- ♦ [Section 9.1.2, “Supported Combinations for Moving Volumes,” on page 74](#)
- ♦ [Section 9.1.3, “Supported Combinations for Splitting Volumes,” on page 75](#)

9.1.1 Supported Combinations for Junctions

DFS junctions point to data that is stored on a different NSS volume or NCP volume. [Table 9-1](#) summarizes the requirements for the junction, junction target location, and the users’ file access. Consider the following additional requirements:

- ♦ Both the junction and junction target servers must use the same file access protocol for users.
- ♦ You must configure file system trustee rights for users on the junction and the junction target location. For visibility, users must have at least Read and File Scan rights on the target location.
- ♦ When you create a junction, the target volume or subdirectory must already exist.
- ♦ The junctions on the target volume must also be supported by the protocol the users are using to access data.
- ♦ Novell CIFS for Linux allows multiple levels of junctions when the junction points to the root of a target volume or to a subdirectory.

In the following table, the NetWare and Linux platforms represent only the explicitly supported versions of NetWare and Linux as defined in [Section 3.1, “Requirements for OES Services,”](#) on [page 31](#).

Table 9-1 Supported Combinations for Junctions

Junction Server			Junction Target Server			Target Location		User
Platform	Volume	Protocol	Platform	Volume	Protocol	Root	Subdir	File Access
NetWare or Linux	NSS	NCP	NetWare or Linux	NSS	NCP	Yes	Yes (no junctions)	Novell Client
NetWare or Linux	NSS	NCP	Linux	NCP Volume	NCP	Yes	Yes (no junctions)	Novell Client
NetWare	NSS	CIFS	NetWare	NSS	CIFS	Yes	No	CIFS/Samba
Linux	NSS	CIFS	Linux	NSS	CIFS	Yes	Yes	CIFS/ Samba
Linux	NSS	CIFS	NetWare	NSS	CIFS	Yes	No	CIFS/ Samba

9.1.2 Supported Combinations for Moving Volumes

The Move operation moves the implicit rights of the source volume to the target volume. If it is a different pool, the destination pool can be on the same server or on a different server in the same DFS management context. [Table 9-2](#) summarizes the requirements for the original and destination servers.

During the move process, the original and destination servers must both use the NCP protocol. Users can continue to access data via NCP or CIFS/Samba in the original location while data is being copied to the new location. After the move, you can configure the destination server to use NCP, CIFS, or Samba, as appropriate for your environment.

IMPORTANT: Samba does not support DFS junctions. If you move a volume from NetWare to Linux, junctions on the volume are broken for Samba users.

After the move is complete, the volume location is automatically updated in the VLDB. This ensures that junctions that point to the volume are not broken. No junctions are created in the move process.

In the following table, the NetWare and Linux platforms represent only the explicitly supported versions of NetWare and Linux as defined in [Section 3.1, “Requirements for OES Services,”](#) on [page 31](#).

Table 9-2 Supported Combinations for the Move Volume Task

Original Server Configuration			Destination Server Configuration		
Platform	Volume	Protocol	Platform	Volume	Protocol
NetWare or Linux	NSS	NCP, during the move	NetWare	NSS (new)	NCP, during the move
					NCP or CIFS, after the move
NetWare or Linux	NSS	NCP, during the move	Linux	NSS (new)	NCP, during the move
					NCP or Samba (no junctions), after the move

9.1.3 Supported Combinations for Splitting Volumes

The DFS **Split Volume** task splits data from a directory on an NSS volume to a new NSS volume. You can split the volume at any subdirectory level. The target location is the root of a new NSS volume. The **Split Volume** task does not allow you to split a volume to a subdirectory. [Table 9-3](#) summarizes the requirements for the original and destination server.

During the split process, the original and target servers must both use the NCP protocol. Users can continue to access data via NCP or CIFS/Samba in the original location while data is being copied to the new location. After the split is complete, a junction is created in place of the directory in the original volume. Users access data in the target location via that junction.

IMPORTANT: Samba does not support DFS junctions. If you split an NSS volume on Linux, the junction works only for NCP users.

The Split operation moves the implicit rights on the directory being split to the target volume. For visibility, users must have at least Read and File Scan rights on the target location.

In the following table, the NetWare and Linux platforms represent only the explicitly supported versions of NetWare and Linux as defined in [Section 3.1, “Requirements for OES Services,”](#) on [page 31](#).

Table 9-3 Supported Combinations for the Split Volume Task

Original Server Configuration			Destination Server Configuration			Junction Target Location	
Platform	Volume	Protocol	Platform	Volume	Protocol	Root	Subdirectory
NetWare or Linux	NSS	NCP, during the split	NetWare or Linux	NSS (new)	NCP, during the split	Yes	Not allowed
		NCP, after the split			NCP, after the split		
NetWare	NSS	NCP, during the split	NetWare	NSS (new)	NCP, during the split	Yes	Not allowed
		CIFS, after the split			CIFS, after the split		

Original Server Configuration			Destination Server Configuration			Junction Target Location	
Platform	Volume	Protocol	Platform	Volume	Protocol	Root	Subdirectory
NetWare	NSS	NCP, during the split	Linux	NSS (new)	NCP, during the split	Yes (no junctions)	Not allowed
		CIFS, after the split			Samba, after the split		Not supported for CIFS/Samba

9.2 Guidelines for DFS Management Contexts

You must configure a DFS management context and let it build the VLDB before you can use DFS junctions and tasks for volumes in that context.

For information about creating a DFS management context, see [Section 10.1, “Creating a DFS Management Context,”](#) on page 85.

9.3 Guidelines for VLDB Services

The VLDB service is configured when you create the DFS management context. At least one instance of the VLDB service for a DFS management context must be running in order use DFS junctions and tasks for volumes in that context. You can define one or two replica sites to host instances of the VLDB service.

The VLDB service tracks only those volumes in the DFS management context that have Volume objects in NetIQ eDirectory.

- ♦ **NSS Volume Entries in the VLDB:** NSS volumes can be source or target volumes for DFS junctions and the **Move Volume** or **Split Volume** tasks. NSS automatically creates a Volume object in eDirectory when you create the volume in iManager or NSSMU. These tools go through the `_admin` volume, so the corresponding VLDB entry occurs automatically.

If the Volume object is not created or is damaged, you can force NSS to create it, using the **Update eDirectory** option on the **Storage > Volumes** page. For instructions, see [“Updating eDirectory Volume Objects using iManager”](#) in the *Storage Services File System (NSS) Administration Guide for Linux*.

- ♦ **NCP Volume Entries in the VLDB:** On Linux, NCP volumes (NCP shares defined for Linux Ext3 and Reiser file systems) can be the target of junctions. NCP Server automatically creates a Volume object in eDirectory when you create NCP volumes by defining NCP shares.

For information about monitoring the VLDB service, see [Chapter 10, “Managing VLDB Services,”](#) on page 85.

9.4 Guidelines for Junctions

Use the guidelines in this sections for planning for the junction and target volumes for DFS junctions.

- ♦ [Section 9.4.1, “Junction Volumes,”](#) on page 77
- ♦ [Section 9.4.2, “Junction Target Volumes,”](#) on page 77

- ♦ [Section 9.4.3, “Junction Target Directory,” on page 78](#)
- ♦ [Section 9.4.4, “Junctions,” on page 78](#)

9.4.1 Junction Volumes

The volume where the DFS junction resides must be an NSS volume on one of the following supported operating systems (or later versions):

- ♦ OES 24.4
- ♦ OES 2023
- ♦ OES 2018 SP3
- ♦ OES 2018 SP2
- ♦ OES 2018 SP1
- ♦ OES 2018
- ♦ OES 2015 SP1
- ♦ OES 2015
- ♦ OES 11 SP2
- ♦ OES 11 SP1
- ♦ OES 2 Linux
- ♦ NetWare 6.5

IMPORTANT: A junction does not work if you mount its NSS volume on a server running an unsupported platform.

9.4.2 Junction Target Volumes

The target volume must be an existing volume within a DFS management context. For a DFS junction, the target volume can be an NSS volume or an NCP volume (an NCP share on a Linux POSIX volume). When moving or splitting volumes, only NSS volumes are supported as target volumes.

The target volume for a junction can be an NSS volume on the following platforms:

- ♦ OES 24.4
- ♦ OES 2023
- ♦ OES 2018 SP3
- ♦ OES 2018 SP2
- ♦ OES 2018 SP1
- ♦ OES 2018
- ♦ OES 2015 SP1
- ♦ OES 2015
- ♦ OES 11 SP2
- ♦ OES 11 SP1

- ◆ OES 2 Linux or later
- ◆ NetWare 6.5 SP8

The target volume for a junction can be an NCP volume (an NCP share on an Ext3 or Reiser file system) on an OES server.

Target volumes cannot be non-NCP Linux volumes primarily for security reasons such as enforcing file system trustees, rights, inherited rights filters, and file attributes. In addition, the target volume must be represented by a Volume object in NetIQ eDirectory in order to be tracked by the VLDB. Volume objects are created automatically in eDirectory when you create an NSS volume or an NCP volume.

9.4.3 Junction Target Directory

When using NSS volumes as the target volume in an NCP or CIFS environment, junctions can point to the root of a target volume or to a subdirectory on it. For junctions pointing to subdirectories, users must use the latest version of the Novell Client or CIFS in order for junctions to work.

9.4.4 Junctions

When planning and managing junctions, consider the following guidelines:

- ◆ The junction's volume and the target volume must be in the same NetIQ eDirectory tree.
- ◆ Junctions can exist in or out of a DFS management context. If a junction is in a DFS management context, the context can be the same or different than the one for the target volume.
- ◆ The target volume must be in an existing DFS management context where an instance of its VLDB service is up and running.
- ◆ Before creating a junction, make sure the source and target volumes are mounted and active.
- ◆ Junctions can be created only in existing directories. Make sure to create the directory path before attempting to create the junction.
- ◆ Junctions can point only to existing volumes or existing directories. Make sure the target volume or target directory exists before attempting to create the junction.
- ◆ The users must be defined with User objects in NetIQ eDirectory in order to be available as potential trustees. You can add trustees to a junction or junction target at any time.
- ◆ Both the junction and target locations inherit trustees and trustee rights relative to their actual locations in accordance with the OES Trustee Model. You must set explicit rights on the two locations to block any rights that you do not want to be inherited.

For information about the OES Trustee Model, see "[Understanding File System Access Control Using Trustees](#)" in the *OES 2023: File Systems Management Guide*.

9.5 Guidelines for Using DFS with Encrypted NSS Volumes

Make sure you understand the security implications in this section if you use DFS with encrypted NSS volumes.

- ◆ [Section 9.5.1, "Creating DFS Junctions on Encrypted NSS Volumes," on page 79](#)
- ◆ [Section 9.5.2, "Moving or Splitting Encrypted NSS Volumes," on page 79](#)

9.5.1 Creating DFS Junctions on Encrypted NSS Volumes

We strongly advise against creating a situation where encrypted and nonencrypted volumes are paired in the junction-to-target relationship. If you create a DFS junction on an encrypted NSS volume, the target volume should also be an encrypted NSS volume. Otherwise, the data on the target location is not encrypted and the data is not secure.

WARNING: When creating DFS junctions, make sure the source and target volumes are either both encrypted or both nonencrypted.

9.5.2 Moving or Splitting Encrypted NSS Volumes

We strongly advise against using the **Move Volume** or **Split Volume** tasks for encrypted NSS volumes because of the following security considerations:

- ◆ You can move or split data only to a newly created NSS volume. NSS encrypted volume support is available only for volumes created in NSSMU, so the target volume is necessarily an NSS volume that is not encrypted.
- ◆ The data is transferred nonencrypted from the encrypted NSS volume to the nonencrypted target volume where the data is stored nonencrypted.

WARNING: If you use the **Move Volume** or **Split Volume** tasks on an encrypted NSS volume, the relocated data is not encrypted in its new location. It is no longer secure.

9.6 Guidelines for Moving or Splitting NSS Volumes

Use the guidelines in this section when planning to use DFS to move or split NSS volumes.

- ◆ [Section 9.6.1, “Choosing Source and Destination Volumes,” on page 79](#)
- ◆ [Section 9.6.2, “Preparing the DFS Management Context,” on page 81](#)
- ◆ [Section 9.6.3, “Requirements for OES Services,” on page 81](#)
- ◆ [Section 9.6.4, “Prerequisites for Trustees and Trustee Rights,” on page 82](#)
- ◆ [Section 9.6.5, “Moving or Splitting in a Cluster Environment,” on page 82](#)
- ◆ [Section 9.6.6, “Moving or Splitting in a Dynamic Storage Technology Environment,” on page 82](#)

9.6.1 Choosing Source and Destination Volumes

- ◆ The **Move Volume** and **Split Volume** tasks are available only for NSS volumes. Both the original and destination volumes are NSS.
- ◆ The source volume must be an NSS data volume on one of the following server platforms (or later versions):
 - ◆ OES 24.4
 - ◆ OES 2023
 - ◆ OES 2018 SP3

- ◆ OES 2018 SP2
 - ◆ OES 2018 SP1
 - ◆ OES 2018
 - ◆ OES 2015 SP1
 - ◆ OES 2015
 - ◆ OES 11 SP2
 - ◆ OES 11 SP1
 - ◆ OES 2 Linux
 - ◆ NetWare 6.5 SP8
- ◆ The destination location for a move or split is a newly created NSS volume on one of the following server platforms (or later versions):
 - ◆ OES 24.4
 - ◆ OES 2023
 - ◆ OES 2018 SP3
 - ◆ OES 2018 SP2
 - ◆ OES 2018 SP1
 - ◆ OES 2018
 - ◆ OES 2015 SP1
 - ◆ OES 11 SP2
 - ◆ OES 11 SP1
 - ◆ OES 2 Linux
 - ◆ NetWare 6.5 SP8
 - ◆ The destination NSS volume is typically in a different pool on the same or different server.

You must have unpartitioned free space available for this volume on the destination server. For Linux, the free space must be on an unpartitioned device or on a device that is managed by the Logical Volume Manager (NLVM).

The destination volume should be configured with the same volume attributes as the original volume. Review the properties for the original volume before you begin a move or split, and note which attributes need to be set. Specifically, the compression attribute must match.
 - ◆ When moving or splitting a volume to a pool on a different server, the administrator username and password must be valid on both servers. Otherwise, the **Move Volume** or **Split Volume** job fails.
 - ◆ Deleted files are not relocated, so make sure to salvage any deleted files that you want to keep before you begin.
 - ◆ Users can continue to access data on the source volume during the move or split process.

The move or split process tracks which files change after they are copied, so files can be accessed while it is running. The job may reach a point where it is necessary for you to disconnect users in order to allow the job to finish, but not until it has at least attempted to copy all files multiple times.
 - ◆ You cannot move or split to an existing volume. Data is moved or split to the root of a newly created NSS volume that you configure when you define the move or split job.

9.6.2 Preparing the DFS Management Context

- ♦ The original and destination servers must be in the same DFS management context, so you cannot move or split across trees. The DFS management context is necessary even if you are moving the volume to a different pool on the same server.

If a DFS management context does not exist, you must create a DFS management context at an O or OU class level in the NetIQ eDirectory tree that contains both the source and destination servers. For instructions, see [Section 10.1, “Creating a DFS Management Context,”](#) on page 85.

- ♦ The VLDB service must be enabled and running in the DFS management context. For information, see [Section 10.4, “Starting or Activating the VLDB Service,”](#) on page 89.

9.6.3 Requirements for OES Services

- ♦ NCP Server must be running when you set up the move or split job and remain running until the job is completed.

If you are using CIFS/Samba options for users, make sure that NCP Server is up and running before you define the move or split job. It is not required that CIFS/Samba users be configured as NCP users during or after the move or split is completed.

For information about how to install and configure NCP Server on Linux, see [“Installing and Configuring NCP Server for Linux”](#) in the *NCP Server for Linux Administration Guide*.

- ♦ OES Storage Management Services (SMS) must be installed and running. The NetWare Emulation Mode (`--tsaMode`) for TSAFS must be set to *dual* when moving NSS volumes from NetWare to Linux. The default setting is *linux*. For instructions, see [“Configuring SMS”](#) on page 32.

Active Directory Environment

In addition to above requirements for an Active Directory user to access NSS volumes, you must ensure that the pool containing NSS volumes is media-upgraded, the NSS volumes are Active Directory enabled (AD-enabled), and trustee rights are assigned on the specific folders or files.

Table 9-4 Support Matrix to Perform Move and Split Operations

Source NSS Volumes	Destination NSS Volumes
AD-enabled	AD-enabled
Non AD-enabled	Non AD-enabled, AD-enabled

*= The data stored in the source volume must be less than 8 TB, if you are performing move or split operation to NSS32 pool volume.

9.6.4 Prerequisites for Trustees and Trustee Rights

- ♦ For a **Move Volume** job, the trustee access rights for the original volume are transferred automatically to the target volume.
- ♦ For a **Split Volume** job, the implicit rights on the directory being split are moved to the target volume.

9.6.5 Moving or Splitting in a Cluster Environment

For OES 2 SP2 and earlier versions, perform the move/split only from an active node and only for unshared volumes. The Move and Split operations among shared volumes or from a shared or unshared volume to another unshared or shared volume do not work.

For OES 2 SP3 and later versions, perform the move/split only from an active node. DFS supports move and split operations from a shared volume to another shared volume in a clustered environment.

9.6.6 Moving or Splitting in a Dynamic Storage Technology Environment

Do not attempt to use the **Move Volume** or **Split Volume** tasks on a volume that is the primary or secondary storage area in a Dynamic Storage Technology shadow volume.

If the NSS volume is a part of a shadow volume, you must force the data to either the primary or secondary NSS volume in that relationship. After all the data is on a single volume, remove the shadow volume relationship. Then you can move the data on the volume using DFS.

For more information about using DFS with DST, see [Section 9.8, “Guidelines for Using DFS and Dynamic Storage Technology,” on page 83](#).

9.7 Guidelines for Managing Move Volume or Split Volume Jobs

Consider the following guidelines for managing your DFS move or split volume jobs:

- ♦ If the server crashes during a volume move or split operation, the operation resumes where it left off when the server comes back up.
- ♦ You can set up as many move or split jobs as you want; however, DFS can concurrently run only four active move or split operations. After four requests, any additional requests must wait for one of the running operations to complete, or you must pause a job and start the operation you want to run.

- ◆ After you move a volume with the **Move Volume** task, DFS automatically updates the VLDB with the new physical location of the volume. After the update, scripts that access the volume through an existing junction do not need any changes. However, scripts that reference the volume or server name must be updated, and so do any drive mappings to the server or volume.
- ◆ When you split a volume with the **Split Volume** task, DFS automatically creates a DFS junction at the directory point where you split the volume. After the split is complete, you can optionally modify the trustee rights on the junction and target volume in iManager with **Distributed File Services > Modify Junction**.

9.8 Guidelines for Using DFS and Dynamic Storage Technology

The Dynamic Storage Technology coexists with DFS, but they are not tightly integrated. Use the guidelines in this section when using DST and DFS in the same environment.

- ◆ [Section 9.8.1, “DFS and DST Compatibility,” on page 83](#)
- ◆ [Section 9.8.2, “Using DFS Junctions in a DST Shadow Volume,” on page 83](#)
- ◆ [Section 9.8.3, “Moving and Splitting Volumes in a DST Shadow Volume,” on page 84](#)

9.8.1 DFS and DST Compatibility

NSS volumes that are shadowed with DST recognize DFS junctions on the primary volume. It does not migrate junctions to the secondary volume. Junctions work properly on a volume where DST is running. DFS junctions can point only to the primary volume of the shadow pair.

DST considers only the junction itself as data on the primary volume. It does not follow the junction to manage any data stored in the target location. You must manage the data in the target location independently of the junction’s volume, as you normally do for DFS junctions.

9.8.2 Using DFS Junctions in a DST Shadow Volume

When using Dynamic Storage Technology in combination with Distributed File Services, consider the following guidelines:

- ◆ The shadowing efforts for the junction volume and the junction target volume are unrelated, and are not coordinated.
- ◆ Create new DFS junctions only on the primary volume of a shadow relationship between two NSS volumes.
- ◆ When the junction target volume is in a shadow relationship, point the junction at the primary volume. Junctions support only NSS volumes or NCP volumes as junction targets.
- ◆ When the target volume of an existing junction becomes the secondary volume in a shadow relationship, the junction is broken. You must create a new junction that points to the same location on the primary volume of that shadow relationship, then delete the junction on the secondary volume.
- ◆ Do not create a shadow relationship for any NSS volume while a DFS **Move Volume** or **Split Volume** is in progress for the volumes involved.

9.8.3 Moving and Splitting Volumes in a DST Shadow Volume

The DFS **Move Volume** and **Split Volume** tasks do not work properly when DST is running on the original volume. DFS does not automatically demigrate the data to move or copy it to the move or split destination location.

IMPORTANT: Before you use the **Move Volume** task or **Split Volume** task on an NSS volume, you must modify the volume's DST policies to force it to demigrate data from the secondary volume to the primary volume.

Make sure you have enough space available on the primary volume to demigrate the data. When the demigration is complete, turn off DST shadowing on the volume, and leave it off until the move or split is complete. Now, you can define a **Move Volume** or **Split Volume** job on the original volume.

After a **Move Volume** job is complete, you can optionally configure DST shadowing on the new volume.

After a **Split Volume** job is complete, you can optionally configure DST shadowing on the original volume. Data that was split to the new location is not affected by shadowing that you set up on the original volume. In order to shadow the data that was moved to a new location, you must set up DST shadowing on that target volume.

9.9 Guidelines for DFS and Volume Attributes

Junction volumes and target volumes function independently from each other. For example, if volume attributes such as Salvage and Compression are set on the junction volume, those attributes do not follow the junction to the target volume. You must manage volume attributes of each volume separately.

9.10 Guidelines for Using DFS and Nearline Storage

Nearline storage is a third-party solution that migrates least-used data from faster storage disks to a less-expensive storage disk. For NSS volumes, the third-party software uses the Migration attribute to identify which volumes participate in nearline storage.

If the Migration attribute is set for the NSS volume that you want to move or split, some of the volume's data might reside on nearline storage. The **Move Volume** and **Split Volume** tasks demigrate the files from the secondary storage, then copy the files to the new location. Make sure the original volume and new volume have enough space to incorporate both inline and nearline files to allow the data demigration.

10 Managing VLDB Services

This section discusses how to create a management context for Distributed File Services and to manage its VLDB service.

- ◆ [Section 10.1, “Creating a DFS Management Context,” on page 85](#)
- ◆ [Section 10.2, “Deleting a Management Context,” on page 87](#)
- ◆ [Section 10.3, “Managing Replica Sites,” on page 88](#)
- ◆ [Section 10.4, “Starting or Activating the VLDB Service,” on page 89](#)
- ◆ [Section 10.5, “Specifying Non-Default VLDB Database Paths on Replica Sites,” on page 90](#)
- ◆ [Section 10.6, “Stopping the VLDB Service,” on page 90](#)
- ◆ [Section 10.7, “Monitoring the Health of the VLDB Service,” on page 91](#)
- ◆ [Section 10.8, “Viewing VLDB Service Details for a Replica Site,” on page 92](#)
- ◆ [Section 10.9, “Adding a Replica Site,” on page 94](#)
- ◆ [Section 10.10, “Removing a Replica Site,” on page 95](#)
- ◆ [Section 10.11, “Viewing a List of Volume Entries in the VLDB,” on page 95](#)
- ◆ [Section 10.12, “Adding a Volume Entry to the VLDB,” on page 96](#)
- ◆ [Section 10.13, “Deleting a Volume Entry from the VLDB,” on page 97](#)
- ◆ [Section 10.14, “Repairing the VLDB,” on page 98](#)

10.1 Creating a DFS Management Context

The DFS management context monitors the location of any NSS volume or NCP volume that has a Volume object in a specified O or OU container in the NetIQ eDirectory tree. Before you can create junctions, you must create at least one DFS management context that contains the volumes you want to target. When you create a DFS management context, you specify one or two servers to host instances of its VLDB service and VLDB. A given server can host only one VLDB. It is the VLDB service and VLDB that allow you to create DFS junctions that point to volumes in the DFS management context.

You can create more than one DFS management context if you have a geographically diverse company. In this way, each geographic area can manage and control the junctions and the VLDB service within its own domain. Whenever you rebuild the VLDB, it searches all services in the context you specify as the DFS management context. If you use DFS for only a small subset of your total servers, the VLDB rebuild is faster if you place only the servers that use DFS in a separate context, then specify the DFS management context at that same level.

After the management context is configured, DFS does not monitor eDirectory for changes to the name or for the existence of the O or OU container. If you change the name of the container or if you delete and replace the container, the DFS management context stops working because its

configuration does not match with the information in eDirectory. The VLDB is broken, and junctions that point to volumes in that container are broken. This failure occurs even if you eventually change the name to the original name of the O or OU container. A VLDB repair cannot fix this problem.

WARNING: If you delete or rename the O or OU container that is referenced by a DFS management context, you must delete the existing DFS management context, then create a new DFS management context for that modified container.

If renaming container modifies the name of the nss admin object for a Linux VLDB replica server, perform the steps listed in “[eDirectory Error 601 When Creating NSS Volume](#)” in the *Storage Services File System (NSS) Administration Guide for Linux* before recreating the DFS management context.

To create a DFS management context:

- 1 In iManager, select the **Distributed File Services** role to expand it, then select **Create Management Context**.
- 2 Configure the following parameters:

Parameter	Description
Name	<p>The distinguished name of the O-level or OU-level container in the eDirectory tree where the management context resides.</p> <p>For example, if a tree contains the following O and OU containers, you can specify a DFS management context in any of them:</p> <p>example hr.example mfg.asia.example sales.emea.example</p>
Replica Site	<p>The distinguished name of the server where you want to host an instance of the VLDB service for the new management context. A management context can have one or two replica sites. Any supported server within the management context can host a replica of the VLDB service, but the chosen server can host a replica for only one management context.</p> <p>The server can be at any level within the specified container but it cannot be in another management context. For example, if a management context exists beneath another context, both function independently. If the server is in the lower-level management context, it cannot host the replica site for the higher-level management context.</p>
Database Location	<p>The path to the directory where the VLDB database is stored on the replica site. The default location is the <code>/var/opt/novell/dfs</code> directory.</p> <p>IMPORTANT: You should modify the VLDB location only when you are clustering the VLDB service so that the VLDB resides on a shared device.</p> <p>The name of the VLDB file itself cannot be specified or modified. The name of the VLDB file is <code>vldb.dat</code>. For information about security issues for the VLDB file, see Section 17.1, “VLDB File,” on page 153.</p>

Parameter	Description
Run VLDB Service on Server Restart	Select this check box if you want the VLDB service to begin automatically when the replica server is restarted. Deselect this check box if you want to start the VLDB service manually or in a clustered environment.

- 3 When you are done, select **OK** to create the DFS management context and load and activate the VLDB service on the replica servers.

The create action updates eDirectory. This process can take up to 5 minutes. Do not click again on the page or elsewhere in the browser until the page refreshes with a message that confirms whether the create was successful or not.

NOTE: `vldb` and `vldrpr` errors are reported in message log file during the creation of Management Context. However, this does not have an impact on DFS management and junction creation functionality.

10.2 Deleting a Management Context

Deleting a DFS management context also deletes the VLDB service on its replica sites. Deleting the only replica site for a DFS management context also deletes the context.

Any affected junctions automatically refer to the next nearest management context they find above the deleted one. If a higher level management context exists, junctions are broken only until its VLDB is updated. If there is no higher level management context, junctions that pointed to volumes in the deleted management context cannot work until you create a new management context for them.

For example, if a management context exists beneath another context, it functions independently of the one above it. If the lower-level management context is removed, its volumes are added to the VLDB of the management context above it. However, if the higher-level management context is removed, its volumes are not covered because they are outside the lower-level management context and would no longer be mapped in any VLDBs. Junctions cannot locate their junction target volumes after the context is deleted, and the junctions are broken until a one or multiple DFS management contexts are put in place that include their junction target volumes.

- 1 In iManager, select the **Distributed File Services** role to expand it, then select **Delete Management Context**.
- 2 Select any server with an NSS volume that is located in the DFS management context that you want to manage.

This action locates the DFS management context, lists the servers in that context that host its VLDB service replicas, and reports the current status of the VLDB service on each.

- 3 Click **OK** to delete the selected DFS management context and its replicas.

For each replica, the delete action deactivates and unloads the VLDB service, deletes the VLDB database, then updates eDirectory.

This process can take up to 5 minutes. Do not click again on the page or elsewhere in the browser until the page refreshes with a message that confirms whether the delete was successful or not.

10.3 Managing Replica Sites

- 1 In iManager, select **Distributed File Services > Manage Replica Sites**.
- 2 Select any server with an NSS volume that is located in the DFS management context that you want to manage.

This action locates the DFS management context, lists the replica servers in that context that host an instance of its VLDB service, and reports the current status of the VLDB service on each.

- ◆ **Name:** The distinguished name of the O-level or OU-level container in the eDirectory tree that defines the selected DFS management context.
- ◆ **Replica Site:** The distinguished names of the servers that host an instance of VLDB service for the selected management context. A management context can have one or two replica sites. The server can be at any level within the specified container that is not controlled by a lower-level management context.
- ◆ **State:** The status of the VLDB service on the replica site. See [Section 10.7, “Monitoring the Health of the VLDB Service,” on page 91](#) for details.
- ◆ **Version:** The build version of the VLDB service module that is running on the replica site.

- 3 Do one or more of the following:

Action	Description	Reference
New (Add Replica Site)	Select a second server to host an instance of the VLDB service for the selected management context.	Section 10.9, “Adding a Replica Site,” on page 94
Delete (Remove Replica Site)	Delete the VLDB service and its VLDB from the replica server for the selected management context. If the server is the only replica site, deleting the replica also deletes the management context.	Section 10.10, “Removing a Replica Site,” on page 95
Activate	Start a VLDB Service that is already loaded on the selected replica site.	Section 10.4, “Starting or Activating the VLDB Service,” on page 89
Details	View more information about the selected replica site. Optionally configure whether to run the VLDB service on server restart, the location of the back-end database, and the number of threads to use when the VLDB service is running.	Section 10.8, “Viewing VLDB Service Details for a Replica Site,” on page 92
Repair	Configure a repair of the VLDB database on the selected replica site.	Section 10.14, “Repairing the VLDB,” on page 98
Start	Load the VLDB service on each of the selected replica sites, then activate the services. If a VLDB service is already loaded, Start simply activates it.	Section 10.4, “Starting or Activating the VLDB Service,” on page 89

Action	Description	Reference
Stop	Deactivate the VLDB service on each of the selected replica sites, then unload the services.	Section 10.6, “Stopping the VLDB Service,” on page 90

10.4 Starting or Activating the VLDB Service

You can activate the VLDB service using either an iManager or a script.

- ♦ [Section 10.4.1, “Using iManager,” on page 89](#)
- ♦ [Section 10.4.2, “Using Script,” on page 89](#)

10.4.1 Using iManager

- 1 In iManager, select **Distributed File Services > Manage Replica Sites**.
- 2 Select any server with an NSS volume that is located in the DFS management context that you want to manage.

This action locates the DFS management context, lists the servers in that context that host its VLDB service replicas, and reports the current status of the VLDB service on each replica.

- 3 Select the check box next to the VLDB replica site that you want to manage.
- 4 Do one of the following:
 - ♦ **Start:** Select **Actions > Start** to load the software module and activate the service.
If the selected replica site was not originally in the **Not Loaded** state, the service is simply activated. This option is the one you use most often because it works for both the **Stopped** and **Not Loaded** states.
 - ♦ **Activate:** Select **Actions > Activate** to activate a service that is loaded but in the **Stopped** state.
The VLDB service might be in a **Stopped** state following a successful VLDB repair. The repair automatically starts the service when the repair is done. If activation fails for any reason, DFS puts the service in the **Stopped** state.

After the service starts successfully, the replica’s status changes to **Running** .

- 5 Verify that the replica site’s status has changed to **Running** by refreshing the **Manage Replica Sites** page.

10.4.2 Using Script

- 1 Log in to the VLDB replica server.
- 2 Start VLDB using the command, `systemctl start novell-dfs.service`

NOTE: The `novell-dfs.service` script is used only to start VLDB service on non-clustered volumes.

10.5 Specifying Non-Default VLDB Database Paths on Replica Sites

If you specify two replica sites when you create a DFS management context, it is not possible to specify non-default VLDB paths that are different for each of the replica sites. By default, each replica site uses the default VLDB path appropriate for its platform. If you specify a non-default VLDB path when two sites are selected, that path applies to both selected replica sites.

For example, you typically specify a non-default VLDB path when you are clustering the VLDB service for a replica site so that the VLDB is located on a clustered resource. If you cluster each replica site, the sites might need different non-default paths on their respective servers.

To specify different non-default paths for two replica sites, create the DFS management context with a single replica site, and specify its non-default VLDB path. After the management context is created successfully, use the **Distributed File Services > Manage Replica Sites** task in iManager to add the second replica and specify the non-default VLDB path to use for its VLDB.

10.6 Stopping the VLDB Service

You can deactivate the VLDB service and unload it using either iManager or a script.

- ♦ [Section 10.6.1, “Using iManager,” on page 90](#)
- ♦ [Section 10.6.2, “Using Script,” on page 90](#)

10.6.1 Using iManager

- 1 In iManager, select **Distributed File Services > Manage Replica Sites**.
- 2 Select any server with an NSS volume that is located in the DFS management context that you want to manage.
This action locates the DFS management context, lists the servers in that context that host its VLDB service replicas, and reports the current status of the VLDB service on each replica.
- 3 Select the check box next to the VLDB replica site that you want to manage.
- 4 Select **Actions > Stop** to deactivate the service and unload the software module.
After the service stops successfully, the replica’s status changes to **Stopped/Not Loaded** .
- 5 Verify that the replica site’s status has changed to **Stopped/Not Loaded** by refreshing the **Manage Replica Sites** page.

10.6.2 Using Script

- 1 Log in to the VLDB replica server.
- 2 Stop VLDB using the command, `systemctl stop novell-dfs.service`

10.7 Monitoring the Health of the VLDB Service

To find the replica sites for a management context and view the status of VLDB service on them, use either iManager or scripts:

- ◆ [Section 10.7.1, “Using iManager,” on page 91](#)
- ◆ [Section 10.7.2, “Using Script,” on page 92](#)

10.7.1 Using iManager

- 1 In iManager, select **Distributed File Services > Manage Replica Sites**.
- 2 Select any server with an NSS volume that is located in the DFS management context that you want to manage.

This action locates the DFS management context, lists the replica servers in that context that host its VLDB service, and reports the current status of the VLDB service on each replica.

- ◆ **Name:** The distinguished name of the O-level or OU-level container in the eDirectory tree that defines the selected DFS management context.
- ◆ **Replica Site:** The distinguished names of the servers that host an instance of VLDB service for the selected management context. A management context can have one or two replica sites. Within the specified container, the server can be at any level that is not controlled by a lower-level management context.
- ◆ **State:** The status of the currently running VLDB service on the replica site. See [Table 10-1](#) for details.
- ◆ **Version:** The build version of the VLDB service module that is running on the replica site.

The following table explains the status conditions for a VLDB service and possible actions:

Table 10-1 State of the VLDB Service

State	Icon	Description	Possible Actions
Running		The VLDB service is loaded and running.	Details, Repair, or Stop actions are possible.
Stopped		The VLDB service is not loaded. The VLDB service is stopped. After a VLDB repair finishes successfully, the VLDB service should automatically load and activate. If the activation fails, the VLDB service goes into a Stopped state.	Activate, Details, Repair, or Start actions are possible.
Working		The VLDB service is initializing; please wait. A VLDB repair is in progress; please wait.	After you start or activate the VLDB service, wait until the replica reports a different state to perform other tasks on that replica. If you interrupt a VLDB repair while it is in progress, you must start over. It does not pick up where it left off.

State	Icon	Description	Possible Actions
Site Connection Failed		iManager could not connect to the replica site. The cause is unknown. This might occur if the connection path, server, or volume are offline at that time.	Use standard methods to verify the health of the replica server and paths in-between the iManager server and the replica server.
Unknown		The reported state from the replica site is either null or a state that iManager does not recognize.	Use standard methods to verify the health of the replica server.

10.7.2 Using Script

- 1 Log in to the VLDB replica server.
- 2 Verify DFS using the command, `systemctl status novell-dfs.service`
- 3 Verify VLDB status using the command, `vldb status`

10.8 Viewing VLDB Service Details for a Replica Site

The Details page for a replica site reports information about its VLDB service. You can modify the following settings from the Details page:

- ♦ Run VLDB service on server restart
- ♦ The location of the VLDB database file
- ♦ The number of requested processing threads (1 to 16 threads)

The Details report includes the following information:

Table 10-2 VLDB Service Details for a DFS Replica Site

Parameter	Description
Replica Site	The typeless fully distinguished name of the selected VLDB service replica site, such as <i>context.exampledomain</i> .
Date	The current date and time (<i>Month dd, yyyy hh:mm:ss AM/PM ZZZ</i>).
Management Context	The management context of the selected VLDB service replica site.
Replica Sites	The common names of the servers that are replica sites for the management context, such as <i>DFSSVR1</i> and <i>DFSSVR2</i> .
State	Current operational state of the service (running, stopped, or broken). <ul style="list-style-type: none"> ♦ A running service responds to all user requests but does not do certain repair operations. ♦ A stopped service rejects normal volume operations but can perform low-level repair operations. ♦ A broken service rejects normal volume operations and must be repaired.

Parameter	Description
Version	<p>Build version of the running software. If this server is configured as a VLDB server, and the VLDB is currently running, these fields display the software version and current state of the service.</p> <p>This information is necessary if you need to contact OpenText Support.</p>
Build Date	<p>Date that the running software was built.</p> <p>This information is necessary if you need to contact OpenText Support.</p>
Service Load Time	<p>Time and date that the running service was loaded into memory on your server.</p>
Run VLDB Service on Server Restart (Modifiable)	<p>Select this option to start the VLDB service automatically when the server is restarted.</p> <p>Deselect this option if you want to start the VLDB service manually or in a cluster environment.</p> <p>If you change the setting, make sure to click OK to apply the change before you leave the Details page.</p> <p>If the VLDB is configured in a cluster configuration with Cluster Services, the cluster load script loads the VLDB service. In this case, you must deselect the check box here, and add the appropriate <code>vldb</code> commands to the load and unload scripts. For clustering instructions, see Section 4.2, "Clustering the VLDB Service," on page 40.</p>
VLDB Repair Information	<p>Information about the currently running repair operation (if any) and the most recently completed repair operation.</p>
VLDB Requests	<p>Number of operations that the service has processed since it was most recently started.</p>
Database Entries	<p>Number of volume entries that have been created, deleted, or modified since the service was most recently started.</p>
Back End Database (Modifiable)	<p>The location on the replica server where the VLDB database file is stored. The default location is the <code>/var/opt/novell/dfs</code> directory.</p> <p>Typically, the location never changes. However, you can optionally change the VLDB database location to a different NSS volume on the same replica server. The destination volume can be in the same or different pool.</p> <p>If you change the location, make sure to click OK to apply the change before you leave the Details page. The database file is automatically moved to the new location. No VLDB repair is necessary.</p>
Threads (Modifiable)	<p>Displays the number of processing threads configured for the service (Requested) and the number actually running (Running). The number of running threads can vary because of lack of memory on the server, or because the number of running threads is in the process of changing to meet the requested number.</p> <p>If you change the setting, make sure to click OK to apply the change before you leave the Details page.</p> <p>Range: 1 (default) to 16</p>

The Refresh setting for the Details report is shared with the one on the Replica Sites page. If you change the Refresh value on either page, it affects both pages.

To access the details for a replica site:

- 1 In iManager, select **Distributed File Services > Manage Replica Sites**.
- 2 Select any server with an NSS volume that is located in the DFS management context that you want to manage.

This action locates the DFS management context, lists the replica servers in that context that host an instance of the VLDB service, and reports the current status of the VLDB service on each replica.
- 3 Do one of the following to view details for a replica site:
 - ◆ Click the Name link of the replica site.
 - ◆ Select the check box next to the replica site that you want to manage, then click **Actions > Details**.
- 4 On the Replica Site Details page, do one or more of the following:
 - ◆ View information about the selected replica site.
 - ◆ Click Print to print a printer-friendly version of the report.
 - ◆ Modify settings if desired, then click **OK** to accept the changes and close the report.

10.9 Adding a Replica Site

You can define one or two replica sites for a DFS management context. If there are already two replica sites, you must remove one of them before you can add a new one. For information on deleting a replica site, see [Section 10.10, “Removing a Replica Site,” on page 95](#).

- 1 In iManager, select **Distributed File Services > Manage Replica Sites**.
- 2 Select any server with an NSS volume that is located in the DFS management context that you want to manage.

This action locates the DFS management context, lists the replica servers in that context that host instances of the VLDB service, and reports the current status of the VLDB service on each replica.
- 3 Visually verify that this is the DFS management context that you want to manage.
- 4 Click **New**.
- 5 Browse to locate and select a server where you want to host a VLDB service for the selected DFS management context.
- 6 Specify the location where you want to put the VLDB file.

The default location is the `/var/opt/novell/dfs` directory.
- 7 Do one of the following:
 - ◆ Select **Run VLDB service on server restart** if you want the service to start automatically when you start the server.
 - ◆ Deselect **Run VLDB service on server restart** if you want to start the service manually or in a cluster environment.
- 8 Click **OK**.

This process can take up to 5 minutes. Do not click again on the page or elsewhere in the browser until the page refreshes with a message that confirms whether the addition was successful or not.

- 9 Click **OK** to dismiss the confirmation message.

The existing replica site automatically begins to synchronize the VLDB on the new site.

10.10 Removing a Replica Site

Removing a replica site deactivates and unloads the VLDB service on the replica server, deletes the VLDB database file on the replica server, then updates the DFS-VLDB-Hosts attribute for the DFS management context (that is, its O or OU container object) in Novell eDirectory.

WARNING: If the selected site is the last remaining replica site, deleting it also deletes its DFS management context.

- 1 In iManager, select **Distributed File Services > Manage Replica Sites**.
- 2 Select any server with an NSS volume that is located in the DFS management context that you want to manage.

This action locates the DFS management context, lists the replica servers in that context that host an instance of its VLDB service, and reports the current status of the VLDB service on each replica.

- 3 Visually verify that this is the DFS management context you want to manage.
- 4 Select the check box next to the replica site you want to remove, then click **Delete**.

This process can take up to 5 minutes. Do not click again on the page or elsewhere in the browser until the page refreshes with a message that confirms whether the delete was successful or not.

- 5 Click **OK** to dismiss the confirmation message.

10.11 Viewing a List of Volume Entries in the VLDB

For VLDB replica sites, you can view a list of current volume entries in the in-memory VLDB.

- 1 On the OES replica site, open a terminal console, then log in as the `root` user.
- 2 At the terminal console prompt, view the current list of VLDB volume entries by entering

```
vldb list
```

For each volume entry, the server name, volume name, and DFS GUID are displayed.

10.12 Adding a Volume Entry to the VLDB

DFS automatically adds volume entries to the VLDB when the DFS management context is initially created, when you create a new NSS volume, and during a VLDB repair process. Entries are not automatically added when you add a server with existing volumes to a container in a DFS management context or when you create an NCP volume. To add them, you must run the `vldb repair` command, which walks the tree and discovers the new volumes.

For OES replica sites, you can optionally add an entry for a volume by using the `vldb add` command instead. This might be faster than running the `vldb repair` command, particularly when you have a large tree but only a few entries that need to be modified. If the volume's eDirectory Volume object already contains a DFS GUID attribute, this GUID is added to the VLDB. Otherwise, this command generates a DFS GUID for the volume and stores it in the Volume object and in the VLDB.

To issue the Add command:

- ♦ The VLDB service must be running on the replica site.
- ♦ You must be logged in as the `root` user or equivalent in the terminal console on the Linux replica site.
- ♦ The specified volume must already have a Volume object in the eDirectory tree, and be in the management context.

The action results and errors are displayed on the console from which the operation is done, and are written to the `/var/log/messages` file.

- 1 On the OES replica site, open a terminal console, then log in as the `root` user.
- 2 At the terminal console prompt, view the current list of VLDB volume entries by entering

```
vldb list
```

For each volume entry, the server name, volume name, and DFS GUID are displayed.

- 3 Visually verify that the volume does not already have an entry in the VLDB.
- 4 Add an entry for the volume to the in-memory VLDB by entering

For OES 2 SP2 or later, enter

```
vldb add VolumeFDN
```

For example, enter

```
vldb add .server2_VOL1.mycompany.TREENAME.
```

This command adds an entry for VOL1 on server2.mycompany.TREENAME to the VLDB database.

For OES 2 SP1, enter

```
vldb add svrname volname
```

Replace *svrname* with the fully distinguished server name. Replace *volname* with the name of the volume.

After successful authentication, the operation is performed on the in-memory VLDB, then is synchronized to the VLDB on the disk.

If you have a second VLDB replica site, the changes you make to the VLDB database on the disk are automatically synchronized to the second site. The second replica can be on a Linux or NetWare server.

10.13 Deleting a Volume Entry from the VLDB

DFS automatically deletes a volume entry from the VLDB when the last replica site for a DFS management context is deleted, when you delete an NSS volume, and during a VLDB repair process. Entries are not automatically deleted when you remove a server with existing volumes from a container to a location outside the current DFS management context or when you delete an NCP volume. To delete the volume entries, you typically run the `vldb repair` command, which walks the tree and discovers the current set of volumes in the management context.

For OES replica sites, you can optionally delete an entry for a volume by using the `vldb delete` command instead. This might be faster than running the `vldb repair` command, particularly when you have a large tree but only a few entries that need to be modified. The delete operation only removes the entry from the database. It does not modify or delete the DFS GUID attribute for the volume's Volume object in eDirectory. It does not delete the Volume object from eDirectory.

IMPORTANT: Deleting the volume entry from the VLDB disables any junction resolution for junctions that target this volume.

If you later run a VLDB repair in the DFS management context, the repair discovers all volumes with Volume objects in eDirectory that are in the management context. It is possible for deleted entries to be added back to the VLDB.

- 1 On the OES replica site, open a terminal console, then log in as the `root` user.
- 2 At the terminal console prompt, view the current list of VLDB volume entries by entering

```
vldb list
```

For each volume entry, the server name, volume name, and DFS GUID are displayed.

- 3 In the list of VLDB volume entries, locate the volume entry that you want to delete and write down the volume's DFS GUID as it appears in the list.
- 4 Delete the entry for the volume from the in-memory VLDB by entering

```
vldb delete vol_dfsguid
```

Replace `vol_dfsguid` with the DFS GUID of the volume as it appears in the report results of the `vldb list` command. For example, enter (all on the same line, of course)

```
vldb delete 0x6affb60fdc56dc01800174685ff0d412
```

The operation is performed on the in-memory VLDB, then is synchronized to the VLDB on the disk.

If you have a second VLDB replica site, the changes you make to the VLDB database on the disk are automatically synchronized to the second site. The second replica can be on a Linux or NetWare server.

10.14 Repairing the VLDB

The VLDB repair rebuilds the VLDB database. It recursively walks the eDirectory tree down from the management context container, and records information about the Volume objects it discovers in a repair database. On completion, VLDB repair activates the repair database, which replaces the current active database. If there are two replica sites, the replica automatically gets synchronized to the active repaired database.

Until the repair database is activated, all VLDB requests (that do not explicitly specify that they are referencing the repair database) act against the existing database. Thus, clients can access DFS junctions even while the VLDB is being repaired for those volumes that still have correct entries in the VLDB.

Make sure you perform the VLDB repair as an administrator user with sufficient eDirectory rights to access the necessary objects in the eDirectory tree. Otherwise, VLDB Repair cannot scan the entire tree within the DFS management context, and the repair is done only for those areas where you have sufficient rights. Problems that occur as a result of logging in with a username with insufficient rights (and any other errors such as crashed servers or eDirectory problems) are logged in the repair log. Administrators should review the system log to look for errors. DFS modules log error conditions to the repair log file (`/var/opt/novell/log/dfs/vlrbpr.log`).

- 1 In iManager, select **Distributed File Services > Manage Replica Sites**.
- 2 Select any server with an NSS volume that is located in the DFS management context that you want to manage.

This action locates the DFS management context, lists the servers in that context that host instances of its VLDB service, and reports the current status of the VLDB service on each replica.

- 3 Select the check box next to the VLDB replica site that you want to manage.

IMPORTANT: If you have two replica servers, run the VLDB repair from only one of the servers.

- 4 Select **Actions > Repair** to open the **Repair the VLDB Database** page.
- 5 Select one of the following repair levels, then click OK:
 - ♦ **Replace the VLDB with Its Last Saved Copy:** The repair option restores the last saved copy of the database. It uses the automatically created backup file that it creates whenever it writes out the database. On completion of the repair, restart the VLDB service.
 - ♦ **Copy the VLDB from the Context's Second Replica Site:** You can use this feature only if you have the VLDB service running on more than one server. The VLDB service gets a copy of the database from another server that is currently running the service. On completion of the repair, restart the VLDB service.
 - ♦ **Rebuild the VLDB by Walking the eDirectory Tree:** When you rebuild a database, the VLDB service walks the eDirectory tree, looks at volume and server objects, and then completely rebuilds the database from scratch.
- 6 Monitor the status of the rebuild periodically until it is done. This can take from a few minutes to a few days, depending on the repair level you chose.

During the repair, the status reports that it is **Working** . If the option **Rebuild the VLDB by Walking the eDirectory Tree** is selected, on completion of repair, DFS automatically reloads the VLDB service on the replica server, then activates the VLDB, changing the state to **Running** . If there is a second replica site, its copy of the database is automatically synchronized to the repaired database.

7 Review the repair log to look for VLDB repair errors:

```
/var/opt/novell/log/dfs/vlrpr.log
```


11 Managing DFS Junctions

This section describes how to manage Distributed File Services junctions.

- ◆ [Section 11.1, “Understanding DFS Junctions,” on page 101](#)
- ◆ [Section 11.2, “Prerequisites and Guidelines for DFS Junctions,” on page 103](#)
- ◆ [Section 11.3, “Creating a DFS Junction,” on page 105](#)
- ◆ [Section 11.4, “Modifying a DFS Junction Name,” on page 106](#)
- ◆ [Section 11.5, “Modifying the Junction Location,” on page 106](#)
- ◆ [Section 11.6, “Modifying the Target Location,” on page 107](#)
- ◆ [Section 11.7, “Adding or Deleting Trustees for the Junction,” on page 108](#)
- ◆ [Section 11.8, “Adding or Deleting Trustees for the Junction Target,” on page 108](#)
- ◆ [Section 11.9, “Modifying Trustee Rights for the Junction,” on page 109](#)
- ◆ [Section 11.10, “Modifying Trustee Rights for the Junction Target,” on page 110](#)
- ◆ [Section 11.11, “Managing Junctions,” on page 110](#)
- ◆ [Section 11.12, “Viewing a DFS Junction,” on page 112](#)
- ◆ [Section 11.13, “Deleting the Junction,” on page 113](#)
- ◆ [Section 11.14, “Salvaging or Purging Deleted Junctions,” on page 114](#)
- ◆ [Section 11.15, “Creating DFS Junction Pointing to Multiple Targets,” on page 115](#)
- ◆ [Section 11.16, “Creating DFS Junction Pointing to Non-OES Targets,” on page 116](#)

11.1 Understanding DFS Junctions

The DFS junction is a special file that takes the place of a directory and its contents. The junction contains information that points to a target location where the data actually resides. The junction can be created at the root of an NSS volume or in any of its directories. The junction can point to the root of the target volume or to any of its directories.

For the administrator, the junction appears in the file structure as a directory. The user usually sees only the data structure in the target location, and is unaware that the junction exists. The user sees the junction as a subdirectory and is unable to access the target data if the target path is down or if VLDB service for the target’s DFS management context is not running. Any attempt to access the junction in a file browser results in an error; that is, they cannot open it. If they right-click the junction and click Properties, they can view information about the junction name. Clients that are not DFS-aware see a junction as a file that they have no rights to access.

- ◆ [Section 11.1.1, “Junction Properties,” on page 102](#)
- ◆ [Section 11.1.2, “Trustee Rights for the Junction and Target Locations,” on page 102](#)

11.1.1 Junction Properties

Junction properties define the junction and the junction target. For information about restrictions on the junction and target locations, see [Section 9.4.4, “Junctions,” on page 78](#).

Junction

The junction is commonly identified by its name and location. DFS assigns a DFS GUID (globally unique identifier) to each Volume object in NetIQ eDirectory to uniquely identify the volume in the VLDB for the DFS management context.

Table 11-1 *Junction Properties*

Property	Description
Name	The administrator-specified name of the junction. The name is handled according to the naming conventions of whatever name space you used to mount the source volume. For example, if the source volume is mounted with the Long name space, the junction name is case insensitive. In a UNIX name space, the name is case sensitive. In a DOS name space, the name is changed to all capitals.
Volume	The NSS volume where the junction resides.
Path	A directory path on the volume where the junction resides. If no path is specified, the junction resides at the root of the volume. The path name does not include the name of the junction.

Junction Target

The junction can point to the root of a target volume or to a directory on it. The target volume can reside within any existing DFS management context that is defined in the same tree as the volume where the junction resides. The junction works only when the VLDB Service is running for that DFS management context.

Table 11-2 *Junction Target Properties*

Property	Description
Volume	The target NSS volume that contains the data that the junction represents.
Path	The directory path on the target NSS volume where the data resides. If no path is specified, the junction points to the root of the target volume.

11.1.2 Trustee Rights for the Junction and Target Locations

DFS honors the trustees and file system trustee rights that you define for the junction location and target location. You can modify the assigned trustees and their rights at any time after you create the junction.

IMPORTANT: To avoid security and visibility issues, make sure to modify the settings on both the junction and the target location.

Effective rights on the junction target include explicitly defined rights on the junction itself and rights that are inherited from the junction's parent directory. To block any undesired inherited rights, set trustees and trustee rights explicitly on the junction. If desired, you can copy the effective rights to the target location as explicit rights.

Visibility rights on the target location include explicitly defined rights on the target location and rights that are inherited from the target's parent directory on the target volume. To block any undesired inherited rights, or to block rights that are set on the junction, set trustees and trustee rights explicitly on the target location or its subdirectories. For file visibility via the junction, users need a minimum of Read and File Scan trustee rights on the target location. If desired, you can copy the visibility rights you set on the target location to the junction as explicit rights.

The following table defines the file system trustee rights that can be set for the junction and target.

Table 11-3 File System Trustee Rights

Trustee Right	Description
S (Supervisor)	Grant all rights to the file or directory.
R (Read)	Open and read files in the directory.
W (Write)	Open and write to files in the directory.
C (Create)	Create files and subdirectories.
E (Erase)	Erase files and directories.
M (Modify)	Rename files and directories, and change file attributes.
F (File Scan)	View and search on file and directory names in the file system structure.
A (Access Control)	Add and remove trustees and change trustee rights to files and directories.

11.2 Prerequisites and Guidelines for DFS Junctions

Use the prerequisites and guidelines in this section for planning and managing DFS junctions:

- ◆ The junction's volume must be an existing NSS volume on one of the following supported operating systems (or later versions):
 - ◆ OES 24.4
 - ◆ OES 2023
 - ◆ OES 2018 SP3
 - ◆ OES 2018 SP2
 - ◆ OES 2018 SP1
 - ◆ OES 2018
 - ◆ OES 2015 SP1
 - ◆ OES 2015

- ◆ OES 11 SP2
 - ◆ OES 11 SP1
 - ◆ OES 2 Linux
 - ◆ NetWare 6.5 SP8
 - ◆ The target volume must be an existing NSS volume or CIFS/SMB share (Windows or NetApp) on one of the following supported operating systems (or later versions):
 - ◆ OES 24.4
 - ◆ Windows Server 2019
 - ◆ Windows Server 2022
 - ◆ NetApp 9.12.1
 - ◆ OES 2023
 - ◆ OES 2018 SP3
 - ◆ OES 2018 SP2
 - ◆ OES 2018 SP1
 - ◆ OES 2018
 - ◆ OES 2015 SP1
 - ◆ OES 2015
 - ◆ OES 11 SP2
 - ◆ OES 11 SP1
 - ◆ OES 2 Linux
 - ◆ NetWare 6.5 SP8
 - ◆ The junction's volume and the target volume must be in the same NetIQ eDirectory tree.
 - ◆ Junctions can exist in or out of a DFS management context. If a junction is in a DFS management context, the context can be the same or different than the one for the target volume.
 - ◆ The target volume must be in an existing DFS management context where its VLDB service is up and running. For information about creating a DFS management context, see [Section 10.1, "Creating a DFS Management Context,"](#) on page 85.
 - ◆ Make sure the source and target volumes are mounted and active.
 - ◆ If you plan to create the junction in a directory, that directory path must exist.
 - ◆ If you plan to point the junction to a directory on the target volume, that directory path must exist.
 - ◆ The users must be defined with User objects in NetIQ eDirectory and Active Directory in order to be available as potential trustees.
 - ◆ Both the junction and target locations inherit trustees and trustee rights relative to their actual locations in accordance with the OES Trustee Model. You must set explicit rights on both locations to block any rights that you do not want to be inherited.
- For information about the OES Trustee Model, see "[Understanding File System Access Control Using Trustees](#)" in the *OES 2023: File Systems Management Guide*.

11.3 Creating a DFS Junction

For information about the settings for junction properties, junction trustees, and target trustees, see [Section 11.1, “Understanding DFS Junctions,”](#) on page 101.

- 1 Make sure you have met the requirements specified in [Section 9.4.4, “Junctions,”](#) on page 78.
- 2 In iManager, click **Distributed File Services > Create Junction**.
- 3 In **Junction**, configure the junction properties:
 - 3a Specify the name of the junction.
 - 3b Browse to locate and select the NSS volume where you want to create the junction, then click **OK**.

The volume name is entered in the **Volume** field in the typeless fully distinguished name format, such as *servername_volname.context*. The volume name is automatically entered in the **Path** field in a common format, such as *volname:*.
 - 3c In **Path**, add an existing directory path where you want to create the junction, or leave only the volume name to create the junction at the root of the volume. Do not include the junction name in the directory path.

If the specified directory path does not exist, this process does not create it for you. Cancel this process, create the directory path that you want to use on the source volume, then try again to create a junction.
- 4 In **Target**, configure the target location properties for the junction.
 - 4a Browse to locate and select the NSS volume where you want the junction to point, then click **OK**.

The volume name is entered in the **Volume** field in the typeless fully distinguished name format, such as *servername_volname.context*.
 - 4b In **Path**, type an existing directory path where you want the junction to point, or leave the field empty to point at the root of the volume.

If the specified directory path does not exist, this process does not create it for you. Cancel this process, create the directory path that you want to use on the target volume, then try again to create a junction.
 - 4c Click **OK** to accept the target location.

5 Active Directory users:

Use NFARM or Rights utility to set trustees. For more information, see [OES File Access Rights Management \(NFARM\)](#).

eDirectory users:

Click **Next** to proceed to the Trustees page, then configure the file system trustee rights for the junction and target locations.

If any part of the junction properties are invalid, an error message displays. You must start over by clicking **Create Junction**.

IMPORTANT: To avoid file visibility and security issues, you should set the file system trustee rights for the junction and target locations when you create the junction.

- 6 Click **Finish** to save your settings and create the junction.
- 7 Click **OK** to dismiss the confirmation message.

11.4 Modifying a DFS Junction Name

- 1 In iManager, click **Distributed File Services > Modify Junction**.
- 2 Browse to locate and select the junction you want to manage.
- 3 On the **Junction Properties** page, specify the new name of the junction.
- 4 Click **OK** or **Apply** to save the change.

IMPORTANT: The changes you make are queued but are not applied until you save the changes. If you leave the **Modify Junction** page without saving, the changes you see on-screen are cancelled.

11.5 Modifying the Junction Location

You cannot use the **Modify Junction** option to modify the junction path. Instead, you create a new junction in the new location, then delete the old junction.

- 1 (Optional) Get a copy of the effective rights on the old junction to help with settings on the junction in its new location.
 - 1a Click **Distributed File Services > Modify Junction**.
 - 1b Browse to locate and select the current junction.
 - 1c Click **Junction Rights > Effective Rights**.
 - 1d Do one or both of the following:
 - ♦ Select all trustees, then click **Copy to Target**.
When you create the new junction that points to this target, you can use the **Target Rights > Copy to Junction** option to set the rights on the new junction.
 - ♦ Print the trustees and trustee rights settings to use as a reference when you create the new junction.
- 2 In iManager, click **Distributed File Services > Create Junction**, then create a new junction in the new location.
- 3 Click **Distributed File Services > Delete Junction**, then browse to locate and delete the old junction.

11.6 Modifying the Target Location

The junction can point to the root of a target volume or to a directory on it. You can change the target location to any NSS volume or NCP volume in any existing DFS management context in the same tree as the NSS volume that contains the junction. Users must be using the Novell Client if you target an NCP volume.

- 1 In iManager, click **Distributed File Services > Modify Junction**.
- 2 Browse to locate and select the junction you want to manage.
- 3 Verify that the trustees and trustee rights for the current target location are the settings you want the location to have after you modify the junction's target path.
 - 3a Click **Target Rights**.
 - 3b Review the Visibility Rights, Trustees, and Trustee rights and make changes if needed.
 - 3c If you modify the trustees or trustee rights, click **OK** or **Apply** to save your changes.
- 4 Click **Junction Properties**. If necessary, repeat [Step 1](#) and [Step 2](#) to return to the Junction Properties page.
- 5 On the Junction Properties page under **Target**, browse to find the NSS volume in an existing DFS management context where the data actually resides.
- 6 In the Target Path dialog box, leave the **Path** empty to point to the root of the selected volume, or specify the path relative to the selected volume, such as `dir1\dir2`.

If the specified directory path does not exist, this process does not create it for you. Cancel this process, create the directory path that you want to use at the target location, then try again to create a junction.
- 7 Click **OK** or **Apply** to save the Target Path changes.
- 8 Configure trustee rights as needed:
 - ◆ Click **Junction Rights**, then configure the trustee rights for the junction.
 - ◆ Click **Target Rights**, then configure the trustee rights for the new target location.

IMPORTANT: To avoid file visibility and security issues, make sure to verify the file system trustee rights on both the junction and target location.

For information, see [Table 11-3 on page 103](#).

- 9 Click **OK** or **Apply** to save the changes to trustee rights.

IMPORTANT: The changes you make are queued but are not applied until you save the changes. If you leave the **Modify Junction** page without saving, the changes you see on-screen are cancelled.

11.7 Adding or Deleting Trustees for the Junction

You can set eDirectory trustees and trustee rights for the junction through the Distributed File Services plug-in for iManager. For Active Directory trustees and trustee rights, use Rights tool or NFARM utility.

- 1 In iManager, click **Distributed File Services > Modify Junction**.
- 2 Browse to locate and select the junction you want to manage.
- 3 Click **Junction Rights**, then click **Trustee** to open a list of trustees for the junction.
- 4 Modify the Trustees list as needed:
 - ◆ Click **Add**, then browse to locate and select one or more users to add as trustees.
 - ◆ Select the **Trustee** check box next to the users who you want to delete from the trustee list, then click **Delete**.
- 5 Configure the trustee rights for the users.
For information about file system trustee rights, see [Table 11-3 on page 103](#).
- 6 If desired, copy all these settings to the target location by selecting all trustees, then clicking **Copy to Target**.
- 7 Click **Target Rights**, verify the trustee and trustee rights settings for the junction target, then modify the trustee rights if needed.

IMPORTANT: For file visibility, users need at least Read and File Scan rights on the target location.

- 8 Click **OK** or **Apply** to save all of the trustee and trustee rights changes.

IMPORTANT: The changes you make are queued but are not applied until you save the changes. If you leave the **Modify Junction** page without saving, the changes that you see on-screen are cancelled.

11.8 Adding or Deleting Trustees for the Junction Target

You can set eDirectory trustees and trustee rights for the junction through the Distributed File Services plug-in for iManager. For Active Directory trustees and trustee rights, use Rights tool or NFARM utility.

- 1 In iManager, click **Distributed File Services > Modify Junction**.
- 2 Browse to locate and select the junction you want to manage.
- 3 Click **Target Rights**, then click **Trustee** to open a list of trustees for the target location.
- 4 Modify the **Trustees** list as needed:
 - ◆ Click **Add**, then browse to locate and select one or more users to add as trustees.
 - ◆ Select the **Trustee** check box next to the users who you want to delete from the trustee list, then click **Delete**.
- 5 Configure the trustee rights for the users.
For information about file system trustee rights, see [Table 11-3 on page 103](#).

- 6 (Optional) Copy all of the **Target Rights** settings to the junction by selecting all **Trustees**, then clicking **Copy to Junction**.
- 7 Click **Junction Rights**, verify the trustee and trustee rights settings for the junction, then modify the settings if needed.

IMPORTANT: Read and File Scan rights are the default trustee rights.

- 8 Click **OK** or **Apply** to save all of the trustee and trustee rights changes.

IMPORTANT: The changes you make are queued but are not applied until you save the changes. If you leave the **Modify Junction** page without saving, the changes that you see on-screen are cancelled.

11.9 Modifying Trustee Rights for the Junction

You can set eDirectory trustees and trustee rights for the junction through the Distributed File Services plug-in for iManager. For Active Directory trustees and trustee rights, use Rights tool or NFARM utility.

- 1 In iManager, click **Distributed File Services > Modify Junction**.
- 2 Browse to locate and select the junction you want to manage.
- 3 Click **Junction Rights**.
- 4 Select the **Trustee** check box next to the user whose rights you want to configure, then modify the user's rights.
For information about file system trustee rights, see [Table 11-3 on page 103](#).
- 5 (Optional) Copy the changed settings to the target location by selecting all **Trustees**, then clicking **Copy to Target**.
- 6 Click **Target Rights**, verify the trustee and trustee rights settings for the junction target location, then modify the trustee rights if needed.

IMPORTANT: For file visibility, users need at least Read and File Scan rights on the target location.

- 7 Click **OK** or **Apply** to save all of the trustee rights changes.

IMPORTANT: The changes you make are queued but are not applied until you save the changes. If you leave the **Modify Junction** page without saving, the changes that you see on-screen are cancelled.

11.10 Modifying Trustee Rights for the Junction Target

You can set eDirectory trustees and trustee rights for the junction through the Distributed File Services plug-in for iManager. For Active Directory trustees and trustee rights, use Rights tool or NFARM utility.

- 1 In iManager, click **Distributed File Services > Modify Junction**.
- 2 Browse to locate and select the junction you want to manage.
- 3 Click **Target Rights**.
- 4 Select the **Trustee** check box next to the user whose rights you want to configure, then modify the user's rights.

For information about file system trustee rights, see [Table 11-3 on page 103](#).

- 5 (Optional) Copy the changed settings to the junction by selecting all **Trustees**, then clicking **Copy to Junction**.
- 6 Click **Junction Rights**, verify the trustee and trustee rights settings for the junction, then modify the trustee rights if needed.

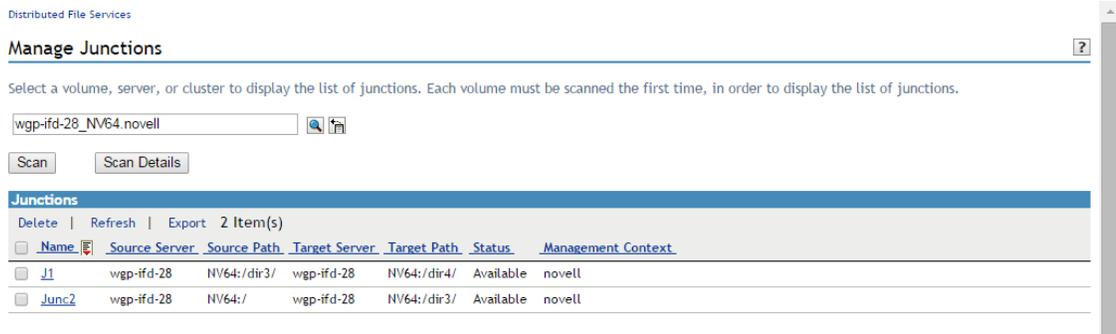
IMPORTANT: Read and File Scan rights are the default trustee rights.

- 7 Click **OK** or **Apply** to save all of the trustee rights changes.

IMPORTANT: The changes you make are queued but are not applied until you save the changes. If you leave the **Modify Junction** page without saving, the changes that you see on-screen are cancelled.

11.11 Managing Junctions

- 1 In iManager, select **Distributed File Services > Manage Junctions**.



- 2 Select a server, volume, or cluster object that you want to manage.
After iManager connects to the server, it searches all the volumes on that server for junctions and lists them.

IMPORTANT: Each volume must be scanned the first time, in order to display the list of junctions.

- 3 The Junctions page displays the list of junctions for the selected server or volume.

Parameter	Description
Name	The administrator-specified name of the junction. You can click the junction name to modify the details of the junction. For more information about modifying junctions, see “Modify Junction” on page 66 .
Source Server	The source server (NSS volumes) where the junction resides.
Source Path	A directory path on the volume or root of the volume where the junction resides.
Target Server	The target server (NSS volumes) on which the data resides that the junction represents.
Target Path	A directory path on the volume or root of the volume where the data resides.
Status	The states of the junction are Available or Broken. The junction is broken when the target location to which it points is not available.
Management Context	The management context of the selected server or volume.

NOTE: If the **Target Path** is NCP POSIX volume, the **Status** displays as “Broken” irrespective of whether the target location to which it points is available or not.

11.11.1 Scanning a Volume

When you connect to the server the first time, you must scan all the volumes, in order to store the junction information in the cache. When new junctions are created, click **Refresh** to update the cache and display the newly added junctions in the Junctions list.

- 1 Select the server, volume, or cluster, then click **Scan**.

11.11.2 Viewing Scan Details

This page displays the scan details of the selected server, volume, or cluster. You can only view the scan details.

Table 11-4 Scan Details

Parameter	Description
Volume Name	The name of the volume that was scanned.
Status	Reports the state of the scan. If a volume was successfully scanned, the status is Scanned. If the status is Not Scanned, then all other fields in the table are empty.
Time Taken	The time taken to complete the scan.
Files	The number of files scanned.
Junctions	The number of junctions scanned.

Parameter	Description
Last Scan	The last date and time the scan was successfully run and completed.

11.11.3 Deleting a DFS Junction

Deleting a junction removes the junction file and any explicitly set trustees, trustee rights, and inherited rights filter on the junction. It does not delete the data or trustee settings in the target location.

Changing the access path to the data might result in different effective rights for users at the target location. To avoid security or visibility issues, verify trustee settings in the target location before or after deleting the junction. Before you delete the junction, you can use the Target Rights page for the junction to modify the settings.

- 1 In the Junction List page, select the check box next to the **Junction Name**, then click **Delete**.
- 2 Click **OK** to delete the selected junctions.

11.11.4 Refreshing the Junction List

When new junctions are created, click **Refresh** to update the cache and display the newly added junctions in the Junctions list.

11.11.5 Exporting Junctions

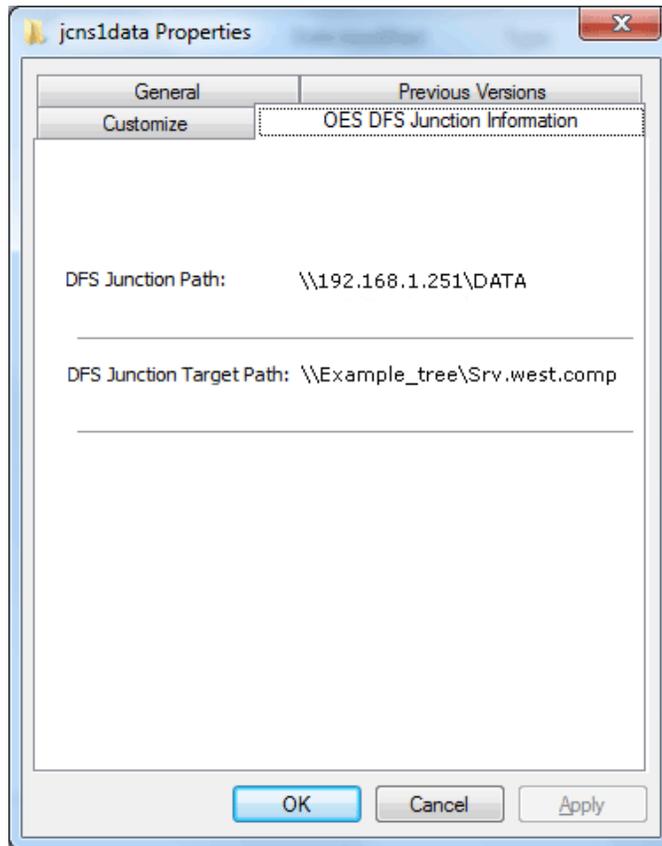
To export the junctions listed in the Junctions table to a .csv file, click **Export**.

11.12 Viewing a DFS Junction

You can access DFS junctions with the latest Client for Open Enterprise Server via the NCP protocol, Web-based services via NetStorage, and the Microsoft client via the CIFS protocol.

- 1 In a file browser, right-click the directory, then select **Properties**.
- 2 Click the **Junction Properties** page to view the junction's property page.

If you are using an unsupported protocol to access a DFS junction, you see something that looks like a small file, but you are unable to read or open it.



11.13 Deleting the Junction

Deleting a junction removes the junction file and the trustees, trustee rights, and inherited rights filters that are explicitly set on the junction. It does not delete the data or trustee settings in the target location.

Changing the access path to the data might result in different effective rights for users at the target location. To avoid security or visibility issues, make sure to verify trustee settings in the target location before or after the delete. Before you delete the junction, you can use the Target Rights page for the junction to modify the settings. After you delete the junction, use any other method you normally use to view and modify rights.

- 1 (Optional, recommended) Verify that the trustees and trustee rights settings at the target location are what you intend them to be when users access the data via a different path than the current junction.

For information, see [Section 11.8, “Adding or Deleting Trustees for the Junction Target,”](#) on page 108 and [Section 11.10, “Modifying Trustee Rights for the Junction Target,”](#) on page 110.

- 2 In iManager, click **Distributed File Services > Delete Junction**.
- 3 Browse to locate the junction you want to delete.
- 4 Click **OK**, then confirm the warning message to delete the junction.

11.14 Salvaging or Purging Deleted Junctions

Deleted junctions are treated like deleted files for an NSS volume. If salvage is enabled for the NSS volume, a deleted junction can be salvaged or purged using the same tools that you use for managing deleted files. If salvage is disabled for the NSS volume, deleted junctions are purged immediately so are not available for salvage.

For more information about configuring salvage for NSS volumes, see “[Salvaging and Purging Deleted Volumes, Directories, and Files](#)”.

11.14.1 Guidelines for Deleted Junctions

- ◆ The NSS volume must be configured for salvage in order for deleted junctions to be available. Enable the Salvage attribute by going to the volume’s Attributes page (**Storage > Volumes > Properties > Attributes**), select **Salvage**, then click **OK**.
- ◆ Deleted junctions are typically purged according to the Purge Delay settings on the server. When the delay time elapses, the deleted junction is no longer available for salvage.
- ◆ Deleted junctions can be salvaged or purged by any trustee for the file with the Create right. If another user has purged the deleted file, it is no longer available for salvage.
- ◆ If the Purge Immediate attribute is set for a junction, it is immediately and permanently removed from the volume upon deletion.

11.14.2 Salvaging a Deleted Junction

You can salvage a deleted junction and restore it to the directory from which it was deleted.

- 1 In iManager, click **Files and Folders**, then click **Deleted File** to open the **Deleted File** page.
- 2 On the **Deleted File** page, use one of the following methods to locate the folder on an NSS volume where the deleted junction existed when it was deleted:
 - ◆ Click the **Search** icon to browse and locate the folder, then click the name link of the folder to select it.
 - ◆ Click the **History** icon to select a folder from the list of folders that you recently accessed.

The **Deleted Files** report lists the deleted files in the folder and shows who deleted each file and when it was deleted.

- 3 Browse the list of deleted files to locate the deleted junction you want to salvage.
- 4 Select the deleted junction, then click **Salvage**.

A confirmation message confirms that the junction was successfully saved. The junction and its trustees, trustee rights, and inherited rights filter are restored.

- 5 Click **Repeat Task** to salvage or purge other deleted files, or click **OK** to dismiss the confirmation message.

11.14.3 Purging Deleted Junctions

You can purge a deleted junction to remove it immediately from the volume. Purged junctions can no longer be salvaged.

- 1 In iManager, click **Files and Folders**, then click **Deleted File** to open the **Deleted File** page.
- 2 On the **Deleted File** page, use one of the following methods to locate the folder on an NSS volume where the deleted junction existed when it was deleted:
 - ◆ Click the **Search** icon to browse and locate the folder, then click the name link of the folder to select it.
 - ◆ Click the **History** icon to select a folder from the list of folders that you recently accessed.

The **Deleted Files** report lists the deleted files in the folder and shows who deleted each file and when it was deleted.

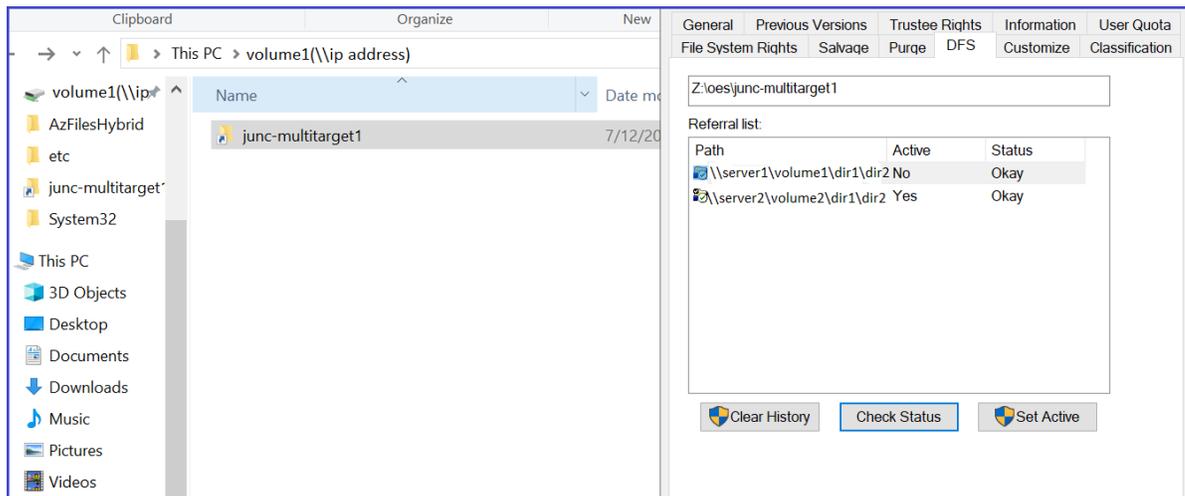
- 3 Browse the list of deleted files to locate the deleted junction you want to purge.
- 4 Select one or multiple deleted junctions (or deleted files) that you want to purge, then click **Purge**.

A confirmation message confirms that the junction was successfully purged.

- 5 Click **Repeat Task** to salvage or purge other deleted files, or click **OK** to dismiss the confirmation message.

11.15 Creating DFS Junction Pointing to Multiple Targets

- 1 Replicate an NSS volume to one or more new NSS volumes.
- 2 Perform VLDB repair on the server where the VLDB is running.
- 3 Creates a junction pointing to original volume having all those replicated volumes as targets.



11.16 Creating DFS Junction Pointing to Non-OES Targets

A non-OES target is a CIFS/SMB share (or its subdirectory) on a Windows/NetApp server. The Windows/NetApp server must be in the same AD tree as the OES server's NSS volume (with AD enabled) where the junction is created.

- 1 Create a junction pointing to non-OES SMB target.
- 2 Verify whether the NSS volume is AD enabled or not.
 - 2a If the NSS volume is not AD enabled, complete the following steps:
 - 2a1 Create an AD user with the same name and password as the existing eDir user.
 - 2a2 Assign minimum of Read and File Scan trustee rights for eDir user on the junction and required rights on the non-OES target.
 - 2b If the NSS volume is AD enabled, complete the following steps:
 - 2b1 Create an AD user.
 - 2b2 Assign minimum of Read and File Scan trustee rights on the junction and required rights on the non-OES target for AD user.
- 3 Access the DFS Junction from the Windows Client.

NOTE: OpenText has certified creation, modification, and resolution of the following non-OES targets:

- ♦ **Windows CIFS/SMB shares:** Windows Server 2019 and Windows Server 2022 using NTLM and Kerberos.
 - ♦ **NetApp CIFS/SMB shares:** With Version 9.12.1 using Kerberos.
-

12 Using DFS to Move NSS Volumes

The **Move Volume** task uses Distributed File Services to move a data volume's file structure, data, and the file system trustee rights information from the original NSS volume to a new NSS volume in the same DFS management context.

- ♦ [Section 12.1, "Prerequisites for Moving an NSS Volume with DFS,"](#) on page 117
- ♦ [Section 12.2, "Moving an NSS Volume with DFS,"](#) on page 120

12.1 Prerequisites for Moving an NSS Volume with DFS

- ♦ [Section 12.1.1, "Planning the Move Volume Job,"](#) on page 117
- ♦ [Section 12.1.2, "Preparing the DFS Management Context,"](#) on page 117
- ♦ [Section 12.1.3, "Preparing the Source Server and Volume,"](#) on page 118
- ♦ [Section 12.1.4, "Preparing the Destination Server,"](#) on page 119

12.1.1 Planning the Move Volume Job

Make sure you meet the prerequisites and guidelines in the following sections of [Chapter 9, "Planning for DFS,"](#) on page 73:

- ♦ [Section 9.1.2, "Supported Combinations for Moving Volumes,"](#) on page 74
- ♦ [Section 9.6.3, "Requirements for OES Services,"](#) on page 81
- ♦ [Section 9.5.2, "Moving or Splitting Encrypted NSS Volumes,"](#) on page 79
- ♦ [Section 9.6, "Guidelines for Moving or Splitting NSS Volumes,"](#) on page 79
- ♦ [Section 9.8, "Guidelines for Using DFS and Dynamic Storage Technology,"](#) on page 83

12.1.2 Preparing the DFS Management Context

- 1 If one does not already exist, create a DFS management context that contains both the source and destination servers.

For instructions, see [Section 10.1, "Creating a DFS Management Context,"](#) on page 85.

- 2 Make sure the VLDB service for the management context is synchronized and running.

For instructions, see [Section 10.7, "Monitoring the Health of the VLDB Service,"](#) on page 91.

- 3 If necessary, start or activate the VLDB service.

For instructions, see [Section 10.4, "Starting or Activating the VLDB Service,"](#) on page 89.

12.1.3 Preparing the Source Server and Volume

If the NSS volume is an encrypted volume, you should not use DFS to move the volume. You cannot create an encrypted volume as the destination volume because that capability is limited to volumes created in NSSMU. Thus, the destination volume would be unencrypted.

- 1 For OES 2015 or later, ensure that NCP Server is installed and running.
For instructions, see the [NCP Server for Linux Administration Guide](#).
- 2 Ensure OES Storage Management Services (SMS) is installed and running.
For instructions, see “[Installing and Configuring SMS](#)” in the [Storage Management Services Administration Guide for Linux](#).
- 3 (Conditional) For an OES 2 SP3 or later source server, if the source volume is a shared volume, reload tsafs on the source server:

3a Open a terminal console, then log in as the `root` user.

3b At the terminal console prompt, enter the following command:

```
smsconfig -u tsafs
```

3c At the terminal console prompt, enter the following command:

```
smsconfig -l tsafs --showclustervolumesonnode
```

The DFS Volume Manager treats the shared source volume as a local or unshared volume on the source server. During the move job, if the source volume is migrated to another node, the DFS Volume Manager sets the status of the job to scheduled and continues the job only when the volume is migrated back to the original source server node.

IMPORTANT: Moving a shared volume is supported only on an OES 2 SP3 or later server.

- 4 (Conditional) If the source volume is currently part of a shadow volume with Dynamic Storage Technology, you must remove the shadow before you can use DFS to move the volume.
For information about Dynamic Storage Technology, see the [Dynamic Storage Technology Administration Guide](#).
- 5 (Conditional) If there are deleted files that you want to keep on the volume, salvage those deleted files before you define the move job.
For information about salvaging deleted files, see “[Salvaging or Purging Deleted Files using the Client for Open Enterprise Servers](#)” in the [Storage Services File System \(NSS\) Administration Guide for Linux](#).
- 6 (Conditional) If you are moving the volume to a pool on a different server, make sure that the administrator username and password you use to log in to iManager are valid on both servers.
- 7 View the attribute settings for the source NSS volume so that you have the information you need to set the same settings for the destination volume.
 - 7a** In iManager, click **Storage > Volumes**.
For instructions, see [Section 8.1.3, “Accessing Roles and Tasks in iManager,”](#) on page 64.
 - 7b** Select the source server to view a list of its NSS volumes.
 - 7c** In the **Volumes** list, select the source NSS volume that you want to move, then wait until the page refreshes and displays information about the selected volume.
 - 7d** Click **Properties** to view attributes for the selected volume.

- 8 Ensure SLP is configured and running. To verify if SLP is running, run the following command:

```
slptool findsrvs smdr.novell
```

On running the above command destination server must also be displayed.

12.1.4 Preparing the Destination Server

- 1 Make sure the destination server contains a disk with sufficient free space to create the destination volume.

You must have unpartitioned free space available for this volume on the destination server. For Linux, the free space must be on an unpartitioned device or on a device that is managed by the Logical Volume Manager (NLVM).
- 2 For OES 2015 or later, ensure that NCP Server is installed and running.

For instructions, see the [NCP Server for Linux Administration Guide](#).
- 3 Ensure OES Storage Management Services (SMS) is installed and running.

For instructions, see “Installing and Configuring SMS” in the [Storage Management Services Administration Guide for Linux](#).
- 4 If you are moving from NetWare to OES 2015 or later, configure the SMS TSAFS mode to *dual*.
 - 4a Open a terminal console, then log in as the `root` user.
 - 4b At a terminal console prompt, enter

```
smsconfig -l tsafs --tsaMode=dual
```

IMPORTANT: After the move job is completed, make sure to reset the TSAFS mode to *linux*.

- 5 (Conditional) If you are moving from an OES 2 SP3 or later target server, if the target volume is a shared volume, reload tsafs on the target server:
 - 5a Open a terminal console, then log in as the `root` user.
 - 5b At the terminal console prompt, enter the following command:

```
smsconfig -u tsafs
```
 - 5c At the terminal console prompt, enter the following command:

```
smsconfig -l tsafs --showclustervolumesonnode
```

The DFS Volume Manager treats the shared target volume as a local or unshared volume on the target server. During the move job, if the target volume is migrated to another node, the DFS Volume Manager sets the status of the job to scheduled and continues the job only when the volume is migrated back to the original target server node.

IMPORTANT: Moving a shared volume is supported only on an OES 2 SP3 or later server.

- 6 If you are moving the volume to a pool on a different server, make sure that the administrator username and password you use to log in to iManager are valid on both servers.
- 7 Ensure that the destination server is registered with SLP for `smdrd` service and SLP is up and running.

12.2 Moving an NSS Volume with DFS

Before you begin, make sure you have completed the prerequisites in [Section 12.1, “Prerequisites for Moving an NSS Volume with DFS,”](#) on page 117

- 1 If you plan to temporarily retain the source volume as a deleted volume in salvage after a successful volume move, verify that your server’s **ImmediatePurgeOfDeletedFiles** setting and the **Purge Delay** setting meet your needs.

IMPORTANT: These settings must be in effect if you disable **Purge Immediately** in [Step 7](#) in order for the volume to be available in salvage.

- 1a Enable salvage for deleted volumes. At the server console, enter

```
nss /NoImmediatePurgeOfDeletedFiles
```

For more information about this parameter, see [“Setting the Immediate Purge of Deleted Files for All NSS Volumes”](#) in the *Storage Services File System (NSS) Administration Guide for Linux*.

- 1b Configure the **Purge Delay** setting as desired. The default **Purge Delay** setting is 4 days (345600 seconds), but the actual setting might differ.

At the server console, enter

```
nss /logicalVolumePurgeDelay=value
```

where *value* is the number of seconds until a deleted volume is purged from the salvage area. For more information about this parameter, see [“Salvaging and Purging Deleted Volumes, Directories, and Files”](#) in the *Storage Services File System (NSS) Administration Guide for Linux*.

- 2 Log in to iManager using an administrator username and password that are valid on both the source and destination servers.
- 3 In iManager, click **Storage > Volumes**.
For instructions, see [Section 8.1.3, “Accessing Roles and Tasks in iManager,”](#) on page 64.
- 4 Use the Server object browser to locate and select the server that contains the NSS volume you want to move.
For instructions, see [Section 8.1.4, “Selecting a Server to Manage,”](#) on page 65.
- 5 From the **Volumes** list, select the volume that you want to move.
Wait for the page to refresh with the volume’s details before continuing.
- 6 Click **Move** to open the **Move Volume** dialog box.

7 Specify the following parameters, then click **Next**.

- ◆ **Purge Data from Original Volume Immediately:** Select this option to purge the original volume’s deleted data from the server’s salvage area immediately following the successful completion of a volume move job.

If this option is disabled (deselected), DFS delays the purge of the volume’s deleted data according to the server’s **Purge Delay** setting and the normal purge process.

You can manually purge or restore the original volume’s deleted data at any time during the purge delay period. Use the normal method of purging deleted volumes. For information, see “[Viewing, Salvaging, or Purging Deleted NSS Volumes in a Pool using iManager](#)” in the *Storage Services File System (NSS) Administration Guide for Linux*.

- ◆ **New Location:** Specify the NetIQ eDirectory common name of the server where you want to move the selected volume.

If the destination volume is a shared volume, select the virtual server object for the pool on which the shared volume is to be created.

If the shared destination volume is migrated to another node during the move job, the data copy to the volume is not affected.

- ◆ **Run Schedule:** Select **Start Now** to begin the move immediately, or specify the date and time you want to schedule the move.

Make sure that the volume is active at the time that the move is to begin.

8 Before moving a volume, you can either select an existing volume or create a new volume as a target location to receive the source data.

8a Select an Existing Volume: Enter or browse a volume as a target path to save the source data. For example, LP1_VOL2. After selecting an existing volume, continue with [Step 9 on page 123](#).

IMPORTANT: The existing volume selected must be on the OES 2018 SP3 or later servers. If the server is on OES 2018 SP2 or earlier versions, click **Cancel** and select the option **Create a New Volume**.

or

8b Create and name the new volume: Specify a unique name for the new volume.

Typically, the new volume's name is different from the original volume's name. The new volume's name must meet the uniqueness requirements in the new location and must conform to volume naming conventions. For guidelines about naming volumes, see ["Naming NSS Storage Objects"](#) in the *Storage Services File System (NSS) Administration Guide for Linux*. It is possible, though not necessarily advisable, to use the same name under some conditions, such as when the original location and the new location are on different servers.

IMPORTANT: If the name you provide is not unique, you receive an error message. You must click **Cancel** to back out of the dialog box, then begin the move process again.

- ◆ Specify the pool on the new location where you want the new volume to reside, specify the volume quota, then click **Next**.

Only pools that have free space appear in the list. You can select an existing pool from the list or create a new pool. If you create a new pool, the dialog box guides you through steps similar to the process for creating a new pool. For instructions, see ["Creating a Pool"](#) in the *Storage Services File System (NSS) Administration Guide for Linux*.

If no pools are listed, there is no space available to create a volume in the new location. Cancel the dialog box, add more devices to the server and expand the desired pool, or free up space by deleting existing pools, then return to the Volume Management page to begin the move process from the beginning.

- ◆ Specify the attributes for the new volume you are creating, based on the volume attributes of the original volume.

The dialog box displays the volume attributes for the original volume. Modifiable attribute settings can differ on the new volume. However, settings such as Compression that cannot be changed after they are set for a volume must be the same on the original volume and the new volume.

Attributes	
<input checked="" type="checkbox"/> Backup	<input type="checkbox"/> Migration
<input type="checkbox"/> Compression	<input type="checkbox"/> Modified File List(MFL)
<input type="checkbox"/> Data Shredding	<input checked="" type="checkbox"/> Salvage
Number of shredding cycles: <input type="text" value="0"/>	<input type="checkbox"/> Snapshot
<input type="checkbox"/> Directory Quotas	<input type="checkbox"/> User Space Quotas
<input type="checkbox"/> Flush Files Immediately	<input type="checkbox"/> User-level Transaction Model
<input checked="" type="checkbox"/> AD-enable the Volume	

The **AD-enable the Volume** option is available only if the Pool containing the NSS volumes is media upgraded. If the volume is already AD-enabled, this option is disabled.

9 Click **Finish**.

The move can take a few minutes to several hours, depending on how much data needs to be moved.

10 To view the job's status or to pause and resume the job, click **Volume Job Control**.

For information, see [Chapter 14, "Managing Move Volume or Split Volume Jobs,"](#) on page 133.

11 (Optional) After the job completes successfully, if you disabled the **Purge Volume Immediately** option, you can manually purge or restore the original volume's deleted data at any time during the purge delay period, using the normal method of purging deleted volumes.

For information, see "[Viewing, Salvaging, or Purging Deleted NSS Volumes in a Pool using iManager](#)" in the *Storage Services File System (NSS) Administration Guide for Linux*.

12 Manually update script files, configuration files, or mappings by modifying the location of the original volume to the location of the new volume.

13 Using DFS to Split NSS Volumes

The **Split Volume** task uses Distributed File Services to move part of a volume's file structure, data, and the file system trustee rights information from the original Storage Services (NSS) volume to a new or an existing NSS volume in the same DFS management context.

- ♦ [Section 13.1, "Prerequisites for Splitting an NSS Volume with DFS,"](#) on page 125
- ♦ [Section 13.2, "Splitting a Volume with DFS,"](#) on page 127

13.1 Prerequisites for Splitting an NSS Volume with DFS

- ♦ [Section 13.1.1, "Planning the Split Volume Job,"](#) on page 125
- ♦ [Section 13.1.2, "Preparing the DFS Management Context,"](#) on page 125
- ♦ [Section 13.1.3, "Preparing the Source Server and Directory,"](#) on page 126
- ♦ [Section 13.1.4, "Preparing the Destination Server,"](#) on page 127

13.1.1 Planning the Split Volume Job

Make sure you meet the prerequisites and guidelines in the following sections of [Chapter 9, "Planning for DFS,"](#) on page 73:

- ♦ [Section 9.1.3, "Supported Combinations for Splitting Volumes,"](#) on page 75
- ♦ [Section 9.6.3, "Requirements for OES Services,"](#) on page 81
- ♦ [Section 9.5.2, "Moving or Splitting Encrypted NSS Volumes,"](#) on page 79
- ♦ [Section 9.6, "Guidelines for Moving or Splitting NSS Volumes,"](#) on page 79
- ♦ [Section 9.8, "Guidelines for Using DFS and Dynamic Storage Technology,"](#) on page 83

13.1.2 Preparing the DFS Management Context

- 1 If one does not already exist, create a DFS management context that contains both the source and destination servers.

For instructions, see [Section 10.1, "Creating a DFS Management Context,"](#) on page 85.

- 2 Make sure the VLDB service for the management context is synchronized and running.

For instructions, see [Section 10.7, "Monitoring the Health of the VLDB Service,"](#) on page 91.

- 3 If necessary, start or activate the VLDB service.

For instructions, see [Section 10.4, "Starting or Activating the VLDB Service,"](#) on page 89.

13.1.3 Preparing the Source Server and Directory

If the NSS volume is an encrypted volume, you should not use DFS to split the volume. You cannot create an encrypted volume as the destination volume because that capability is limited to volumes created in NSSMU. Thus, the destination volume would be unencrypted.

- 1 For OES 2015 or later, ensure that NCP Server is installed and running.

For instructions, see the [NCP Server for Linux Administration Guide](#).

- 2 Ensure OES Storage Management Services (SMS) is installed and running.

For instructions, see “[Installing and Configuring SMS](#)” in the [Storage Management Services Administration Guide for Linux](#).

- 3 (Conditional) For an OES 2 SP3 or later source server, if the source volume is a shared volume, reload the tsafs on the source server.

3a Open a terminal console, then log in as the `root` user.

3b At the terminal console prompt, enter

```
smsconfig -u tsafs
```

3c At the terminal console prompt, enter

```
smsconfig -l tsafs --showclustervolumesonnode
```

The DFS Volume Manager treats the shared source volume as a local or unshared volume on the source server. During the split job, if the source volume is migrated to another node, the DFS Volume Manager sets the status of the job to Scheduled and continues the job only when it is migrated back to the original source server node.

IMPORTANT: Splitting a shared volume is supported from OES 2 SP3 or later.

- 4 (Conditional) If the source volume is currently part of a shadow volume with Dynamic Storage Technology, you must remove the shadow before you can use DFS to split the volume.

For information about Dynamic Storage Technology, see the [Dynamic Storage Technology Administration Guide](#).

- 5 (Conditional) If there are deleted files that you want to keep in the directory you are splitting, salvage those deleted files before you define the split job.

For information about salvaging deleted files, see “[Salvaging or Purging Deleted Files using the Client for Open Enterprise Servers](#)” in the [Storage Services File System \(NSS\) Administration Guide for Linux](#).

- 6 (Conditional) If you are splitting the directory to a pool on a different server, make sure that the administrator username and password you use to log in to iManager are valid on both servers.

- 7 Set explicit trustees and trustee rights on the directory so they can be transferred to the junction when the split job is complete.

Users must have Read and File Scan rights to the directory. Inherited trustees and trustee rights are not automatically transferred to the target volume.

IMPORTANT: You must set rights on the target volume or directory after the split is complete.

13.1.4 Preparing the Destination Server

- 1 Make sure the destination server contains a disk with sufficient free space to create the destination volume.

You must have unpartitioned free space available for this volume on the destination server. For Linux, the free space must be on an unpartitioned device or on a device that is managed by the Logical Volume Manager (NLVM).

- 2 For OES 2015 or later, ensure that NCP Server is installed and running.

For instructions, see the [NCP Server for Linux Administration Guide](#).

- 3 Make sure OES Storage Management Services (SMS) is installed and running.

For instructions, see “Installing and Configuring SMS” in the [Storage Management Services Administration Guide for Linux](#).

- 4 If you are splitting from NetWare to OES 2015 or later, configure the SMS TSAFS mode to *dual*.

4a Open a terminal console, then log in as the `root` user.

4b At a terminal console prompt, enter

```
smsconfig -l tsafs --tsaMode=dual
```

IMPORTANT: After the split job is completed, make sure to reset the TSAFS mode to *linux*.

- 5 (Conditional) If you are splitting from an OES 2 SP3 or later target server, and if the target volume is a shared volume, reload the tsafs on the target server.

5a Open a terminal console, then log in as the `root` user.

5b At the terminal console prompt, enter

```
smsconfig -u tsafs
```

5c At the terminal console prompt, enter

```
smsconfig -l tsafs --showclustervolumesonnode
```

The DFS Volume Manager treats the shared target volume as a local or unshared volume on the target server. During the split job, if the target volume is migrated to another node, the DFS Volume Manager sets the status of the job to Scheduled and continues the job only when it is migrated back to the original target server node.

IMPORTANT: Splitting a shared volume is supported from OES 2 SP3 or later.

- 6 If you are splitting the volume to a pool on a different server, make sure that the administrator username and password you use to log in to iManager are valid on both servers.

13.2 Splitting a Volume with DFS

Before you begin, make sure you have completed the prerequisites in [Section 12.1, “Prerequisites for Moving an NSS Volume with DFS,”](#) on page 117

- 1 Log in to iManager using an administrator username and password that are valid on both the source and destination servers.
- 2 In iManager, click **Storage > Volumes**.

For instructions, see [Section 8.1.3, “Accessing Roles and Tasks in iManager,”](#) on page 64.

- 3 Use the Server object browser to locate and select the server that contains the NSS volume you want to split.

For instructions, see [Section 8.1.4, “Selecting a Server to Manage,”](#) on page 65.

- 4 From the **Volumes** list, select a volume that you want to split.

Wait for the page to refresh with the volume’s details before continuing.

- 5 Click **Split** to open the **Split Volume** dialog box.

Split Volume ?

Enter location, split path, start date and time

Before you split a volume, make sure to create a DFS management context and its VLDB (see Distributed File Services > Create a Management Context) that contains the original and new volume locations. Use Distributed File Services > Volume Job Control to manage the job.

Original Server: srv1.servers.west.company
Original Volume: DFSVOL1_AD
 Purge Data from Original Volume Immediately

New Location:

Split volume at:

Run Schedule:

Start Now
 Start Date and Time

<< Back Next >> Cancel

- 6 Specify the following parameters, then click **Next**.

- ♦ **Purge Data from Original Volume Immediately:** Select this option to purge the original volume’s deleted data from the server’s salvage area immediately following the successful completion of a volume split job.

If this option is disabled (deselected), DFS delays the purge of the volume’s deleted data according to the server’s **Purge Delay** setting and the normal purge process.

You can manually purge or restore the original volume’s deleted data at any time during the purge delay period. Use the normal method of purging deleted volumes. For information, see [“Viewing, Salvaging, or Purging Deleted NSS Volumes in a Pool using iManager”](#) in the *Storage Services File System (NSS) Administration Guide for Linux*.

- ♦ **New Location:** Specify the NetIQ eDirectory common name of the server where you want to move the selected volume.

If the destination volume is a shared volume, select the virtual server object for the pool on which the shared volume is to be created.

If the shared destination volume is migrated to another node during the split job, the data copy to the volume is not affected.

- ◆ **Split Volume at:** Specify the directory path on the selected volume where you want the DFS junction to reside. All data below that point moves to the new volume created at the new location.

IMPORTANT: Do not include a leading slash in the path.

- ◆ **Run Schedule:** Select **Start Now** to begin the move immediately, or specify the date and time you want to schedule the move.

- 7 Before splitting a volume, you can either select an existing volume or create a new volume as a target location to receive the source data.

Split Volume

 **Select or Create a Volume**

Original Server: svr1.servers.west.company New Location: svr2.servers.west.company
 Original Volume: CP1_VOL1

Select an Existing Volume

Folder:  

**Select a volume or folder to save the source data.
 If the specified folder does not exist, it is created.**

Create a New Volume

<< Back
Finish
Cancel

- 7a **Select an Existing Volume:** Enter or browse a volume and/or folder as a target path to save the source data. If the specified folder does not exist, it is created. For example, VOL1 : d1 / d2. After selecting an existing volume, continue with [Step 8 on page 130](#).

IMPORTANT: The existing volume selected must be on the OES 2018 SP3 or later servers. If the server is on OES 2018 SP2 or earlier versions, click **Cancel** and select the option **Create a New Volume**.

- 7b **Create and name the new volume:** Typically, the new volume’s name is different from the original volume’s name. The new volume’s name must meet the uniqueness requirements in the new location and must conform to volume naming conventions. For guidelines about naming volumes, see “[Naming NSS Storage Objects](#)” in the *Storage Services File System (NSS) Administration Guide for Linux*. It is possible, though not necessarily advisable, to use the same name under some conditions, such as when the original volume and the new volume are on different servers.

IMPORTANT: If the name you provide is not unique, you receive an error message. You must click **Cancel** to back out of the dialog box, then begin the split process again.

- ◆ Specify the pool on the new location where you want the new volume to reside, specify the volume quota, then click **Next**.

Only pools that have free space appear in the list. You can select an existing pool from the list or create a new pool. If you create a new pool, the dialog box guides you through steps similar to the process for creating a new pool. For instructions, see “[Creating a Pool](#)” in the *Storage Services File System (NSS) Administration Guide for Linux*.

If no pools are listed, there is no space available to create a volume in the new location. Cancel the dialog box, add more devices to the server and expand the desired pool, or free up space by deleting existing pools, then return to the Volume Management page to begin the move process from the beginning.

- ◆ Specify the attributes for the new volume, based on the volume attributes of the original volume.

The dialog box displays the volume attributes for the original volume. Modifiable attribute settings can differ on the new volume. However, settings such as Compression that cannot be changed after they are set for a volume must be the same on the original volume and the new volume.

The screenshot shows a dialog box titled "Attributes" with a light gray header. Below the header, there are two columns of checkboxes and one text input field. The first column contains: Backup, Compression, Data Shredding, Directory Quotas, Flush Files Immediately, and AD-enable the Volume. The second column contains: Migration, Modified File List(MFL), Salvage, Snapshot, User Space Quotas, and User-level Transaction Model. A text input field for "Number of shredding cycles:" contains the value "0". The "AD-enable the Volume" checkbox is highlighted with a blue border.

A new option **AD-enable the Volume** is introduced in OES 2015. This option is available only if the Pool containing the NSS volumes is media upgraded. If the volume is already AD-enabled, this option is disabled.

- 8 Click **Finish**.

The split can take a few minutes to several hours, depending on how much data needs to be relocated.

- 9 To view the job’s status or to pause and resume the job, click **Volume Job Control**.

For information, see [Chapter 14, “Managing Move Volume or Split Volume Jobs,”](#) on page 133.

- 10 When the job is complete, add the users with visibility rights at the target folder to the newly created junction with the following steps:

- 10a Navigate to **Distributed File Services > Modify Junction**.

- 10b Select the junction file created as part of the split volume process.

- 10c Click **Target Rights** tab and then the **Visibility Rights** tab.

- 10d Select the trustees needed or **Select all** and click on **Copy to Junction**.

- 10e** Click the **Junction Right** tab and then the **Trustee** tab to view the list off all users.
- 10f** Check the rights and click **Ok**.
- 11** Once modifying the junction is complete verify that the junction works as intended.

14 Managing Move Volume or Split Volume Jobs

Use the **Distributed File Services > Volume Job Control** page to monitor and manage the jobs. This page allows you to monitor the status of all the active jobs and recently completed jobs that were initiated for a selected server. You can pause, resume, reschedule, finish, or delete a job, depending on the state it is in.

NOTE: Configure and initiate **Move Volume** jobs and **Split Volume** jobs from the **Storage > Volumes** page in iManager.

- ◆ [Section 14.1, “Monitoring the Status of Move Volume or Split Volume Jobs,” on page 133](#)
- ◆ [Section 14.2, “Pausing a Move or Split Job,” on page 136](#)
- ◆ [Section 14.3, “Resuming a Move or Split Job,” on page 137](#)
- ◆ [Section 14.4, “Rescheduling a Move or Split Job,” on page 137](#)
- ◆ [Section 14.5, “Viewing Files Skipped by a Move or Split Job,” on page 138](#)
- ◆ [Section 14.6, “Finishing a Move or Split Job,” on page 139](#)
- ◆ [Section 14.7, “Deleting a Move or Split Job,” on page 139](#)
- ◆ [Section 14.8, “Troubleshooting Move or Split Job Failures,” on page 140](#)

14.1 Monitoring the Status of Move Volume or Split Volume Jobs

- ◆ [Section 14.1.1, “Understanding the Job Status Report,” on page 133](#)
- ◆ [Section 14.1.2, “Viewing the Volume Job Report,” on page 136](#)

14.1.1 Understanding the Job Status Report

The Volume Job Control Status Report shows the information described in this section. To update the status, click **Move/Split Job Control** in **Roles and Tasks**, or click **Refresh**.

- ◆ [“Type” on page 134](#)
- ◆ [“Name” on page 134](#)
- ◆ [“State” on page 134](#)
- ◆ [“Percent Complete” on page 135](#)
- ◆ [“Comment” on page 135](#)

Type

Distinguishes the job as a Move job ➡ or Split job 📁.

Name

If it is a Move, this is the name of the original volume, such as `DATA1 :`. If it is a Split, this is the path to directory on the original volume where you split it, such as `DATA2 :project\dev`.

State

States are defined in logical tasks so that the Move job or Split job can start and stop at several points in the process and go back to repeat any subprocesses, as needed.

Reported states include the following:

- ◆ **Scheduled**

The Move or Split job is currently suspended, but it will automatically resume (or start) at a later time. If you have paused a job, you must resume the job in order for the schedule to trigger the job to run at scheduled times.

- ◆ **Running**

In a Move or Split job, files are actively being moved from the original volume to the new volume.

- ◆ **Administrator Action Required**

- ◆ **Cleanup Failed**

DFS could not delete one or more files from the original volume while in the **Cleaning Up** state. For example, DFS cannot delete files that are currently in use.

This state requires administrator action. Do one of the following:

- ◆ To retry the cleanup, click **Resume**.

If undeleted files remain in use, DFS might return to this state. You can repeat this option as often as necessary.

- ◆ To complete the job and leave undeleted files in the original volume, click **Finish**.

You must manually delete the duplicate files from the original volume afterwards.

- ◆ **Files Skipped**

A Move or Split job is mostly completed, but some files were left behind after two attempts to copy them to the new volume. Files that are in use at the time of the move or split process cannot be copied to the new location.

IMPORTANT: DFS does not identify which of the files left behind are more recent duplicates of those copied to the new volume and which could not be copied because they were in use during the Move or Split job.

This state requires administrator action. Do one of the following:

- ◆ To retry to copy the files left behind, click **Resume**. If uncopied files remain in use, DFS might return to this state. You can repeat this option as often as necessary. If the files can now be copied successfully, the job will finish normally.
- ◆ To complete the job and leave uncopied files in the original volume, click **Finish**. You must manually determine which files to move from the original volume afterwards. Users can no longer access files left behind in the old location.

- ◆ **Paused**

The Move or Split job has been manually paused by an administrator. From this state, you can **Resume** or **Delete** the job.

- ◆ **Failed**

The Move or Split job failed and cannot be completed successfully. For troubleshooting tips, see [Section 14.8, “Troubleshooting Move or Split Job Failures,”](#) on page 140.

- ◆ **Deleted**

The Move or Split job was stopped by the administrator before it was successfully completed. After you issue a Delete command, the Volume Manager waits for the next convenient step in the process to stop the job. Because it checks for new commands after copying an entire file, the wait time varies. If the file is large, the wait time could be several seconds.

- ◆ **Completed**

DFS completed the Move or Split job, more or less successfully. Completed jobs remain in the status report for seven (7) days after completion.

If the job successfully reaches the **Completed** state on its own, no files remain behind in the original volume or below the DFS junction point in the original volume.

If the job reaches the **Completed** state after a **Cleanup Failed** state, one or more undeleted files might remain behind in the original volume or below the DFS junction point in the original volume.

If the job reaches the **Completed** state after a **Files Skipped** state, one or more uncopied files might remain behind in the original volume or below the DFS junction point in the original volume.

IMPORTANT: You must manually delete or transfer files left behind. Users can no longer access files left behind.

Percent Complete

The estimated percentage of data to be copied from the original volume that has been copied to the new volume as of the instant the status report was created.

Comment

A comment you typed when you issued a **Pause** command.

14.1.2 Viewing the Volume Job Report

To access a report of move and split jobs:

- 1 In iManager, click **Distributed File Services > Volume Job Control**.

For instructions, see [Section 8.1.3, “Accessing Roles and Tasks in iManager,”](#) on page 64.

- 2 Select a server to manage.

For instructions, see [Section 8.1.4, “Selecting a Server to Manage,”](#) on page 65.

A list of move and split jobs appears.

Distributed File Services

Volume Job Control ?

The Volume Job Control page reports the status of all the active move and split jobs initiated from this server. You can pause/resume, reschedule, finish, or delete a job, depending on the state it is in. To create Move Volume or Split Volume jobs, select Storage > Volumes, then use the Move or Split function.

Server:  

Jobs						
<input type="checkbox"/>	Delete	Details	Refresh	Actions	3 Item(s)	
<input type="checkbox"/>	Source Path	State	Run Schedule	Percent Complete	ID	
<input type="checkbox"/>	 VOL1_MOVE	 Completed	8/18/09 11:28 AM	100	1250510969	
<input type="checkbox"/>	 VOL2_MOVE	 Completed	8/18/09 11:02 AM	100	1250510968	
<input type="checkbox"/>	 VOL3:folder1	 Completed	8/18/09 11:47 AM	100	1250510970	

- 3 To exit, click **Close**.

14.2 Pausing a Move or Split Job

Pause suspends one or more Move or Split jobs until you manually resume or delete them. Only four Move or Split jobs can be running concurrently on a given server. The Volume Manager performs the jobs in the order they are scheduled. If four operations are in progress and you want to activate others that you decide are a higher priority, you can pause one or more of the active jobs, thus allowing the new job to run immediately.

You might want to pause a Move or Split job to allow another job to run or to reduce the load on the system or network.

- 1 In iManager, open the **Volume Job Control** page to view a job status report.

For instructions, see [Section 14.1, “Monitoring the Status of Move Volume or Split Volume Jobs,”](#) on page 133.

- 2 Select the **Job** check box next to one or more active jobs that you want to pause.

- 3 Click **Pause**.

- 4 Type a comment to be displayed in the status report, such as the reason you are pausing the job.

- 5 Click **OK**.

After the page refreshes, the jobs report their status as **Pausing** or **Paused**. If you inadvertently selected some jobs that are not eligible to be rescheduled, iManager ignores the **Pause** command for those jobs. It applies only to those jobs that the command is valid for.

14.3 Resuming a Move or Split Job

Resume continues one or more paused Move or Split jobs so that they can continue from wherever they were in the move or split process when you paused them.

IMPORTANT: You cannot resume a completed, failed, or deleted job.

- 1 In iManager, open the **Volume Job Control** page to view the job status report for current and recent Move or Split jobs.

For instructions, see [Section 14.1, “Monitoring the Status of Move Volume or Split Volume Jobs,” on page 133](#).

- 2 Select the **Job** check box next to one or more paused jobs that you want to resume.
- 3 Click **Resume**.
- 4 Click **OK**.

After the page refreshes, the jobs report their status as **Scheduled** or **Running**, depending on when the job was originally scheduled to run. If you inadvertently selected some jobs that are not eligible to be rescheduled, iManager ignores the **Resume** command for those jobs. It applies only to those jobs for which the command is valid.

14.4 Rescheduling a Move or Split Job

Reschedule changes the date and time that the selected jobs should run. It applies the same date and time to all of the selected jobs.

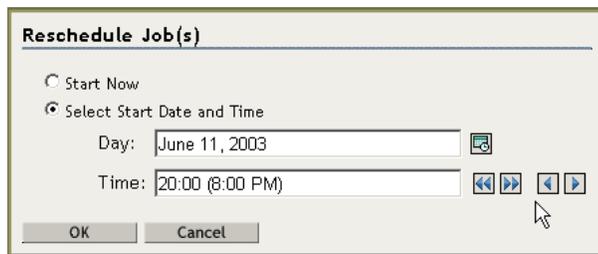
IMPORTANT: You cannot reschedule a completed, failed, or deleted job.

- 1 In iManager, open the **Volume Job Control** page to view a job status report.

For instructions, see [Section 14.1, “Monitoring the Status of Move Volume or Split Volume Jobs,” on page 133](#).

- 2 Select the **Job** check box next to one or more uncompleted jobs that you want to reschedule.
- 3 Click **Reschedule**.

This opens a **Reschedule Jobs** dialog box.



4 To set the new schedule:

- ◆ To start the job immediately, select **Start Now**.
- ◆ To start the job at a future date or time, specify the start date and time when you want the Move or Split job to begin.

5 Click **OK**.

After the page refreshes, the jobs report their status with the new schedule. If you inadvertently selected some jobs that are not eligible to be rescheduled, iManager ignores the **Reschedule** command for those jobs. It applies only to those jobs for which the command is valid.

6 If any of the rescheduled jobs are paused, you must resume them in order for the rescheduling to take effect.

6a On the **Volume Job Control** page, select the job or jobs that are currently paused.

6b Click **Resume**, then click **OK**.

14.5 Viewing Files Skipped by a Move or Split Job

If a Move or Split job reports a **Files Skipped** status, some files could not be moved because they were open at the time that DFS attempted to copy them.

To view a list of files:

1 To retrieve the Operation ID number of the Move or Split job, enter the following command at the server command prompt:

```
volmn status
```

NSS displays a list of the Move and Split jobs that are in progress or were initiated or run in the past seven days.

2 Find the Move or Split job of interest and make a note of its Operation ID (OpID) number.

For example, Move(VOL1) might have an Operation ID number of 104211375.

3 To display a list of the files skipped, enter the following at the server command prompt:

```
volmn list OpID
```

For example, enter

```
volmn list 104211375
```

14.6 Finishing a Move or Split Job

Finish continues a move or split job that has reached a state that requires manual intervention to finish even though some files might remain behind.

- 1 In iManager, open the **Job Control** page to view a job status report.

For instructions, see [Section 14.1, “Monitoring the Status of Move Volume or Split Volume Jobs,”](#) on page 133.

- 2 Select the **Job** check box next to one or more jobs waiting for administrator intervention that you want to complete, acknowledging and understanding the exceptions noted.
- 3 Click **Finish**.

After the page refreshes, the selected jobs report their status as **Scheduled**, **Running**, or **Complete**, depending on how much work was left to do in the job.

If you inadvertently selected some jobs that are not eligible to be finished, iManager ignores the **Finish** command for those jobs. It applies only to those jobs for which the command is valid.

- 4 After the job is completed, do the following cleanup tasks:
 - ♦ If the job successfully reaches the **Completed** state on its own, no files remain behind in the original volume or below the DFS junction point in the original volume.
 - ♦ If the job reaches the **Completed** state after a **Cleanup Failed** state, one or more undeleted files might remain behind in the original volume or below the DFS junction point in the original volume.
 - ♦ If the job reaches the **Completed** state after a **Files Skipped** state, one or more uncopied files might remain behind in the original volume or below the DFS junction point in the original volume. For information about viewing skipped files, see [Section 14.5, “Viewing Files Skipped by a Move or Split Job,”](#) on page 138.

IMPORTANT: You must manually delete or transfer files left behind. Users can no longer access files left behind.

14.7 Deleting a Move or Split Job

Delete cancels a selected job before it begins or up to a certain point in the move or split process. If the process is beyond a certain state, it returns an error message to prevent you from deleting the process.

IMPORTANT: You cannot delete a completed, failed, or previously deleted job.

After you issue a Delete command, the Volume Manager waits for the next convenient step in the process to stop the job. Because it checks for new commands after copying an entire file, the wait time varies. If the file is large, the wait time could be several seconds.

The deletion stops the job at the next convenient step in the process, but performs no cleanup. The destination volume exists and contains all files copied to it before you deleted the job. By default, deleted Move or Split jobs appear in the status report for a week.

IMPORTANT: If deletion continues, the original data is still intact. There is no loss of service or need to copy data from the destination volume back to the original volume.

1 In iManager, open the **Volume Job Control** page to view a job status report.

For instructions, see [Section 14.1, “Monitoring the Status of Move Volume or Split Volume Jobs,”](#) on page 133.

2 Select the **Job** check box next to one or more scheduled or paused jobs that you want to cancel.

3 Click **Delete**.

After the page refreshes, the selected jobs report their status as **Deleted**. Some jobs might not allow themselves to be deleted, depending on how far into the move or split process they are when you click **Delete**.

If you inadvertently selected some jobs that are not eligible to be deleted, iManager ignores the **Delete** command for those jobs. It applies only to those jobs for which the command is valid.

4 If the destination volume exists, you can remove it.

The original volume’s data is still intact. There is no loss of service or need to copy data from the destination volume back to the original volume.

14.8 Troubleshooting Move or Split Job Failures

There are multiple conditions that result in a job failure:

- ♦ [Section 14.8.1, “Failed: \(No Reason Specified\),”](#) on page 140
- ♦ [Section 14.8.2, “Failed: Could Not Start Backup,”](#) on page 141
- ♦ [Section 14.8.3, “Failed: File Read,”](#) on page 141
- ♦ [Section 14.8.4, “Failed: File Restore,”](#) on page 141
- ♦ [Section 14.8.5, “Failed: Invalid Original Server’s NSS Version,”](#) on page 141
- ♦ [Section 14.8.6, “Failed: Invalid Target Server’s NSS Version,”](#) on page 141
- ♦ [Section 14.8.7, “Failed: Log File Problem,”](#) on page 141
- ♦ [Section 14.8.8, “Failed: Login,”](#) on page 142
- ♦ [Section 14.8.9, “Failed: No Management Context,”](#) on page 142
- ♦ [Section 14.8.10, “Failed: Wrong Management Context,”](#) on page 142

14.8.1 Failed: (No Reason Specified)

The Move or Split job failed for an unspecified reason. This failure state is unlikely because most failures identify a specific error.

14.8.2 Failed: Could Not Start Backup

The Move or Split job failed because the Storage Management Services (SMS) could not be started. The Volume Manager uses SMS to move data by backing it up from the original volume and immediately restoring it to the new volume.

Make sure that SMS is installed and loaded on the original and destination servers, then try again.

14.8.3 Failed: File Read

The Move or Split job failed because a read error occurred while SMS was backing up files from the original volume. The Volume Manager uses SMS to move data by backing it up from the original volume and immediately restoring it to the new volume.

This error does not occur if the file that SMS is trying to read is merely open. DFS tracks files that are open when SMS attempts to back them up and tries again to back them up later in the process.

14.8.4 Failed: File Restore

The Move or Split job failed because a write error occurred while SMS was restoring files to the new volume. The Volume Manager uses SMS to move data by backing it up from the original volume and immediately restoring it to the new volume.

To avoid this problem, make sure the new volume has sufficient space allocated to contain the data you intend to move to it.

14.8.5 Failed: Invalid Original Server's NSS Version

The Move or Split job failed because the specified original server has a version of NSS that does not support Move and Split. For information about supported server platforms for Moves, see [Section 9.1.2, "Supported Combinations for Moving Volumes," on page 74](#). For information about supported server platforms for Splits, see [Section 9.1.3, "Supported Combinations for Splitting Volumes," on page 75](#).

14.8.6 Failed: Invalid Target Server's NSS Version

The Move or Split job failed because the specified target server has a version of NSS that does not support Move and Split. For information about supported server platforms for Moves, see [Section 9.1.2, "Supported Combinations for Moving Volumes," on page 74](#). For information about supported server platforms for Splits, see [Section 9.1.3, "Supported Combinations for Splitting Volumes," on page 75](#).

14.8.7 Failed: Log File Problem

The Move or Split job failed because a log file cannot be created or DFS cannot write to it. DFS tracks files that are open when SMS attempts to back them up and tries again to back them up later in the process. The process fails because it needs the log file to identify which files to retry to move.

14.8.8 Failed: Login

The Move or Split failed because the supplied user name and password were invalid.

To avoid this problem, make sure you have the necessary rights and permissions to move files on the original volume and the new volume.

If the volumes on different servers, the administrator username and password you use when you log in to iManager to create the job must be valid on both servers.

By default, usernames are case sensitive on Linux, but they are case insensitive on NetWare. Login fails if you are using the what appears to be the same username, but it is treated differently on the two platforms. To avoid this problem, make sure to create usernames in lowercase.

14.8.9 Failed: No Management Context

The server where the original volume exists is not contained in a DFS Management context. Move and Split are DFS operations, and require the original and destination servers to be in the same DFS Management context.

Define a management context that includes both servers, allow time for the VLDB to be built, then try again.

14.8.10 Failed: Wrong Management Context

The original server and the new server specified in a Move or Split job are in different DFS Management contexts. This is not allowed.

Define a management context that includes both servers, allow time for the VLDB to be built, then try again.

15 Troubleshooting DFS

This section describes some issues you might experience with Distributed File Services, and provides suggestions for resolving or avoiding them.

- ◆ [Section 15.1, “Adding Replica Site to the New Management Context Fails with an eDirectory - 603 Error,” on page 143](#)
- ◆ [Section 15.2, “NetStorage Does Not Resolve a DFS Junction If Both OES 2015 or Later Server and NetWare VLDB Replicas are Present in a Management Context.,” on page 144](#)
- ◆ [Section 15.3, “DFS may not function properly after upgrading NSS on OES 2 and later.,” on page 144](#)
- ◆ [Section 15.4, “Cannot Delete DFS Management Context by Using iManager,” on page 144](#)
- ◆ [Section 15.5, “Cannot Re-Create a DFS Management Context on a Container,” on page 145](#)
- ◆ [Section 15.6, “Errors Using DFS on an Upgraded OES 11 Server or Later,” on page 146](#)
- ◆ [Section 15.7, “Junctions Are Broken After a Volume Object Update,” on page 146](#)
- ◆ [Section 15.8, “Junctions Are Broken After Deleting and Re-Creating an NCP Volume,” on page 147](#)
- ◆ [Section 15.9, “Move Volume or Split Volume Job Fails to Start,” on page 147](#)
- ◆ [Section 15.10, “Users Cannot See Directories or Files on the Target Location,” on page 147](#)
- ◆ [Section 15.11, “VLDB Stops Working After Renaming the O or OU Container for a DFS Management Context,” on page 147](#)
- ◆ [Section 15.12, “The State of a Move Volume or Split Volume Job in a Cluster Environment is Scheduled,” on page 148](#)

For additional troubleshooting information, see the [OpenText Knowledgebase \(http://support.novell.com\)](http://support.novell.com).

NOTE: Micro Focus is now OpenText.

15.1 Adding Replica Site to the New Management Context Fails with an eDirectory -603 Error

Using iManager, replica site is not added to the newly created management context because admin user has insufficient rights.

To resolve this issue, ensure that the admin user has sufficient rights (create, read,write,access, modify, and erase) on the container to be made as a management context.

15.2 NetStorage Does Not Resolve a DFS Junction If Both OES 2015 or Later Server and NetWare VLDB Replicas are Present in a Management Context.

NetStorage fails to resolve a DFS junction if the target volume's Management Context has both NetWare and OES 2015 or later server VLDB replicas.

Junction resolution works if either one of the VLDB replicas is deleted.

15.3 DFS may not function properly after upgrading NSS on OES 2 and later.

DFS is delivered as a part of the NSS rpm on the OES 2 and later versions. When you upgrade NSS, the DFS binaries are automatically upgraded. After the upgrade, for DFS to function properly, you must restart the daemons in the following order:

- 1 jstcpd
- 2 adminusd
- 3 volmnd
- 4 (Optional) Restart vldb, if the server is a VLDB replica.

All the above binaries are located in the `/opt/novell/nss/sbin` directory.

15.4 Cannot Delete DFS Management Context by Using iManager

If you have selected a cluster pool as a DFS replica and it gets corrupted, the management context and the replica cannot be deleted.

When a DFS management context is created on an O or OU container object, two attributes are added to its container object in eDirectory:

- ♦ **DFS-VLDB-Hosts:** Contains a list of the replica servers for the management context.
- ♦ **VLDB-Backend-ID:** Contains the filename used for the VLDB, which is `vdqad`.

To resolve this issue, do the following:

- 1 Using iManager, delete the attributes: DFS-VLDB-Hosts and VLDB-Backend-ID from the O or OU container.
 - 1a Using iManager, select **Directory Administration > Modify Object**.
 - 1b Specify the container that is located in the DFS management context.
 - 1c Click **General > Other** to display the Attributes.
 - 1d From the **Valued Attributes**, select DFS-VLDB-Hosts, click **Delete**, then **OK**.
 - 1e From the **Valued Attributes**, select VLDB-Backend-ID, click **Delete**, then **OK**.
- 2 If the VLDB process is running on the replicas, kill the process.
 - 2a To get the process id of vldb, execute the following command:

```
ps -aef | grep vldb
```

2b Kill the process id received in [Step 2a](#).

The DFS management context is deleted.

15.5 Cannot Re-Create a DFS Management Context on a Container

When attempting to create a DFS management context on a container that had previously been a management context, you might get the following error:

```
Error: Storage Error
```

```
servername.ou_context.o_context: Could not add the replica site to the new management context. -603 - eDirectory Error - Object attribute does not exist.
```

This error can occur if you previously deleted a DFS management context with multiple VLDB replicas. It is related to NetIQ eDirectory synchronization and occurs randomly.

When a DFS management context is created on an O or OU container object, two attributes are added to its container object in eDirectory:

- ♦ **DFS-VLDB-Hosts:** Contains a list of the replica servers for the management context.
- ♦ **VLDB-Backend-ID:** Contains the filename used for the VLDB, which is `vldb` for this release.

When you delete the management context, if an eDirectory synchronization happens to be interrupted for any reason, the DFS-VLDB-Hosts attribute is deleted but the VLDB-Backend-ID is not. When you next try to create a management context again on the same container, the service finds the VLDB-Backend-ID attribute and assumes it is already a management context. Then it tries to add the replica servers to the DFS-VLDB-Hosts attribute, which it expects to be present. When it does not find the attribute, it returns a -603 eDirectory error.

To resolve this problem you should remove the old VLDB-Backend-ID attribute, then try again to create the DFS management context.

To remove the old VLDB-Backend ID attribute from the O or OU container:

- 1 In iManager, select **Directory Administration > Modify Object**.
- 2 Select the O or OU container that you chose for the DFS management context.
- 3 Click **General > Other** to display the Attributes.
- 4 From the **Valued Attributes**, select VLDB-Backend-ID, click **Delete**, then **OK**.

Now you should be able to create a DFS management context on the container.

15.6 Errors Using DFS on an Upgraded OES 11 Server or Later

After upgrading from OES 2 Linux to OES 11 or later server, errors occur when trying to use DFS on the upgraded server.

The `/var/opt/novell/dfs` is the default location for the VLDB database files. It is automatically created during a fresh install, and should also be automatically created for an upgrade. The DFS plugin to NetIQ iManager assumes that the default directory exists and does not create it for you if you accept the default location when using the server as a DFS replica site. Because the path does not exist, the VLDB initialization process fails, and the VLDB file is not created.

To resolve this problem:

- 1 Create the `/var/opt/novell/dfs` directory as the `root` user, and set its POSIX permissions to mode 755 (`rxwxr-xr-x`).
- 2 In iManager, remove the server as a replica site, then add the server as a replica site to create the VLDB on this server.
- 3 If removing and adding the server as a DFS replica site does not cause the VLDB to be created, you can force the file to be created by reinitializing the database using the `vldb -init` command.

WARNING: Before you use the `-init` option, see [Section A.1.4, “Hidden VLDB Command,”](#) on page 158.

Enter the following command at a terminal console prompt as the `root` user:

```
vldb -init
```

- 4 Go to the `/var/opt/novell/dfs` directory, and verify that the database file was created.
- 5 Start the VLDB services.

15.7 Junctions Are Broken After a Volume Object Update

In very rare cases, it is possible that a volume's DFS GUID for a volume needs to be regenerated after a Volume object is updated, causing junctions that point to the volume to be broken.

For NSS volumes, the DFS GUID for a volume is stored as an attribute of the Volume object and in the `~DFSINFO.8-P` file in the root directory of the volume. If the old Volume object and the `~DFSINFO.8-P` file are not present when you perform the Update eDirectory option for an NSS pool or volume, then the Volume object is created without a DFS GUID.

If junctions are broken after updating a Volume object, run a VLDB repair or add an entry (available on Linux only) to the VLDB to generate a DFS GUID for the volume. Afterwards, you must delete and re-create the junctions that point to the volume so the junctions can pick up the volume's new DFS GUID.

15.8 Junctions Are Broken After Deleting and Re-Creating an NCP Volume

If you delete an NCP volume, the Volume object is deleted from eDirectory. The existing entry in the VLDB is invalid because the Volume object no longer exists. Junctions that point to the volume are broken. Re-creating the NCP volume cannot fix the broken junctions.

If you re-create the NCP volume, a new Volume object is created. The first time that you add an entry for the volume to the VLDB (using the `vldb add` command or running a VLDB repair), a new DFS GUID is automatically generated for the Volume object. In the initial OES 11 release and earlier, the `~DFSINFO.8-P` file is not used for NCP volumes and is not stored at the root directory of the volume. Therefore, the old DFS GUID is unknown to DFS and cannot be re-used.

If you delete and re-create an NCP volume, you must delete and re-create the junctions that point to the volume so the junctions can pick up the new DFS GUID.

15.9 Move Volume or Split Volume Job Fails to Start

When moving or splitting a volume to a volume located on a different server, the administrator username and password must be valid on both servers. Otherwise, the **Move Volume** or **Split Volume** job fails.

Two possible causes of invalid matches are:

- ♦ The administrator username that you used to log in to iManager and the original server is not configured for access on the destination server.
- ♦ There is a case mismatch between the usernames, and the destination server is a Linux server, where usernames are case-sensitive.

15.10 Users Cannot See Directories or Files on the Target Location

If users cannot see the directories or files on the target location, you probably need to set the file system trustees and trustee rights on the junction and on the junction target location. Users need at least the Read and File Scan rights for visibility into the directory structure and can be done by modifying the junction page. For more information refer, [Section 11.9, “Modifying Trustee Rights for the Junction,” on page 109.](#)

15.11 VLDB Stops Working After Renaming the O or OU Container for a DFS Management Context

After the DFS management context is configured, DFS does not monitor eDirectory for changes to the name or for the existence of the O or OU container. If you change the name of the container or if you delete and replace the container, the DFS management context stops working because its

configuration does not match with the information in eDirectory. The VLDB is broken, and junctions that point to volumes in that container are broken. This failure occurs even if you eventually change the name back to the original name of the O or OU container. A VLDB repair cannot fix this problem.

To avoid this problem, do not rename or delete and replace an O or OU container after you create a DFS management context.

To resolve this problem, you must delete the existing DFS management context, then create a new DFS management context for the modified container.

15.12 The State of a Move Volume or Split Volume Job in a Cluster Environment is Scheduled

If the source server is an OES 2 SP3 server or later and the source volume is a shared volume: The move or split might get scheduled if the DFS Volume Manager is unable to locate the source volume.

On the source server, check the `/var/log/messages` file for more information. If the message, “Failed to find source volume ” is present for the job ID, perform the following:

- 1 Open a terminal console on the source server, then log in as the `root` user.
- 2 At the terminal console prompt, unload tsafs by entering the following command:

```
smsconfig -u tsafs
```

- 3 Load the tsafs by entering the following command:

```
smsconfig -l tsafs --showclustervolumesonnode
```

If the target server is an OES 2 or later server and the target volume is a shared volume: The move or split operation might get scheduled if the DFS Volume Manager is unable to find the target volume.

On the source server, check the `/var/log/messages` file for more information. If the message, “Failed to find target volume ” is present for the job ID, reload tsafs on the node on which the target volume is currently active:

- 1 Open a terminal console on the target server, then log in as the `root` user.
- 2 At the terminal console prompt, unload tsafs by entering the following command:

```
smsconfig -u tsafs
```

- 3 At the terminal console prompt, enter

```
smsconfig -l tsafs
```

16 Known Issues

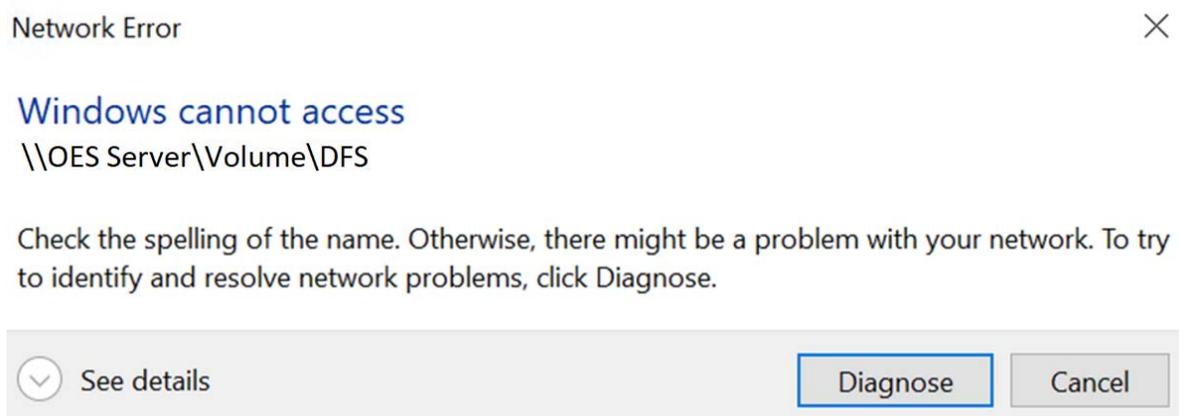
This section describes some known issues you might experience with Distributed File Services.

- Section 16.1, “Windows Cannot Access Error,” on page 149
- Section 16.2, “CIFS eDir User can Access Non-OES Windows Target DFS Junction,” on page 150
- Section 16.3, “Non-OES Target Validation Errors,” on page 150
- Section 16.4, “NCP Clients Issues,” on page 150
- Section 16.5, “iManager Issues,” on page 150
- Section 16.6, “Browsing NSS Volume in iManager Does Not List Non-OES Junction,” on page 150
- Section 16.7, “DFS Scan Junction Fails to Work on Non-Replica VLDB Servers,” on page 151
- Section 16.8, “DFSTOOL Unable to List DFS Junction Pointing to Multiple Targets,” on page 151
- Section 16.9, “RME must be Configured for DFS Junction Pointing to Multiple Targets,” on page 151
- Section 16.10, “DFS Junction Pointing to Non-OES Target using Windows Domain Name,” on page 151
- Section 16.11, “DFSTOOL Unable to Validate Special Character in the Share Name,” on page 151
- Section 16.12, “DFSTOOL Encryption Error,” on page 151
- Section 16.13, “DFSTOOL List Issue,” on page 151

16.1 Windows Cannot Access Error

A permission denied error will appear for the user if Windows SMB Share or Windows Server are not available, or no trustee rights are available for the Windows SMB Share.

Figure 16-1 Error Message



16.2 CIFS eDir User can Access Non-OES Windows Target DFS Junction

If the Active Directory administrator permissions are granted to Windows share, the CIFS eDirectory user can access the DFS junction on the non-OES Windows target DFS junction.

16.3 Non-OES Target Validation Errors

In case of any non-OES target validation errors, use `-i` option to establish the non-OES junction without verifying the existence of the target server or share:

- ♦ `dfstool -c /media/nss/VOL1/dir1/junc1 -t target_server_or_ip_address/share_name/path_to_target_folder -T non-oes -i`

(or)

```
dfstool -c /media/nss/VOL1/dir1/junc1 -t target_server_or_ip_address/share_name/path_to_target_folder -T non-oes --ignore-targetpath-check
```

- ♦ `dfstool -m /media/nss/VOL1/dir1/junc1 -t target_server_or_ip_address/share_name/path_to_target_folder -T non-oes -i`

(or)

```
dfstool -m /media/nss/VOL1/dir1/junc1 -t target_server_or_ip_address/share_name/path_to_target_folder -T non-oes --ignore-targetpath-check
```

16.4 NCP Clients Issues

- ♦ NCP client does not list non-OES targets.
- ♦ For DFS junction, the NCP client is unable to list all multiple targets. In a failover scenario, the NCP client cannot use the other target if one of the targets is unavailable as the NCP clients always points to the first target path.

16.5 iManager Issues

- ♦ iManager manage junction is unable to list DFS junctions that point to multiple targets.
- ♦ If an NSS volume has both OES and a non-OES junction, iManager junction scan lists only OES junctions. So, to view non-OES junctions, you must use `dfstool`.

16.6 Browsing NSS Volume in iManager Does Not List Non-OES Junction

When browsing through the NSS volume for modifying or deleting DFS junction, iManager does not list non-OES Windows junction target and only displays the OES junction.

16.7 DFS Scan Junction Fails to Work on Non-Replica VLDB Servers

Using the `dfstool` command, scan junction fails to work on non-replica VLDB servers and throws an error.

16.8 DFSTOOL Unable to List DFS Junction Pointing to Multiple Targets

`dfstool scan` or `list junction` is unable to list DFS junctions that point to multiple targets.

16.9 RME must be Configured for DFS Junction Pointing to Multiple Targets

Cluster migrating a resource (which has a first target path) to another server (which has a second target path) followed by "vldb repair" would result in only one active target path until the user configures Resource Mutual Exclusion (RME).

16.10 DFS Junction Pointing to Non-OES Target using Windows Domain Name

- If you have configured Windows DFS root namespace, you can create a DFS junction pointing to DFS root namespace or folder under the root namespace.
- If you have not configured DFS Root Namespace, you cannot access the DFS junction target.

16.11 DFSTOOL Unable to Validate Special Character in the Share Name

`dfstool` does not validate the special characters (`$$`, `$!`) appended to the share name and creates junction successfully.

16.12 DFSTOOL Encryption Error

`dfstool` throws an encryption issue even though the junction is successfully created when creating a junction with Netapp shares using the `-A` option.

16.13 DFSTOOL List Issue

When using DFS Namespace to generate a non-OES junction, `DFSTOOL` incorrectly lists the non-OES junction target path because DFS Namespace is appended before the SMB target share.

Junction Name	Source Server	Source Path	Target Server	Target Path	Management Context	Status
junc1	OESserver	Vol1:/ nonoes/	Windows_do main	DFSnamespace:/ Winshare1/	*NA*	Available
junc2	OESserver	Vol1:/ nonoes/	Windows_do main	DFSnamespace:/ Winshare1/dir1	*NA*	Available

17 Security Considerations

This section describes security issues and recommendations for Distributed File Services for Open Enterprise Server. It is intended for security administrators or anyone who is using DFS and is responsible for the security of the system. It requires a basic understanding of DFS, the Storage Services (NSS) volumes, and NCP volumes on Linux. It also requires the organizational authorization and the administrative rights to effect the configuration recommendations.

- ♦ [Section 17.1, “VLDB File,” on page 153](#)
- ♦ [Section 17.2, “TCP Port 6901,” on page 153](#)
- ♦ [Section 17.3, “Move and Split Job Crash Persistence,” on page 153](#)
- ♦ [Section 17.4, “Creating DFS Junctions on Encrypted NSS Volumes,” on page 154](#)
- ♦ [Section 17.5, “Moving or Splitting Encrypted NSS Volumes,” on page 154](#)
- ♦ [Section 17.6, “~DFSINFO.8-P File,” on page 154](#)

17.1 VLDB File

For Linux, the VLDB (volume location database) back-end database file is `/var/opt/novell/dfs/vldb.dat`. The file is owned by the code-specified DFS user, which is the `root` user. The DFS code sets POSIX access rights for the file as mode 644. This should not be modified by the administrator.

Whenever the VLDB is updated, it makes a copy of `vldb.dat` called `vldb.bak`. Its access rights are set by the code and should not be modified by the administrator.

17.2 TCP Port 6901

DFS uses JetStream for interprocess communications by DFS modules. JetStream uses an unregistered TCP port 6901 (0x1AF5). This port assignment is not configurable. Using DFS through a firewall requires this port to be opened by the network administrator.

17.3 Move and Split Job Crash Persistence

The **Move Volume** and **Split Volume** jobs require a username and password when they are started. To permit automatic restarting of crashed operations, the username and password are stored (in encrypted form) in the job state database. The DFS Volume Manager keeps job state information in two files, named `volmchk.dat` and `volmch2.dat`. The files are stored in the `/var/opt/novell/dfs/` directory.

The NICI calls `LSSProtect` and `LSSUnprotect` are used for the encryption, and the username and password are encrypted as a single field. The use name and password are stored in encrypted form both in memory and on disk, and only decrypted (into a temporary buffer) when needed.

17.4 Creating DFS Junctions on Encrypted NSS Volumes

We strongly advise against creating a situation where encrypted and nonencrypted volumes are paired in the junction-to-target relationship. If you create a DFS junction on an encrypted NSS volume, the target volume should also be an encrypted NSS volume. Otherwise, the data on the target location is not stored encrypted, and the data is not secure.

WARNING: When creating DFS junctions, make sure the source and target volumes are either both encrypted or both nonencrypted.

17.5 Moving or Splitting Encrypted NSS Volumes

We strongly advise against using the **Move Volume** or **Split Volume** tasks for encrypted NSS volumes because of the following security considerations:

- ♦ You can move or split data only to a newly created NSS volume. NSS encrypted volume support is available only for volumes created in NSSMU, so the target volume is necessarily an NSS volume that is not encrypted.
- ♦ The data is transferred nonencrypted from the encrypted NSS volume to the nonencrypted target volume where the data is stored nonencrypted.

WARNING: If you use the **Move Volume** or **Split Volume** tasks on an encrypted NSS volume, the relocated data is stored nonencrypted in its new location. It is no longer secure.

17.6 ~DFSINFO.8-P File

Whenever you create an NSS volume with NSS management tools, NSS automatically generates a DFS GUID and writes it as an attribute in the volume object and in the `~DFSINFO.8-P` file located in the root directory of the volume. The file is used to restore a DFSGUID for the volume during a VLDB repair in a rare occurrence that the information has been lost in eDirectory.

Any trustee with Read and File Scan rights at the root of an NSS volume can see this file. It also shows up if you point any junction at the root of a volume, because this file is present for all NSS volumes. You can remove Read and File Scan rights to the file for users who you do not want to see the file.

This file is only visible on NSS volumes on OES Linux.

A

DFS Commands and Utilities

This section describes the Distributed File Services command line instructions and utilities that are available for Open Enterprise Server (OES).

- ♦ [Section A.1, “VLDB,” on page 155](#)
- ♦ [Section A.2, “VOLMN,” on page 158](#)
- ♦ [Section A.3, “DFSTOOL,” on page 159](#)

For information about NSS file system commands and utilities, please refer to “[NSS Commands](#)” and “[NSS Utilities](#)” in the *Storage Services File System (NSS) Administration Guide for Linux*.

A.1 VLDB

- ♦ [Section A.1.1, “Managing the VLDB Service,” on page 155](#)
- ♦ [Section A.1.2, “Managing VLDB Entries,” on page 156](#)
- ♦ [Section A.1.3, “Repairing the VLDB,” on page 158](#)
- ♦ [Section A.1.4, “Hidden VLDB Command,” on page 158](#)

A.1.1 Managing the VLDB Service

Use the `vldb` command options in [Table A-1](#) to manage the VLDB service and VLDB file for a DFS replica server. For Linux, make sure you are logged in as the `root` user or equivalent in the terminal console.

Table A-1 DFS Volume Location Database (*vldb*) Commands

Options	Description
<code>vldb help</code>	Display a list of available VLDB commands.
<code>vldb start service</code>	Resume operation of the VLDB.
<code>vldb stop service</code>	Suspend operation of the VLDB.
<code>vldb exit</code>	Terminate the Volume Location Service on this machine.
<code>vldb status</code>	Display the current status of the Volume Location Service.
<code>vldb context</code>	Display this VLDB server's management context.

Options	Description
For Linux cluster load scripts: <code>vldb -dir /vldbpath</code>	Start the VLDB service for the Novell Cluster Services cluster of the VLDB services for a DFS management context. Replace <code>vldbpath</code> with the path to the VLDB file. The path must exactly match what you entered for the DFS management context. Add this command to the cluster load script. Make sure the volume that contains the VLDB is mounted before issuing the command.
<code>vldb refresh</code>	Update the VLDB entries from the other VLDB server.

A.1.2 Managing VLDB Entries

For VLDB replica sites on OES 2 or later servers, the additional commands in [Table A-2](#) are available to manually add volume entries to or delete volume entries from the VLDB database for a single volume at a time without having to run the `vldb repair` command. Using these commands to manually add and delete entries can be faster than running `vldb repair`, particularly when you have a large tree but only a few entries that need to be modified. If you have a second replica site, the changes you make in one replica site are automatically synchronized to the second VLDB. The second VLDB replica site can be NetWare or Linux.

To issue these commands:

- ◆ The VLDB service must be running on the replica site.
- ◆ You must be logged in as the `root` user or equivalent in the terminal console on the Linux replica site.

The action results and errors are displayed on the console from which the operation is done, and are written to the `/var/log/messages` file.

Table A-2 Additional DFS Volume Location Database (`vldb`) Commands for Linux

Options	Description
<code>vldb list</code>	Display a list of the in-memory VLDB entries for the currently running VLDB. Displays the server name, volume name, and volume GUID for each volume entry.

Options	Description
<p><code>vldb add <i>VolumeFDN</i></code></p> <p>NOTE: For OES 2 SP1, the syntax is</p> <p><code>vldb add <i>svrname volname</i></code></p>	<p>Add an entry for the specified volume to the in-memory entries of the VLDB database, then synchronize the change to the VLDB file on the disk.</p> <p>The specified volume must have a Volume object in the eDirectory tree, and be in the management context. If the volume's eDirectory Volume object already contains a DFS GUID attribute, this GUID is used for the entry in the VLDB. Otherwise, this command automatically generates a DFS GUID for the volume, then stores the GUID as an attribute of the Volume object and uses it for the entry in the VLDB.</p> <p>This command requires eDirectory authentication. The command prompts for the valid administrator username and password of the user who has sufficient rights in eDirectory to update the attributes of Volume objects. Enter the username in typeless fully distinguished format (username.ou_context.o_context, such as admin.eur.company). After successful authentication, the operation is performed.</p> <p>For example on OES 2 SP2 or later, enter</p> <pre>vldb add .server2_VOL1.mycompany.TREENAME.</pre> <p>This command adds an entry for VOL1 on server2.mycompany.TREENAME to the VLDB database.</p> <p>For example on OES 2 SP1, enter</p> <pre>vldb add .server2.mycompany.TREENAME. VOL1</pre> <p>This command adds an entry for VOL1 on server2.mycompany.TREENAME to the VLDB database.</p>
<p><code>vldb delete <i>vol_dfsguid</i></code></p>	<p>Delete an entry for the specified volume from the in-memory entries of the VLDB database, then synchronize the change to the VLDB file on disk. The delete operation only removes the entry from the database. It does not modify or delete the DFS GUID attribute for the volume's Volume object in eDirectory. It does not delete the Volume object from eDirectory.</p> <p>Replace <i>vol_dfsguid</i> with the DFS GUID of the volume as it appears in the report results of the <code>vldb list</code> command. For example, enter (all on the same line, of course)</p> <pre>vldb delete 0x6affb60fdc56dc01800174685ff0d412</pre> <p>IMPORTANT: Deleting the volume entry from the VLDB disables any junction resolution for junctions that target this volume.</p> <p>If you later run a VLDB repair in the DFS management context, the repair discovers all volumes with Volume objects in eDirectory that are in the management context. It is possible for deleted entries to be added back to the VLDB.</p>

A.1.3 Repairing the VLDB

Use the `vldb` command options in [Table A-3](#) to repair the VLDB service and VLDB file for a DFS replica server. For Linux, make sure you are logged in as the `root` user or equivalent in the terminal console.

Table A-3 DFS Volume Location Database (*vldb*) Repair Commands

Options	Description
<code>vldb repair</code>	<p>Walk the eDirectory tree to rebuild the VLDB by adding the DFS GUID for all volumes with a Volume object in the DFS management context.</p> <p>You must run the command from the server console to allow a username and password to be entered that is valid across multiple containers and management contexts.</p> <p>Make sure you perform this task as an admin user with sufficient rights to access the necessary objects in the tree. Otherwise, VLDB Repair cannot scan the entire tree within the DFS management context, and the repair affects only those areas where you have sufficient rights. Problems that occur as a result of logging in with a username with insufficient rights (and any other errors such as crashed servers or eDirectory problems) are logged in the repair log. Administrators should review the repair log to look for errors.</p> <p>Review the repair log to look for VLDB repair errors:</p> <pre>/var/opt/novell/log/dfs/vlrpr.log</pre>
<code>vldb cancel repair</code>	Stop a running repair operation.

A.1.4 Hidden VLDB Command

When you create a DFS management context, on the first time that the VLDB service is loaded, the `vldb` command will run with the `-init` flag (`vldb -init`) in order to create a new, empty VLDB. This is done automatically by the DFS configuration tools, not by the administrator.

The `-init` option is generally never used by the administrator unless instructed to do so by Novell Support. The `-init` option must be issued at the command line in the event that the VLDB file becomes corrupt and the VLDB service cannot be restarted. The VLDB service refuses to load if it finds a corrupt database, so there is no opportunity to repair the VLDB unless the `-init` flag is specified.

A.2 VOLMN

Use the DFS Volume Manager (`volmn`) command to display the current status of the DFS Volume Manager module and its jobs. For Linux, make sure you are logged in as the `root` user or equivalent in the terminal console.

Table A-4 DFS Volume Manager (volmn) Command

Options	Description
volmn status	Display the Operation ID, type of operation, source volume, and status of all Volume Manager move and split operations on this server.
volmn list <opID>	Display a list of files skipped by the specified operation.
volmn pause <opID>	Pause the specified running operation.
volmn resume <opID>	Resume the specified paused operation.
volmn cancel <opID>	Cancel the specified operation.
volmn help	Display a list of commands.

A.3 DFSTOOL

- ♦ [Section A.3.1, “Managing DFS Operations,” on page 159](#)

A.3.1 Managing DFS Operations

dfstool is a command line utility for managing DFS operations. Make sure you are logged in as the root user in the terminal console.

Table A-5 Operations supported by DFSTOOL

Parameters	Description
dfstool -c	Create junction.
dfstool -d	Delete junction.
dfstool -m	Rename the junction name and modify the target path.
dfstool -s	List the scan details of the selected volume.
dfstool -l	Provide you a list of junctions inside the volume after the scan is completed.
dfstool -M	Move an NSS volume to another existing NSS volume.
dfstool -S	Split part of a volume’s file structure and data, from a volume to another new or an existing volume in the same DFS management context.
dfstool -C	Create DFS Management Context.
dfstool -D	Delete DFS Management Context.

Parameters	Description
<code>dfstool -R</code>	<p>Repair the VLDB service for a DFS replica server. Accepts an optional repair level as input.</p> <ul style="list-style-type: none"> ◆ Rebuild: This is the default level. When you rebuild a database, the VLDB service walks the eDirectory tree, looks at volume and server objects, and then completely rebuilds the database from scratch. ◆ Lowlevel: This is an additional level. This repair option restores the last saved copy of the database. ◆ Refresh: This is an additional level. The VLDB service gets a copy of the database from another server that is currently running the service.
<code>dfstool --start-vldb</code>	Start the VLDB service.
<code>dfstool --stop-vldb</code>	Stop the VLDB service.
<code>dfstool --activate-vldb</code>	Activate the VLDB service.
<code>dfstool --deactivate-vldb</code>	Deactivate the VLDB service.
<code>dfstool -L</code>	<p>View information about the VLDB service. Accepts an optional information type as input.</p> <ul style="list-style-type: none"> ◆ Basicinfo: This is the default level. Display the basic information about the VLDB service. ◆ Statistics: This is an additional level. Display the statistical information about the VLDB service. ◆ Repair: This is an additional level. Display information about the currently running repair operation (if any) and the most recently completed repair operation. ◆ Complete: This is an additional level. Display a complete report related to the VLDB service.
<code>dfstool --job-list</code>	List all volume jobs.
<code>dfstool --pause-job</code>	Pause the running volume job. To add a comment, use the <code>--pause-comment</code> option.
<code>dfstool --resume-job</code>	Resume the volume job that is currently in the Pause state.
<code>dfstool --cancel-job</code>	<p>Delete the volume job.</p> <p>Cancels a job before it starts or at a specific point in the move or split process. If the process has progressed past a particular point, it returns an error message to prevents you from deleting the process.</p> <p>If the deletion continues, it stops the job at the next convenient phase in the process but does not clean up. The target volume still exists, and it contains all of the files that were copied there before you deleted the task. Deleted jobs are displayed in the status report for one week by default.</p>
<code>dfstool --reschedule-job</code>	Reschedule the volume job to a specified date and time using the <code>--start-time</code> option.

Parameters	Description
<code>dfstool --list-skippedfiles</code>	List the skipped files for a particular job where the status is in <code>filesskipped</code> .

Table A-6 DFSTOOL Command Options

Options	Description
<code>-v, --version</code>	Display the program version information.
<code>-h, --help</code>	Displays the help screen.
<code>-A, --auth-targetpath-check</code>	Check for target path existence for non OES targets by authentication.
<code>-n, --name</code>	Enter a new name for the junction.
<code>-T, --target-type</code>	Add a new target type which can be either OES or non-OES. The default option is OES.
<code>-t, --target</code>	Target of a junction. The format is <code>volumeName[/path/to/directory]</code> for oes targets and <code>serverName/SMBShare/path/to/directory</code> for non-oes targets.
<code>-u, --username</code>	Enter the username. If you do not specify a username, you will be prompted to enter one.
<code>-p, --password</code>	Enter the password. If you do not specify a password, you will be prompted to enter a password.
<code>-H, --no-header</code>	Does not display the header and the footer when displaying the junctions in the table format.
<code>-i, --ignore-targetpath-check</code>	Ignore the validation of target path existence for non OES targets.
<code>-j, --json</code>	List of junctions in JSON format.
<code>-P, --vldbpath</code>	Enter a VLDB path. The default path is <code>/var/opt/novell/dfs</code> .
<code>--start-time</code>	Specify the time to start the move or split job. The input format is <code>YYYYMMDDHHMMSS</code> .
<code>--pause-comment</code>	Specify the comment for the <code>--pause-job</code> option. This parameter is optional.
<code>--target-server</code>	Name of the target server. This can be either FQDN or short name. <ul style="list-style-type: none"> ◆ FQDN: Ensure to add period at the beginning and at the end of the target server. Example: <code>.serverName.context.treeName</code>. ◆ Short Name: No period or tree details is required here. Example: <code>serverName.context</code>. <p>Use this option if you need the target volume from a certain OES server but you have two or more volumes with the same name on separate OES servers.</p>

B DFS Modules

Distributed File Services consists of the software modules listed in this section.

- ♦ [Section B.1, “DFS VLDB Modules,” on page 163](#)
- ♦ [Section B.2, “DFS Volume Manager Module,” on page 163](#)
- ♦ [Section B.3, “DFS Remote Procedure Calls Modules,” on page 163](#)
- ♦ [Section B.4, “DFS Library Modules,” on page 164](#)
- ♦ [Section B.5, “JetStream Modules,” on page 164](#)

B.1 DFS VLDB Modules

vldb

The main module for the VLDB. It is responsible for loading the dependent modules. Runs as a daemon. It also processes console commands.

vlmsg

The message layer. It receives requests through JetStream, processes them, and sends replies.

vdqad

The implemented back-end database.

vlrpr

The module that repairs a VLDB by walking the eDirectory tree.

B.2 DFS Volume Manager Module

volmn

The main module for the DFS Volume Manager. Runs as a daemon. Also processes console commands.

B.3 DFS Remote Procedure Calls Modules

vlrpc

Used to make remote procedure calls to the VLDB. Runs as a daemon.

vmrpc

Used to make remote procedure calls to the DFS Volume Manager.

B.4 DFS Library Modules

libdfs

DFS shared library that provides some common low-level functions.

libmcinfo

DFS shared library that provides common code to locate a DFS management context.

B.5 JetStream Modules

jsmsg

Application interface. Contains the APIs called by services that make use of JetStream, such as the VLDB.

jstcp

Transport module. Provides the interface between the jsmsg module and the Berkeley sockets transport interface

C Error Code List

This section lists the error codes for the VLDB module on a Open Enterprise Server (OES) server.

- ♦ [Table C-1, “VLDB Error Codes,” on page 165](#)
- ♦ [Table C-2, “VLRPC Error Codes,” on page 166](#)
- ♦ [Table C-3, “VLDB Repair Error Codes,” on page 166](#)
- ♦ [Table C-4, “Back-end Database plug-in Error Codes,” on page 166](#)

Table C-1 VLDB Error Codes

Value	Option	Description
0	VLDB_SUCCESS	Successful
-2	VLDB_ERR_INVALID_PARAMETERS	Invalid parameters
-3	VLDB_ERR_REQUEST_WAS_ABORTED	Request was aborted
-4	VLDB_ERR_DATABASE_IS_CORRUPT	Volume Location Database is corrupt
-5	VLDB_ERR_INSUFFICIENT_RIGHTS	Insufficient rights to perform the operation
-6	VLDB_ERR_TRANSACTION_NOT_FOUND	Transaction not found
-7	VLDB_ERR_COULD_NOT_CANCEL	Could not cancel the operation
-8	VLDB_ERR_NO_MORE_ENTRIES	No more entries
-9	VLDB_ERR_ENTRY_NOT_FOUND	Entry not found in the Volume Location Database
-10	VLDB_ERR_ENTRY_ALREADY_EXISTS	Entry already exists in the Volume Location Database
-11	VLDB_ERR_INVALID_OPCODE	Invalid opcode
-12	VLDB_ERR_OPERATION_NOT_SUPPORTED	Operation is not supported
-13	VLDB_ERR_INSUFFICIENT_RESOURCES	Insufficient resources
-14	VLDB_ERR_MAX_SERVERS_EXCEEDED	Management context already has the maximum number of VLDB servers allowed
-15	VLDB_ERR_SERVICE_IS_STOPPED	VLDB service is stopped
-16	VLDB_ERR_SERVICE_IS_NOT_STOPPED	VLDB service is not stopped
-17	VLDB_ERR_DATABASE_UNDER_REPAIR	Volume Location Database is under repair
-18	VLDB_ERR_DATABASE_NOT_UNDER_REPAIR	Volume Location Database is not under repair
-19	VLDB_ERR_IMPOSSIBLE	Impossible

Value	Option	Description
-20	VLDB_ERR_NOT_ALL_ENTRIES_DELETED	Not all entries were deleted
-21	VLDB_ERR_INVALID_INCARNATION_NUMBER	Invalid incarnation number
-31	VLDB_ERR_SERVER_NOT_IN_MC	Server is not in the specific management context

Table C-2 VLRPC Error Codes

Value	Option	Description
-1000	VLDB_ERR_NO_MANAGEMENT_CONTEXT	No management context
-1001	VLDB_ERR_CANNOT_CONNECT	Cannot connect to the VLDB service
-1002	VLDB_ERR_CANNOT_DISCONNECT	Cannot disconnect from the VLDB service
-1003	VLDB_ERR_NDS_ERROR	eDirectory operation failed
-1004	VLDB_ERR_CANT_LOGIN_AS_SERVER	Cannot login as server
-1005	VLDB_ERR_REQUEST_TIMED_OUT	Request is timed out
-1006	VLDB_ERR_SERVICE_IS_NOT_RUNNING	VLDB service is not running

Table C-3 VLDB Repair Error Codes

Value	Option	Description
-2000	VLDB_ERR_CANT_CONNECT_TO_HIGHER_LEVEL_VLDB	Cannot connect to the higher level VLDB
-2001	VLDB_ERR_CANT_READ_HIGHER_LEVEL_VLDB	Cannot read the higher level VLDB

Table C-4 Back-end Database plug-in Error Codes

Value	Option	Description
-3000	VLDB_ERR_NO_SUCH_DATABASE	No such database
-3001	VLDB_ERR_OUT_OF_DISK_SPACE	Out of disk space
-3002	VLDB_ERR_RECORD_IS_LOCKED	Record is locked
-3003	VLDB_ERR_RECORD_NOT_LOCKED	Record is not locked
-3004	VLDB_ERR_DATABASE_IS_OPEN	Database is open
-3005	VLDB_ERR_NO_MEMORY	Out of memory
-3008	VLDB_ERR_REPAIR_LEVEL_NOT_SUPPORTED	VLDB repair level is not supported
-3009	VLDB_ERR_CANNOT_STOP_REPAIR	Cannot stop the VLDB repair

Value	Option	Description
-3010	VLDB_ERR_PRIMARY_DB_IS_OPEN	Primary database is open
-3011	VLDB_ERR_MAX_REPLICAS_DEFINED	Maximum number of VLDB replicas exists
-3012	VLDB_ERR_RECORD_WAS_DELETED	Record is deleted
-3013	VLDB_ERR_NO_REPLICA	No replica
