IBM System Storage N series
Data ONTAP 7.3 Upgrade Guide

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Contents

About this guide

This guide applies to systems, including systems with gateway functionality, running Data ONTAP 8.*x* 7-Mode. In the Data ONTAP 8.*x* 7-Mode product name, the term *7-Mode* signifies that the 8.*x* release has the same features and functionality found in the prior Data ONTAP 7.1, 7.2, and 7.3 release families.

Note: In this document, the term *gateway* describes IBM N series storage systems that have been ordered with gateway functionality. Gateways support various types of storage, and they are used with third-party disk storage systems—for example, disk storage systems from IBM, HP®, Hitachi Data Systems®, and EMC®. In this case, disk storage for customer data and the RAID controller functionality is provided by the back-end disk storage system. A gateway might also be used with disk storage expansion units specifically designed for the IBM N series models.

The term *filer* describes IBM N series storage systems that either contain internal disk storage or attach to disk storage expansion units specifically designed for the IBM N series storage systems. Filer storage systems do not support using third-party disk storage systems.

Supported features

IBM® System Storage™ N series storage systems are driven by NetApp® Data ONTAP® software. Some features described in the product software documentation are neither offered nor supported by IBM. Please contact your local IBM representative or reseller for further details. Information about supported features can also be found at the following Web site:

www.ibm.com/storage/support/nas/

A listing of currently available N series products and features can be found at the following Web site:

www.ibm.com/storage/nas/

Getting information, help, and services

If you need help, service, or technical assistance or just want more information about IBM products, you will find a wide variety of sources available from IBM to assist you. This section contains information about where to go for additional information about IBM and IBM products, what to do if you experience a problem with your IBM N series product, and whom to call for service, if it is necessary.

Next topics

Before you call

Before you call, make sure that you have taken these steps to try to solve the problem yourself:

- Check all cables to make sure that they are connected properly.
- Check the power switches to make sure that the system is turned on.
- Use the troubleshooting information in your system documentation and use the diagnostic tools that come with your system.

Using the documentation

Information about N series hardware products is available in printed documents and a documentation CD that comes with your system. The same documentation is available as PDF files on the IBM NAS support Web site:

www.ibm.com/storage/support/nas/

Data ONTAP software publications are available as PDF files on the IBM NAS support Web site:

www.ibm.com/storage/support/nas/

Web sites

IBM maintains pages on the World Wide Web where you can get the latest technical information and download device drivers and updates.

- For NAS product information, go to the following Web site:
  www.ibm.com/storage/nas/
- For NAS support information, go to the following Web site:
  www.ibm.com/storage/support/nas/
- For AutoSupport information, go to the following Web site:
  www.ibm.com/storage/support/nas/
- For the latest version of publications, go to the following Web site:
  www.ibm.com/storage/support/nas/

Accessing online technical support

For online Technical Support for your IBM N series product, visit the following Web site:

www.ibm.com/storage/support/nas/

Hardware service and support

You can receive hardware service through IBM Integrated Technology Services. Visit the following Web site for support telephone numbers:

www.ibm.com/planetwide/

Supported servers and operating systems

IBM N series products attach to many servers and many operating systems. To determine the latest supported attachments, follow the link to the Interoperability Matrices from the following Web site:

www.ibm.com/systems/storage/network/interophome.html

Firmware updates

As with all devices, it is recommended that you run the latest level of firmware, which can be downloaded by visiting the following Web site:

www.ibm.com/storage/support/nas/

Verify that the latest level of firmware is installed on your machine before contacting IBM for technical support. See the *Data ONTAP Upgrade Guide* for your version of Data ONTAP for more information on updating firmware.

How to send your comments

Your feedback is important in helping us provide the most accurate and high-quality information. If you have comments or suggestions for improving this document, send us your comments by e-mail to *starpubs@us.ibm.com*. Be sure to include the following:

- Exact publication title
- Publication form number (for example, GC26-1234-02)
- Page, table, or illustration numbers
- A detailed description of any information that should be changed

Planning your upgrade

Because new features are introduced in each release of Data ONTAP, you must understand new features and upgrade requirements, and evaluate how they might impact your current configuration. You are more likely to encounter issues if you are upgrading from a release earlier than the immediately previous version of Data ONTAP.

Next topics

Upgrade process overview

Before beginning to upgrade Data ONTAP software, you should plan the upgrade and familiarize yourself with the required steps.

1. Plan your upgrade by familiarizing yourself with requirements and issues before you upgrade.
   Plan to do the following:

   - Review the Release Notes for your Data ONTAP upgrade target release.
   - Understand any requirements for upgrading to the target release from your existing software.
   - Create a back-out plan, in the unlikely event that you need to revert to the Data ONTAP release that was running on your system before the upgrade.
     You should contact technical support if you need to revert to a previous release of Data ONTAP.
   - Note any potential changes to your system after the upgrade.
   - If you have storage systems in an active/active configuration, select the appropriate upgrade method.
   - If your storage system is in a SAN environment, verify that all components of your SAN configuration are compatible with the upgraded Data ONTAP release by consulting the compatibility and configuration information about FCP and iSCSI products.
     See the appropriate matrix at the N series Service and Support Web site at www.ibm.com/storage/support/nas/.

- If you run the SnapMirror software, identify storage systems with destination and source volumes.
- If you are running MetroCluster systems, verify that all MetroCluster components are compatible with the target release.

2. If necessary, perform any required preparatory procedures before upgrading to the new Data ONTAP release.

   Required procedures might include the following:

   - Resolving upgrade issues, including performing an intermediate upgrade
   - Ensuring that you have a current Snapshot copy of the root volume of any system being upgraded
   - Updating disk firmware
   - Updating disk shelf firmware
   - Upgrading storage system firmware

3. Obtain the appropriate software image from the IBM NAS support site.

   Copy the image to your storage system or to an HTTP server on your network.

4. Install the Data ONTAP software image on your storage system.

   Extract the system files from the software image you copied to your system.

   Note: There are different procedures depending on whether you are updating from a release earlier or later than Data ONTAP 7.2.

5. Download the new Data ONTAP system files to the boot device.

   The upgrade process is completed when your active/active configuration or single system reboots with the new version of Data ONTAP.

6. If you are upgrading from a release earlier than Data ONTAP 7.2.5, supply IBM customer support information at the storage system command-line interface after completing the upgrade.

Related concepts

Planning your upgrade on page 19
Updating firmware on page 97
Obtaining Data ONTAP software images on page 49
Installing Data ONTAP software images on systems running Data ONTAP 7.2 or later on page 55
Installing Data ONTAP software images on systems running a Data ONTAP 7.1 release on page 63
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Updating IBM customer contact information on page 95
Reversion to a previous release on page 129

Related tasks

Preparing for the upgrade on page 39

Recommendations for all systems upgrading to this release

You should follow these simple guidelines to ensure your storage system upgrade goes smoothly.

- Review the "Important cautions" section of the *Release Notes* for this Data ONTAP release.
  It contains important information that could affect the behavior of your system during and after upgrading.
- Upgrade during non-peak hours.
- Avoid performing a quota initialization prior to upgrading.
  If a quota initialization is in process prior to upgrading, wait for the initialization to finish.

Upgrade host requirements

An *upgrade host* is the client system or server from which you upgrade Data ONTAP. You can upgrade Data ONTAP from a Windows or UNIX client, or from an HTTP server.

The host from which you upgrade your storage system must have access to at least one of the following items.

- The IBM NAS support site
- Portable storage media (such as a CD-R or USB drive) containing Data ONTAP software images
- An HTTP server containing Data ONTAP software images

You can install Data ONTAP system files after you prepare the upgrade host.

Next topics

Requirements when upgrading from a Windows or UNIX client using the CIFS or NFS protocols on page 22
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Related concepts

Installing Data ONTAP software images on systems running Data ONTAP 7.2 or later on page 55

Requirements when upgrading from a Windows or UNIX client using the CIFS or NFS protocols

If the CIFS or NFS protocols are licensed on your storage system, you can upgrade from a Windows or UNIX client using those protocols. You must be able to administer the storage system from the UNIX or Windows client. This client is usually the storage system's administration (admin) host.

UNIX and Windows clients must meet these requirements.

- A UNIX client can be running any available version of UNIX.
- A Windows client can be running any version of Windows unless you are running Windows NT.
- A Windows NT client requires Windows NT version 3.51 or later.

For information about admin hosts, see the *Data ONTAP System Administration Guide*.

Requirements when upgrading from an HTTP server

To upgrade from an HTTP server, you must be able to serve the upgrade package from the HTTP server and you must know the exact URL (including any necessary host and port information) to enter at the storage system console.

Using an HTTP server is a good choice in these circumstances:

- The storage system does not have a CIFS or NFS license.
- You want to distribute Data ONTAP upgrade packages to multiple storage systems.
- You want to use installation scripts.

For information about the console, see the *Data ONTAP System Administration Guide*.

Related concepts

Obtaining images for HTTP servers on page 49

Upgrade requirements for SnapMirror

If you are upgrading Data ONTAP on storage systems that are running the SnapMirror software, you must upgrade the systems that have SnapMirror destination volumes *before* you upgrade the systems that have SnapMirror source volumes.

For SnapMirror volume replication, the destination volume must run under a version of Data ONTAP equal to or later than that of the SnapMirror source volume. If you upgrade the source volumes first, SnapMirror volume replication is disabled. To reenable SnapMirror volume replication, you must downgrade the source system or upgrade the destination system, so that the version of Data ONTAP on the source system is earlier than or the same as that on the destination system.

The requirement to upgrade SnapMirror destination volumes first applies to both asynchronous and synchronous SnapMirror for volume replication.

The requirement does not apply to SnapMirror for qtree replication, SnapVault, or data restoration for tape using the `restore` command. However, when you upgrade systems that use these features,

you should upgrade your SnapMirror destination systems, SnapVault secondary systems, and restoration target systems before the corresponding source systems to maintain backward compatibility.

For more information about running SnapMirror on storage systems configured for network-attached storage (NAS), see the *Data ONTAP Data Protection Online Backup and Recovery Guide*.

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SnapMirror synchronous and asynchronous mode during upgrade on page 23
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Why you must plan for SnapMirror upgrades

When you upgrade Data ONTAP on systems with SnapMirror relationships, the order in which you upgrade the systems is critical. If you do not upgrade in the correct order, SnapMirror transfers might not work correctly.

A SnapMirror transfer is possible only when the destination system can read a Snapshot copy of the source system. Therefore, the destination system must be upgraded first, because the upgraded destination system is able to read the Snapshot copies of the earlier release. If the source system is upgraded first, the destination system might not be able to read the source Snapshot copies, leading to failed SnapMirror transfers.

SnapMirror creates restart checkpoints during transfers, which allow an interrupted transfer to be restarted. These restart checkpoints are deleted during the following operations:

- Upgrade operation
- Revert operation
- System controller head swap operation

Once the restart checkpoints are deleted for an incomplete SnapMirror transfer, the transfer needs to be performed again from the start.

Note: Performing a SnapMirror transfer from the start is not the same as reinitializing the SnapMirror relationship. As long as there is a common Snapshot copy between the SnapMirror source and destination volumes, the destination can be updated with incremental transfers.

For more information about SnapMirror restart checkpoints, see the *Data ONTAP Data Protection Online Backup and Recovery Guide*.

SnapMirror synchronous and asynchronous mode during upgrade

When you upgrade Data ONTAP on a destination storage system running on a synchronous mirror, SnapMirror goes into asynchronous mode.

Synchronous SnapMirror requires that the source and destination run the same version of Data ONTAP. Therefore, when you upgrade a destination storage system in a synchronous mirror,

SnapMirror goes into asynchronous mode. When SnapMirror is in asynchronous mode, the source system replicates data to the destination system every minute until a synchronous replication can be reestablished—that is, when the source system is upgraded so that the same Data ONTAP version is running on destination and source systems.

Related tasks

Upgrading in a SnapMirror environment on page 66

Upgrade requirements for systems mirroring each other

To upgrade Data ONTAP on storage systems that are mirroring volumes to each other, you must disable the mirror, upgrade each system, and reenable the mirror.

SnapMirror can be configured to enable two storage systems to mirror each other's volumes. In this case, each storage system is both a source system and a destination system. For example, System A can mirror volumes to System B, and System B can mirror volumes to System A.

In this configuration, there is logically no way to update both destinations before the corresponding source systems. Therefore, to upgrade Data ONTAP on storage systems that are mirroring volumes to each other, you must disable the mirror, upgrade each system, and reenable the mirror.

Release family upgrade requirements

Each Data ONTAP release family introduces new features. Most issues are resolved automatically in the Data ONTAP software, but a few issues require manual configuration.

When you upgrade and there are one or more intermediate release families between your source and target release, the latest release usually includes any automatic upgrade software included in previous releases (unless otherwise specified). However, you might need to review and resolve upgrade issues associated with intermediate release families before upgrading to the new release.

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Different types of upgrades

Data ONTAP upgrades can be *within* a release family or *between* release families.

An upgrade *within* a release family is one in which the release number x.y.z does not change in the x or y components, but only in the z components of the release number. The following are examples of upgrades within release families:

- 7.3 to 7.3.1

- 7.2 to 7.2.5
- 7.2 to 7.2P1

An upgrade *between* release families is one in which the release number x.y.z changes in the x or y components from the original to the target release. For example, an upgrade from 7.2.5 to 7.3.5 is an upgrade between release families.

Upgrades between release families

A new release family usually includes major changes in infrastructure and subsystems.

When you upgrade from one release family to another, one or more of the following might have been introduced on your platform:

- Fundamental infrastructure changes—for example, changes to WAFL or RAID operation
- Version number changes requiring a file system upgrade—for example, in RAID, WAFL, nonvolatile log (NVLOG), or Java subsystems
- New system firmware

Such feature changes and requirements are cumulative between succeeding release families. You do not have to upgrade sequentially to each new release family—in other words, you can skip release families—but you must comply with the requirements of any intermediate release and you should be aware of any new system behavior introduced in an intermediate release. For example, if you are upgrading from 7.1.2 to the current 7.3 release, you must satisfy the upgrade requirements of the 7.2 and 7.3 release families.

Note: Major nondisruptive upgrades (nondisruptive upgrades between release families) are supported only to a release in a succeeding release family. For example, you can upgrade directly from Data ONTAP 7.1.3 to 7.2.7 using the nondisruptive method, but not to 7.3.3. In such a case, you must upgrade nondisruptively through an intermediate release.

For these reasons, upgrades between release families sometimes take longer, involve more steps, and interrupt storage system services longer than upgrades within a release family.

Related concepts

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Upgrades within a release family

Upgrades within a release family are usually simpler and involve less service disruption than upgrades between release families.

This is because major changes are not usually introduced within a release family. Rather, these releases usually include bug fixes and minor feature enhancements.

Required intermediate upgrades

To upgrade nondisruptively to the 7.3 release family, your system must be running Data ONTAP 7.2.3 or a later release in the 7.2 family. An intermediate upgrade is required when upgrading nondisruptively from an earlier Data ONTAP release family.

If you want to upgrade nondisruptively from a release earlier than 7.2.*x* to a 7.3.*x* release, you must perform an intermediate upgrade (also known as a multi-hop upgrade) to the latest 7.2.*x* release before upgrading to the target 7.3.*x* release. In addition, if you are running a Data ONTAP 7.1 release earlier than 7.1.2, you must perform a minor NDU to the latest 7.1.*x* release.

Attention: After performing an intermediate upgrade, you must wait at least 10 minutes before proceeding to the final upgrade (or to an additional intermediate upgrade) to ensure that all upgrade processes have finished.

To upgrade to the 7.3 release family using the standard method, your system should be running Data ONTAP 7.1 or later.

Nondisruptive upgrade requirements

Nondisruptive upgrades do not require downtime, and are available on some active/active configurations.

In a nondisruptive upgrade (NDU), active/active technology allows a takeover storage system to assume the functions of the “failed” partner while it is being upgraded. There is a takeover and giveback operation for each active/active node (storage system that is part of an active/active relationship). Because the partner node fulfills service requests during the "failed" system's upgrade, no disruption in service is experienced by the clients.

In addition, because the takeover system assures continuous availability of the "failed" system's disks, more extensive upgrades requiring a system halt—such as system firmware updates and hardware adapter replacements—can be performed without disrupting services based on stateless protocols.

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When not to use nondisruptive upgrades on page 27
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When to use nondisruptive active/active upgrades

You can use the nondisruptive upgrade method on active/active configurations that meet certain Data ONTAP requirements. Nondisruptive upgrades are most appropriate when high availability of storage system services is critical.

You can use the nondisruptive method when one or more of the following is being performed:

- Upgrades to the Data ONTAP 7.3 release family from an immediately preceding release family (for example, from 7.2.3 to 7.3)

  Note: To upgrade nondisruptively to the 7.3 release family, you must be running Data ONTAP 7.2.3 or a later release in the 7.2 family.

  If you need to upgrade to the most recent 7.2 release before upgrading to the 7.3 release family, you can upgrade nondisruptively to Data ONTAP 7.2.3 or later from 7.1.2 or later (in the 7.1 release family).

- Data ONTAP upgrades within a release family (for example, from 7.3 to 7.3.1)
- System firmware updates
- Certain hardware upgrades

  Note: See the *Data ONTAP Active/Active Configuration Guide* for more information about changing system hardware nondisruptively.

When not to use nondisruptive upgrades

You cannot use the nondisruptive upgrade method in all circumstances.

Upgrades might be disruptive if any of the following conditions are true:

- You have storage systems actively serving CIFS to clients.

  Because CIFS is session-oriented, sessions must be terminated before upgrade procedures to prevent data loss.

  Note: The Microsoft Server Message Block (SMB) 2.0 protocol does not provide the ability for CIFS sessions to survive takeover and giveback operations in active/active configurations. Therefore, you cannot upgrade Data ONTAP nondisruptively if the SMB 2.0 protocol is active between your storage system and Windows clients.

- You have storage systems actively serving File Transfer Protocol (FTP) or Network Data Management Protocol (NDMP) clients that cannot be postponed.

  Because these protocols are session-oriented, outstanding sessions must finish, and these services must be disabled to use nondisruptive upgrades.

- You need to update disk firmware and you have RAID4 aggregates on your system.

  Standard disk firmware updates automatically take disks in RAID4 aggregates offline until the update is complete. Services and data are unavailable until they are back online.

  Note: If you upgrade RAID protection to RAID-DP, disk firmware updates take place in the background and are nondisruptive.

For these conditions, standard upgrades are recommended.

Related concepts

Disk shelf firmware updates on page 109
Disk firmware updates on page 105
Service availability during disk firmware updates on page 106

Requirements for nondisruptive upgrades on all systems

You must ensure that your systems meet configuration and utilization requirements before beginning a nondisruptive upgrade process.

Major nondisruptive upgrades (nondisruptive upgrades between release families) to Data ONTAP 7.3 releases are supported from Data ONTAP 7.2.3 and later Data ONTAP 7.2 releases.

- If you are running a release in the Data ONTAP 7.2 family that is earlier than 7.2.3 and you want to upgrade nondisruptively to a Data ONTAP 7.3 release, you must first upgrade nondisruptively to the latest Data ONTAP 7.2 release.
- If you are running a release in the Data ONTAP 7.1 family that is earlier than 7.1.2 and you want to upgrade nondisruptively to a Data ONTAP 7.3 release, you must first upgrade nondisruptively to the latest Data ONTAP 7.1 release, then upgrade nondisruptively to the latest 7.2 release.

Minor nondisruptive upgrades (nondisruptive upgrades within release families) are supported from all previous Data ONTAP 7.3 releases.

To use the nondisruptive upgrade procedure, your systems must meet the following configuration requirements:

- You must have an active/active configuration in which a partner controller takes over I/O during the upgrade process.
- Because failed disk drives prevent giveback operations and can introduce loop instability throughout the storage system, you must remove or replace all failed disk drives *before* beginning the nondisruptive upgrade.
- There should be no old core files in the `/etc/crash` directory.
- Your systems must be running the latest disk and disk shelf firmware *before* beginning the nondisruptive upgrade.
- If your system serves NFS clients, you must use hard mounts.

  Attention: You should not use soft mounts when there is a possibility of frequent NFS timeouts, which can lead to disruptions during the upgrade process and possible data corruption.
- You must be able to open a terminal session to the console port of both controllers in an active/active configuration using one of the following methods:
  - Direct serial connection
  - A console server
  - The systems' remote LAN modules (RLMs), if available

- The systems' Baseboard Management Controllers (BMCs), if available

  Because network connections to the controllers are lost during the takeover and giveback operations performed during the nondisruptive upgrade, Telnet, SSH, or FilerView sessions will not work.

You should not exceed the following maximum values for FlexVol volumes for major or minor nondisruptive upgrades (the values listed are specific to this Data ONTAP release).

Note: Up to 100 of the maximum number of FlexVol volumes for your platform can be enabled for deduplication.

Platform	Value
N7600, N7700, N7800, or N7900	300
N6210, N6240, or N6270	300
N6060	200
N6040	150
N5600	300
N5500	150
N5300	150
N5200	150
N3300, N3400, and N3600	150
N3700	150

You should avoid exceeding maximum values for the following system elements on all platforms:

Element	Value (per storage controller)
Snapshot copies	No more than 10 times the number of FlexVol volumes
CPU utilization	No greater than 50%
Disk utilization	No greater than 50%

Related concepts

Requirements for nondisruptive upgrades on systems with deduplicated volumes on page 30
Optimal service availability during upgrades on page 143
Considerations for stateless protocols on page 144
Required intermediate upgrades on page 26

Requirements for nondisruptive upgrades on systems with deduplicated volumes

You can perform major and minor nondisruptive upgrades when deduplication is enabled, provided that no more than 100 FlexVol volumes have deduplication enabled and that no deduplication operations are running during the Data ONTAP upgrade.

The total number of deduplicated and non-deduplicated FlexVol volumes must not exceed the total number of FlexVol volumes supported for nondisruptive upgrades on your system.

Nondisruptive upgrades cannot take place when deduplication operations are active. To ensure that no deduplication operations are active, you must take both of the following actions:

- If any deduplication operations are active, you must halt them until the Data ONTAP upgrade has completed.
- You must perform the Data ONTAP upgrade during a time period when deduplication operations are not scheduled to run.

You can use the `sis status` command to determine if the status of a deduplication is `Active` or `Idle`. On a system with deduplication enabled, the output of the `sis status` command is similar to the following:

```
 Path              State      Status     Progress
/vol/v457         Enabled    Idle       Idle for 00:12:30
/vol/v458         Enabled    Idle       Idle for 00:12:30
/vol/v459         Enabled    Idle       Idle for 00:12:30
/vol/v460         Enabled    Idle       Idle for 00:12:30
/vol/v461         Enabled    Active     521 MB Scanned
/vol/v462         Enabled    Active     489 MB Scanned
/vol/v463         Enabled    Active     387 MB Scanned
/vol/v464         Enabled    Idle       Idle for 00:12:30
```

You can use the `sis stop` command to abort the active SIS operation on the volume and the `sis start` command to restart it.

For information about deduplication, see the *Data ONTAP Storage Management Guide* and the sis(1) man page.

Standard upgrade requirements

A standard upgrade can be performed on any active/active configuration, but downtime is required.

In a standard upgrade, downtime is required because the active/active configuration is disabled and each node is updated. When the active/active configuration is disabled, each node behaves as a single-node storage system; in other words, system services associated with the node are interrupted for as long as it takes the system to reboot.

You can also complete other maintenance tasks, such as system firmware and hardware, as part of the standard upgrade. These can also take place when the active/active configuration is disabled.

Evaluating upgrade issues

Every Data ONTAP release family has unique upgrade requirements that you must understand and resolve before you decide to upgrade. Depending on your version of Data ONTAP, you might have to upgrade to an intermediate release before upgrading to the current release.

Before you decide to upgrade, you need to understand the following:

- Issues you must resolve before upgrading to the new release
- New system behavior after upgrading to the new release

Because significant new features are introduced in each new Data ONTAP release family, you might encounter issues when upgrading to a new release family, especially if you are not upgrading from the immediately previous version of Data ONTAP.

For example, if you are upgrading from a release in the 7.1 family to the current 7.3 release, you must review and resolve upgrade issues associated with the 7.2 and 7.3 release families (but not 7.1) before upgrading to Data ONTAP 7.3 or later.

Next topics

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Behavior changes when upgrading to the Data ONTAP 7.3 release family on page 35
Behavior changes when upgrading from a release earlier than Data ONTAP 7.2 on page 36

Issues to resolve before upgrading to the Data ONTAP 7.3 release family

You must understand and resolve certain issues before you upgrade to Data ONTAP 7.3 and later releases.

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Kerberos Multi Realm support on page 33
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Disks offline in Windows 2008 after a standard upgrade on page 34

Changes in SnapLock Compliance support

SnapLock Compliance is supported in the Data ONTAP 7.3 release family starting with the Data ONTAP 7.3.1 release. If you are upgrading a system with SnapLock Compliance volumes, be aware that after the upgrade you can only revert to Data ONTAP 7.1.3, Data ONTAP 7.2.5.1, and later

versions in these release families. If you revert to any other release, you will not be able to bring SnapLock Compliance volumes online and this reversion can also cause a ComplianceClock skew.

All systems with SnapLock Compliance volumes that are not running a supported Data ONTAP release must be upgraded to a supported release. In addition, systems that do not include any SnapLock Compliance volumes but contain volumes or aggregates that are mirrored, copied or cascaded from SnapLock Compliance volumes or aggregates must also be upgraded. Following are some specific cases noteworthy for operations involving SnapLock Compliance volumes and aggregates.

- Qtree SnapMirror support for SnapLock Compliance volume requires both the source and destination systems to be running a supported SnapLock Compliance release.
- Volume SnapMirror, `vol copy`, and `aggr copy` operations will fail if the source system is upgraded to a supported SnapLock Compliance release and the destination system is running a version that does not support SnapLock Compliance.

For more information about SnapLock Compliance, see the *Data ONTAP Archive and Compliance Management Guide*.

Changes in SnapLock for SnapVault support

You should make sure your SnapLock for SnapVault configuration (previously known as LockVault) is supported before upgrading to Data ONTAP 7.3.1 or later.

The following table lists the SnapVault relationships that are supported with SnapLock volumes.

If the SnapVault...	**Then ...**
Source and destination systems are both running Data ONTAP 7.3.1 or later	The following SnapVault relationships are supported: • Between SnapLock Compliance volume (source) and SnapLock Enterprise volume (destination) • Between SnapLock Compliance (source) and a regular volume (destination) • Between regular volumes (source) and SnapLock Enterprise volume (destination) • Between regular volume (source) and SnapLock Compliance volume (destination) The SnapVault relationship between SnapLock Compliance volumes as the source and destination volumes is not supported.

If the SnapVault...	Then ...
Source system is running Data ONTAP 7.2.5.1 or 7.1.3, and the destination system is running Data ONTAP 7.3.1 or later	The SnapVault relationship between SnapLock Compliance (source) and SnapLock Compliance (destination) is not supported. All other SnapVault relationships are allowed between all types of volumes.
Source system is upgraded to Data ONTAP 7.3.1 and later, and the destination system is running Data ONTAP 7.2.5.1 or 7.1.3	The SnapVault relationship is allowed between all types of volumes.
Source and destination systems are both running Data ONTAP 7.2.5.1 and you upgrade the destination system to Data ONTAP 7.3.1 or later	Ensure that the source and destination volumes are not SnapLock Compliance volumes. If either the source or the destination volume is a SnapLock Compliance volume, the `snapvault update` command fails.

Default archival Snapshot copies

Data ONTAP 7.3.1 introduces a user-configurable option that allows you to enable or disable taking archival Snapshot copies at the end of the data transfer. When you upgrade the storage system to Data ONTAP 7.3.1 or later, archival Snapshot copies are enabled on all new volumes, by default.

The configuration of the existing SnapVault for NetBackup volumes is automatically updated to reflect the fact that archival Snapshot copies are enabled on these volumes. Therefore, when you upgrade from Data ONTAP 7.3 or a release in the Data ONTAP 7.2 family, the behavior remains the same.

For more information about archival Snapshot copies and the user-configurable option, see the *Data ONTAP Data Protection Online Backup and Recovery Guide*.

Kerberos Multi Realm support

If you upgrade to Data ONTAP 7.3.1 or later from an earlier release, Data ONTAP continues to use the old keytab file for UNIX-based KDCs (`/etc/krb5.keytab`). You should only use the new keytab file for UNIX-based KDCs (`/etc/UNIX_krb5.keytab`) if you reconfigure Kerberos after such an upgrade or configure Kerberos for the first time.

In Data ONTAP 7.3.1 and later releases, you can configure Data ONTAP to use both Active Directory and UNIX-based KDC types simultaneously. This configuration is sometimes referred to as a "Kerberos Multi Realm" configuration.

To support Multi Realm configurations, Data ONTAP uses two sets of principal and keytab files. For Active Directory-based KDCs, the principal and keytab files are `/etc/krb5auto.conf` and `/etc/krb5.keytab`, respectively, just as in releases prior to Data ONTAP 7.3.1. For UNIX-based KDCs, however, the principal and keytab files are `/etc/krb5.conf` and `/etc/UNIX_krb5.keytab`,

respectively. So, starting with Data ONTAP 7.3.1, the keytab file for UNIX-based KDCs has changed from `/etc/krb5.keytab` to `/etc/UNIX_krb5.keytab`.

This change does not affect upgrades, however, because Data ONTAP continues to use the old keytab file (`/etc/krb5.keytab`) for UNIX-based KDCs if you upgrade from a release prior to Data ONTAP 7.3.1. You need only use the new keytab file for UNIX-based KDCs (`/etc/UNIX_krb5.keytab`) if you reconfigure Kerberos after such an upgrade or you configure Kerberos for the first time.

For more information, see the section on Kerberos security services in the *Data ONTAP File Access and Protocols Management Guide*.

More free space required in Data ONTAP 7.3

Data ONTAP 7.3 includes an improvement to free space accounting. As a result, existing FlexVol volumes reserve additional space, resulting in a loss of 0.5 percent of free space. Upgrading to Data ONTAP 7.3 or later from an earlier release causes existing FlexVol volumes to require more free space from their containing aggregates. If there is insufficient free space in an aggregate to satisfy the increased requirement from its FlexVol volumes, the space guarantee for one or more volumes in that aggregate might be disabled.

Related tasks

Determining system capacity and space guarantees before upgrading to Data ONTAP 7.3 or later on page 45

License changes for the FlexCache feature

If you are currently using the FlexCache feature, you need to take action to continue to use this feature when you upgrade to Data ONTAP 7.3 and later.

The current FlexCache license, flex_cache, has been replaced by a new license, flexcache_nfs. The old license is supported for the Data ONTAP 7.2 release family, but is not supported for Data ONTAP 7.3 and later. Contact IBM support to obtain and install the new flexcache_nfs license if it is not already present on your system.

Attention: If you upgrade to Data ONTAP 7.3 or later and the new license is not installed, you will not be able to access data in FlexCache volumes after the upgrade. As soon as you install the new license, the FlexCache data will become accessible.

Disks offline in Windows 2008 after a standard upgrade

During a standard upgrade to Data ONTAP 7.3.3 and later releases, LUNs are assigned new revision numbers. Windows Server 2008 software interprets the LUNs with new revision numbers as new

disks and sets them offline; this status is shown in Windows 2008 management interfaces after the upgrade. Windows Server 2003 ignores the LUN revision number.

You can work around this problem using the nondisruptive upgrade method, which allows the LUNs to maintain their revision numbers. You can also bring the disks online after the upgrade using Windows disk management tools or SnapDrive functionality.

For more information, see the knowledgebase article *Disks show as offline in Windows 2008 after Data ONTAP upgrade* on the IBM NAS support site.

Behavior changes when upgrading to the Data ONTAP 7.3 release family

You should be aware of several changes in Data ONTAP behavior that might occur if you upgrade to Data ONTAP 7.3 or later releases.

Next topics

The NetBackup application can no longer manage SnapVault relationships with N series storage system data on page 35
Physical reallocation of volumes slows the reversion process on page 35
SnapMirror and SnapVault restart checkpoints deleted during upgrade on page 36
Deduplication requires additional free space in aggregates after upgrading on page 36

The NetBackup application can no longer manage SnapVault relationships with N series storage system data

Beginning with Data ONTAP 7.3, the use of Symantec NetBackup for configuring and managing SnapVault transfers between N series primary and secondary storage systems is no longer supported.

If you are currently using the N series SnapVault Management option from Symantec, you can migrate to N series Operations Manager or Protection Manager, or to management using the command-line interface (CLI). This option is not supported with Data ONTAP 7.3 and later releases. You can continue to use this option with Data ONTAP 7.2.*x* and earlier. You should check with Symantec about support for this option for NetBackup versions later than 6.5.

Physical reallocation of volumes slows the reversion process

Data ONTAP 7.3 and later releases support physical reallocation, which allows you to optimize the physical layout of volumes in an aggregate, leaving the virtual location of the volumes untouched. However, once volumes have been physically reallocated, reverting to an earlier release family will take significantly longer.

For more information about physical reallocation, see the *Data ONTAP System Administration Guide*.

SnapMirror and SnapVault restart checkpoints deleted during upgrade

Starting with Data ONTAP 7.3, when you upgrade to Data ONTAP 7.3 or later, all aborted qtree SnapMirror and SnapVault transfers with restart checkpoints will restart from the beginning because all restart checkpoints will be deleted during the upgrade process.

Deduplication requires additional free space in aggregates after upgrading

If you use deduplication, you must ensure that there is adequate free space in the aggregates containing deduplicated volumes after upgrading to Data ONTAP 7.3 or later.

In earlier Data ONTAP releases, the deduplication fingerprint database was stored in the deduplicated volume. In Data ONTAP 7.3 and later releases, the deduplication fingerprint database is automatically moved to the containing aggregate when deduplication is run for the first time on a volume after an upgrade. Before running deduplication for the first time, you should ensure that the aggregate has free space that is at least 4 percent of the total data usage for all volumes in the aggregate that have deduplication enabled, in addition to 2 percent free space for FlexVol volumes. This enables additional storage savings by deduplicating any new blocks with those that existed before the upgrade.

If there is not sufficient space available in the aggregate, the deduplication operation fails with an error message.

During a deduplication failure, there is no loss of data and the volume is still available for read/write operations. However, depending upon the space availability in the aggregate, fingerprints of the newly added data might be lost.

If you receive a deduplication failure message, you should add space to the aggregate (depending on the limits of your configuration) and run deduplication again.

For example, if an aggregate contains 3 FlexVol volumes and each volume has 5 TB of data (1 TB is physical usage and 4 TB is deduplication savings), the total data in the aggregate amounts to 15 TB. In such a case, after the upgrade, 600 GB (4 percent of 15 TB) and 300 GB (2 percent of 15 TB) must be available in the aggregate and volumes respectively.

For more information about deduplication, see the *Data ONTAP Storage Management Guide*.

Behavior changes when upgrading from a release earlier than Data ONTAP 7.2

You should understand the changes in Data ONTAP behavior that might occur if you upgrade from a release earlier than Data ONTAP 7.2.

Next topics

DAFS column is no longer displayed in sysstat output on page 37
Change in logging for NULL RPC mountd requests on page 37
AutoSupport improvements require updated IBM customer contact information on page 37

Aggregate reallocation will retard the reversion process on page 37

DAFS column is no longer displayed in sysstat output

In Data ONTAP 7.2 and later releases, the DAFS column is no longer displayed in the `sysstat -x` command output. Scripts that use the DAFS column will be offset by one column.

Change in logging for NULL RPC mountd requests

If you use the `/etc/messages` file to trace NULL RPC mountd requests, you should note that the process has changed in Data ONTAP 7.2 and later releases.

In earlier releases, NULL RPC mountd requests were automatically logged to `/etc/messages`. Beginning with Data ONTAP 7.2, you must specify that you want to be notified of NULL RPC mountd requests by adding a *.debug entry to the `/etc/syslog.conf` file.

For more information, see the section on tracing mountd requests in the *Data ONTAP File Access and Protocols Management Guide*.

AutoSupport improvements require updated IBM customer contact information

Data ONTAP 7.2.5 and later releases include improved AutoSupport reporting features. To take advantage of these features, you must enter IBM customer contact information after completing the upgrade if you are upgrading from an earlier release.

Related concepts

Updating IBM customer contact information on page 95

Aggregate reallocation will retard the reversion process

Data ONTAP 7.2.2 and later releases support aggregate reallocation. This allows you to optimize the location of physical blocks in the aggregate, which increases contiguous free space. However, once aggregates have been reallocated, reverting to an earlier release family will take significantly longer.

For more information about aggregate reallocation, see the *Data ONTAP System Administration Guide*.

Preparing for the upgrade

Before installing the latest Data ONTAP release on your storage system, you need to verify information and complete some tasks.

Steps

1. Verify that your system meets the minimum requirements.
2. Verify that you have resolved any upgrade issues.
3. Ensure that you have a current Snapshot copy of the root volume of any system being upgraded.

   For more information about creating Snapshot copies, see the *Data ONTAP Data Protection Online Backup and Recovery Guide*.
4. Verify whether you need to update storage system firmware.
5. If you are running SnapMirror, identify storage systems with destination volumes and upgrade them before upgrading storage systems with source volumes.
6. If you are running MetroCluster systems, verify that all MetroCluster components are compatible with the target release.

   For more information, see your MetroCluster documentation and the MetroCluster Compatibility Matrix. If you are running MetroCluster on a gateway, see also the *Gateway Interoperability Matrix*.
7. Check whether you need to perform one or both of the procedures described in the following table.

If...	Then complete this procedure...
You are running CIFS on the storage system and are using a Windows NT 4.0 domain controller for authentication	Verify that the storage system has a domain account
You are running CIFS on the storage system and are using a Windows 2000 domain controller for authentication	Enable DNS with Windows 2000 name server addresses

8. If you are using the nondisruptive upgrade method, ensure that your systems meet the requirements.
9. If you are upgrading from a release earlier than Data ONTAP 7.3, ensure that there is adequate free space in your aggregates.
10. If you are upgrading from a release earlier than Data ONTAP 7.2, evaluate and address any issues associated with your source release.

Next topics

Verifying system requirements on page 40
Enabling DNS with Windows 2000 name server addresses on page 41
Verifying that you have a domain account on page 42
Preparing for nondisruptive upgrades on page 42
Preparing for nondisruptive upgrades on systems with VMware ESX server hosts on page 44
Determining system capacity and space guarantees before upgrading to Data ONTAP 7.3 or later on page 45
Using the aggrSpaceCheck tool to prepare your upgrade to Data ONTAP 7.3 or later on page 46
Renaming a vif that is named "vip" before upgrading to Data ONTAP 7.2 and later on page 47

Related concepts

Why you must plan for SnapMirror upgrades on page 23

Related tasks

Determining whether your CFE-based system needs a system firmware update on page 99

Verifying system requirements

Before you upgrade, you must make sure your system meets the minimum requirements.

Next topics

Ensuring that your system supports the target Data ONTAP release on page 40
Ensuring that there is adequate free space in every volume containing LUNs on page 41
Checking for the latest versions of system firmware for your system on page 41
Determining the required firmware for your disks on page 41
Determining the required firmware for your disk shelves on page 41

Ensuring that your system supports the target Data ONTAP release

You can check the available Data ONTAP releases on the IBM NAS support site to determine if your system supports the target Data ONTAP release.

Result

If the target release is listed, you can upgrade to it.

Ensuring that there is adequate free space in every volume containing LUNs

Before upgrading a storage system in a SAN environment, you must ensure that every volume containing LUNs has available at least 1 MB of free space. The space is needed to accommodate changes in the on-disk data structures used by the new version of Data ONTAP.

About this task

"LUNs" in this context refers to the LUNs that Data ONTAP serves to clients, not to the array LUNs used for storage on a storage array.

Steps

1. Check free space in a volume containing LUNs by entering the following command at the storage system command line:

   `df`

2. If the volume does not have at least 1 MB (1024 KB) of free space, create free space in the full volume either by deleting unnecessary data or by growing the size of the volume.

Checking for the latest versions of system firmware for your system

You can check the system firmware versions available for your system on the IBM NAS support site to determine if a system firmware update is required.

Determining the required firmware for your disks

By viewing the latest required firmware revisions for Fibre Channel and SAS disk drives on the IBM NAS support site, you can determine if you need to update the disk firmware for your system.

Determining the required firmware for your disk shelves

By viewing the latest required firmware revisions for disk shelves on the IBM NAS support site, you can determine if you need to update the disk shelf firmware for your system.

Enabling DNS with Windows 2000 name server addresses

If you are running CIFS on the storage system and are using a Windows 2000 domain controller for authentication, then before upgrading, you need to enable DNS with Windows 2000 name server addresses.

Steps

1. Using a text editor, create or open the `/etc/resolv.conf` file in the root volume. Enter up to three lines, each specifying a Windows 2000 name server host in the following format:

nameserver *ip_address*

Example

nameserver 192.9.200.10

2. Save the file.
3. Enter the following command at the storage system console to enable DNS:

   options dns.enable on

Verifying that you have a domain account

If you are running CIFS and using a Windows NT 4.0 domain controller for authentication, you need to verify that your storage system has a domain account.

Step

1. From the storage system's console, enter the following command:

   cifs domaininfo

   Data ONTAP displays the storage system's domain information.

Preparing for nondisruptive upgrades

You must complete certain steps to ensure a successful nondisruptive upgrade procedure. Configurations that are eligible for nondisruptive upgrades must meet certain protocol and availability requirements.

About this task

Ensure that you understand these requirements before you use the nondisruptive method.

Steps

1. Ensure that your active/active configuration is optimally configured and functioning correctly.

   The system clocks on both partner systems should be synchronized with a time server. A discrepancy in system time between the partner systems could cause problems with the upgrade.
2. Ensure that your system firmware version is current.

   In some environments, firmware updates are required to support new Data ONTAP functionality.
3. Ensure that your clients are optimally configured and functioning correctly.

   Check service protocols and configure client timeout settings to ensure availability meets requirements for a nondisruptive upgrade.

4. Verify that all components of your SAN configuration are compatible with the upgraded Data ONTAP release by consulting the compatibility and configuration information about FCP and iSCSI products.

   See the appropriate matrix at the N series Service and Support Web site at http://www.ibm.com/storage/support/nas/.

5. If the automatic giveback option, `cf.giveback.auto.enable`, is set to `on`, disable automatic giveback by entering the following command on one of your storage systems in the active/active configuration:

   `options cf.giveback.auto.enable off`

   After the upgrade procedure, you can reset this option to `on` (if desired).

6. Ensure that you have no failed disks on either node.

   If either node has failed disks, giveback might fail. To avoid this issue, remove any failed disks before entering the `cf giveback` command.

7. Remove any old core files from the `/etc/crash` directory.

   For more information about managing the contents of the `/etc/crash` directory and deleting old core files, see the savecore(1) man page.

8. If you need disk firmware updates in addition to the Data ONTAP upgrade, ensure that all disks on your system are in RAID-DP or mirrored RAID4 aggregates.

   Disk firmware updates take place automatically in the background when RAID-DP protection is configured. Services and data continue to be available during the disk firmware update.

   Note: RAID4 volumes can be upgraded nondisruptively (temporarily or permanently) to RAID-DP to automatically enable the background firmware update capability.

9. If you are upgrading to this Data ONTAP release from an earlier release family, ensure that your disk firmware and disk shelf firmware are current. If they are not, you must update to the latest disk firmware and disk shelf firmware before starting the nondisruptive upgrade procedure.

10. If you use deduplication technology, ensure that your system includes no more than 100 deduplicated volumes and that no deduplication operations are active during the Data ONTAP upgrade.

11. If you use SnapMirror technology, ensure that SnapMirror is suspended and no SnapMirror operations are in process while upgrading Data ONTAP.

12. If you are planning to perform a nondisruptive upgrade on a system that does not send AutoSupport messages, you should nonetheless trigger AutoSupport notifications using the `autosupport.doit` option at the beginning and end of the upgrade.

    These notifications allow you to preserve a local copy of information about the state of your system before the upgrade.

Related concepts

Optimal service availability during upgrades on page 143
Disk firmware updates on page 105
Disk shelf firmware updates on page 109

Preparing for nondisruptive upgrades on systems with VMware ESX server hosts

Before performing a nondisruptive upgrade on storage systems exporting data over NFS to VMware ESX server hosts, verify that your client's NAS components are correctly configured, to ensure service availability for VMware guest operating systems during the upgrade.

About this task

These steps must be performed from the ESX server or guest operating systems, not from the storage system.

Steps

1. Increase the NFS datastore's heartbeat time on the VMware ESX server.

   The following parameters should be set to the recommended values:

Parameter	Value
`NFS.HeartbeatFrequency`	12
`NFS.HeartbeatMaxFailures`	10

   For more information about setting ESX server parameters, see the ESX documentation.

2. Set the SCSI Disk timeout value on all guest operating systems to 190 seconds.

   You can obtain scripts to set the recommended SCSI disk settings in the guest operating systems for use with VMware ESX 3.5 and storage systems running Data ONTAP. When downloaded and run on the guest operating systems, the scripts create and modify the necessary files for each guest operating system type. Using the scripts ensures that the correct timeout settings are used in the guest operating systems to achieve maximum I/O resiliency when the guest operating systems are connected to storage systems.

   For more information about obtaining and running the scripts, see the knowledgebase article *VMware ESX Guest OS I/O Timeout Settings for IBM N Series Storage Systems* on the IBM NAS support site.

3. Align the file systems that use virtual machine disk format (VMDK) on Windows with the storage systems' WAFL file system.

This step is optional but recommended for best performance.

Virtual machines store their data on virtual disks. As with physical disks, these disks are formatted with a file system. When formatting a virtual disk, the file systems with VMDK format, the datastore, and the storage array should be in proper alignment. Misalignment of the virtual machine's file system can result in degraded performance.

When aligning the partitions of virtual disks for use with storage systems, the starting partition offset value must be divisible by 4,096. The recommended starting offset value for Windows 2000, 2003, and XP operating systems is 32,768. Windows 2008 and Vista default at 1,048,576; that value does not require any adjustments.

For more information about aligning virtual disks and WAFL file systems, see "Virtual Machine Partition Alignment" in the IBM Redbook *IBM System Storage N series with VMware ESX Server*.

Related information

IBM System Storage N series with VMware ESX Server: www.redbooks.ibm.com/abstracts/sg247636.html?Open

Determining system capacity and space guarantees before upgrading to Data ONTAP 7.3 or later

If you suspect that your system has almost used all of its free space, or if you use thin provisioning, you should check the amount of space in use by each aggregate. If any aggregate is 97 percent full or more, *do not* proceed with the upgrade until you have used the aggrSpaceCheck tools to determine your system capacity and plan your upgrade.

Step

1. Check your system's capacity by entering the following command:

   `df -A`

If the capacity field shows...	Then...
96% or less for all aggregates	You can proceed with your upgrade to Data ONTAP 7.3; no further action is required.
97% or more for any aggregate	Use the aggrSpaceCheck tool to plan your upgrade.

After you finish

After using the aggrSpaceCheck tool and completing the upgrade, make sure that your space guarantees are configured according to your requirements.

Related tasks

Using the aggrSpaceCheck tool to prepare your upgrade to Data ONTAP 7.3 or later on page 46

Using the aggrSpaceCheck tool to prepare your upgrade to Data ONTAP 7.3 or later

You must use the aggrSpaceCheck tool if any aggregate on your storage system is 97 percent full or more.

Before you begin

If your current system capacity is 96 percent or less for all aggregates, you do not need to complete this procedure. You can proceed with your upgrade to Data ONTAP 7.3 and later releases.

To use the aggrSpaceCheck tool, you must have the following:

- A Windows or UNIX client system with RSH enabled
- RSH configured on your storage system(s)
  For information about configuring RSH, see the *Data ONTAP System Administration Guide*.
- Access to the IBM NAS support site
- Access to the storage system being upgraded
- Root user privileges

About this task

The aggrSpaceCheck tool is a utility that runs on the administration host client system. It is available for download from the IBM NAS support site. When installed on the client system, it connects to the storage system using the RSH protocol and checks whether there is enough free space to enable Data ONTAP 7.3. It does so by executing several Data ONTAP commands, parsing the result, and performing calculations to assess space requirements. The results and recommended actions are displayed immediately.

Steps

1. Enter one of the following commands, depending on your client system.

If you have a...	Enter the following command...
Windows client	`aggrSpaceCheck [-user user_name] -filer system_name`
UNIX client	`perl aggrSpaceCheck.pl [-user user_name] -filer system_name`

Example

To connect to a system called server1, enter the following command from a Windows client:

```
aggrSpaceCheck -filer server1
```

To connect to a system called server1 as user sysadmin, enter the following command from a Windows client:

```
aggrSpaceCheck -user sysadmin -filer server1
```

To connect to a system called server1 as user root, enter the following command from a UNIX client:

```
perl aggrSpaceCheck.pl -user root -filer server1
```

For more information, see the readme.txt file that is included with the aggrSpaceCheck tool.

2. Use the recommendations displayed by the aggrSpaceCheck tool to prepare your system.

After you finish

When you have completed your preparations, proceed with the upgrade.

Renaming a vif that is named "vip" before upgrading to Data ONTAP 7.2 and later

Beginning in Data ONTAP 7.2, the string "vip" is reserved for private virtual interfaces. If you have configured a vif (a feature that implements link aggregation) named "vip" on your storage system in an earlier release, you must rename that vif before upgrading your system to Data ONTAP 7.2.1 or higher.

About this task

If you do not rename the vif, the interface status of the vif named "vip" will be set to down and the interface will be unavailable for network traffic.

To ensure continued network connectivity over the vif, complete the following steps before upgrading to Data ONTAP 7.2.

Steps

1. Bring down the vif with the `ifconfig` command.
2. Destroy the vif using the `vif destroy` command.
3. Re-create the vif using the `vif create` command and a different unique name.

   For more information about vif administration, see the *Data ONTAP Network Management Guide*.

Obtaining Data ONTAP software images

You must copy a software image from the IBM NAS support site to your storage system using UNIX or Windows client connections. Alternatively, you can copy software images to an HTTP server on your network and then storage systems can access the images using the `software` command.

To upgrade the storage system to the latest release of Data ONTAP, you need access to software images and the latest firmware versions. Software images, firmware version information, and the latest firmware for your storage system model are available on the IBM NAS support site. Note the following important information:

- Software images are specific to storage system models.
  Be sure to obtain the correct image for your system.
- Software images include the latest version of system firmware that was available when a given version of Data ONTAP was released.

Next topics

Obtaining images for HTTP servers on page 49
Obtaining images for UNIX clients on page 51
Obtaining images for Windows clients on page 52
Managing files in the /etc/software directory on page 54

Obtaining images for HTTP servers

If you have an HTTP server that is accessible to your storage system, you can copy Data ONTAP software images to the HTTP server and use the `software` command to download and install Data ONTAP software images to your storage system.

Note: You can also use HTTPS connections when SecureAdmin is installed and enabled on the storage system.

When you use an HTTP server to provide Data ONTAP software images, you do not have to mount the storage system to a UNIX administration host or map a drive to the storage system using Windows to perform the installation.

You can copy the Data ONTAP system files to both single systems and storage systems in an active/active configuration.

For more information, see the software (1) man page.

Next topics

Copying the software image to the HTTP server on page 50

Copying software images from the HTTP server without installing the images on page 50

Related concepts

Installing Data ONTAP software images on systems running Data ONTAP 7.2 or later on page 55

Copying the software image to the HTTP server

You must copy the software image file to the HTTP server. This task prepares the HTTP server to serve software images to storage systems in your environment.

Step

1. Copy the software image (for example, `73_setup_i.exe`) from the IBM NAS support site or another system to the directory on the HTTP server from which the file will be served.

Copying software images from the HTTP server without installing the images

You can copy software images to your storage system without immediately installing them. You might do this, for instance, if you want to perform the installation at a later time.

Step

1. Enter the following command from the storage system console:

   `software get` ***`url`*** **`-f`** ***`filename`***

   `url` is the HTTP location from which you want to copy the Data ONTAP software images.

   Use the following URL syntax if you need to specify a user name, password, host, and port to access files on the HTTP server using Basic Access Authentication (RFC2617):

   `http://`*`username:password@host:port/path`*

   Use the `-f` flag to overwrite an existing software file of the same name in the storage system's `/etc/software` directory. If a file of the same name exists and you do not use the `-f` flag, the download will fail and you will be prompted to use `-f`.

   `filename` is the file name you specify for the software file being downloaded to your storage system. If no destination file name is specified, Data ONTAP uses the file name listed in the URL from which you are downloading and places the copy in the `/etc/software` directory on the storage system.

   Example

   In the following example, the `software get` command uses a new destination file name:

   ```
   software get http://www.example.com/downloads/pc_elf/73_setup_i.exe
   73_mailboxes_i.exe
   ```

You see a message similar to the following:

```
software: copying to /etc/software/73_mailboxes_i.exe
software: 100% file read from location.
software: /etc/software/73_mailboxes_i.exe has been copied.
```

Obtaining images for UNIX clients

If you are using a UNIX client to copy a Data ONTAP software image to your storage system, you need access to both the storage system's console and the system's upgrade host. If the upgrade host does not have a Web connection, you must also have access to a client system that can reach the IBM NAS support site.

Next topics

Mounting the storage system on your client on page 51
Obtaining software images on page 52

Related concepts

Upgrade host requirements on page 21
Installing Data ONTAP software images on systems running Data ONTAP 7.2 or later on page 55

Mounting the storage system on your client

Before you copy a software image to your storage system, you must mount the system on your UNIX upgrade host.

Steps

1. As root user, mount the storage system's root file system to the client's `/mnt` directory, using the following command:

   mount *system*:/vol/vol0 */mnt*

   system is the name of the storage system.

   /mnt is the directory on the client where you want to mount the storage system's root file system.

2. Change to the */mnt* directory using the following command on your UNIX client console:

   cd */mnt*

   /mnt is the directory on the client where you mounted the storage system's root file system.

3. To acquire Data ONTAP files, download the Data ONTAP files using a Web browser from the IBM NAS support site.

Obtaining software images

You can use a Web browser to copy the software image from the IBM NAS support site to a UNIX client.

About this task

You can copy the software image directly to your upgrade host. If your upgrade host does not have Web access, you can copy the software image to portable storage media attached to a different client, then copy the image from portable storage to the upgrade host.

Note: Be sure to save the .exe image to your system; do not run it as an executable file.

Steps

1. Use a Web browser to log in to the IBM NAS support site.
2. Click **Data ONTAP**.
3. Click the **Download** tab.
4. After you have chosen the software image that corresponds to your platform, complete one of the following actions, depending on your Web environment.

If you are connecting to the IBM NAS support site from...	Then...
An upgrade host	Save the image to the `.../etc/software` directory on the mountpoint that you chose when you mounted the storage system on your client.
Another UNIX client	**a.** Save the image to portable storage media. **b.** Connect the portable storage media to your upgrade host. **c.** Copy the image to the `.../etc/software` directory on the mountpoint that you chose when you mounted the storage system on your client.

5. Continue with the installation procedures.

Obtaining images for Windows clients

If you are using a Windows client to copy a Data ONTAP software image to your storage system, you need access to both the storage system's console and the system's upgrade host. If the upgrade

host does not have a Web connection, you must also have access to a client system that can reach the IBM NAS support site.

Next topics

Mapping the storage system to a drive on page 53
Obtaining software images on page 53

Related concepts

Upgrade host requirements on page 21
Installing Data ONTAP software images on systems running Data ONTAP 7.2 or later on page 55

Mapping the storage system to a drive

Before you copy a software image to your storage system, you must map the root directory of the system to your Windows upgrade host.

Before you begin

You should make sure that the CIFS service is running and that the Administrator user is defined in CIFS as having authority to access the C$ directory.

Steps

1. Log in to your client as Administrator or log in using an account that has full control on the storage system `C$` directory.
2. Map a drive to the `C$` directory of your storage system.

   Note: On some computers, firewall software might not permit you to map a drive to the `C$` directory of a storage system. To complete this procedure, disable the firewall until you no longer need access to the storage system through your laptop.
3. Copy the software image from the IBM NAS support site.

Obtaining software images

You can use a Web browser to copy the software image from the IBM NAS support site to a Windows client.

About this task

You can copy the software image directly to your upgrade host. If your upgrade host does not have Web access, you can copy the software image to portable storage media attached to a different client, then copy the image from portable storage to the upgrade host.

Note: Be sure to save the .exe image to your storage system; do not run it as an executable file.

Steps

1. Use a Web browser to log in to the IBM NAS support site.
2. Click **Data ONTAP** from the Current N series NAS/iSCSI product list.
3. Click the **Download** tab, and then click Downloadable Files.
4. Choose **Windows** from the Platform/Operating system drop-down list.
5. After you have chosen the software image that corresponds to your platform, complete one of the following actions, depending on your Web environment.

If you are connecting to the IBM NAS support site from...	Then...
An upgrade host	Save the image to the `\etc\software` directory on the mountpoint that you chose previously, when you mounted the storage system on your client.
Another Windows client	**a.** Save the image to portable storage media. **b.** Connect the portable storage media to your upgrade host. **c.** Copy the image to the `\etc\software` directory on the mountpoint that you chose previously, when you mounted the storage system on your client.

6. Continue with the installation procedures.

Managing files in the /etc/software directory

After you have copied Data ONTAP system files to the `/etc/software` directory on your storage system, you can manage them from the storage system console with the `software` command.

If you want to...	Then use the following command...
List the contents of the `/etc/software` directory	`software list`
Delete files from the `/etc/software` directory	`software delete`

For more information, see the software(1) man page.

Installing Data ONTAP software images on systems running Data ONTAP 7.2 or later

You should use the `software update` command to extract and install the system files on a Data ONTAP 7.2 or later system.

You can use the `software update` command to install a software image you have already copied to your storage system, or to copy and install the image from an HTTP server.

You must know the location of and have access to the software image. The `software update` command requires one of the following as an argument:

- The name of the software image you copied to the `/etc/software` directory
- The URL of the HTTP server that you configured to serve software images

The `software update` command allows you to perform several operations at one time. For example, if you use an HTTP server to distribute software images, you can copy an image from the HTTP server, extract and install the system files, download the files to the boot device, and reboot your system with one command.

For more information about the `software update` command and its options, see the software(1) man page.

Note: Beginning with Data ONTAP 7.3.1, the following processes are deprecated for extracting and installing Data ONTAP upgrade images:

- Using the `tar` command from UNIX clients
- Using the setup.exe file and WinZip from Windows clients

They will not be supported in future release families.

Next topics

Installing software images from an HTTP server on page 55
Installing software images from the /etc/software directory on page 59

Installing software images from an HTTP server

To complete this procedure on a Data ONTAP 7.2 or later system, you must know the URL of an HTTP server in your environment that is configured to serve software images.

Step

1. From the storage system prompt, enter the following command:

`software update` *`url options`*

- *`url`* is the URL of the HTTP server and subdirectory.
- *`options`* is one or more of the following:
  - The `-d` option prevents the `download` command from being run automatically after the system files are installed.
  - The `-f` option overwrites the existing image in the `/etc/software` directory.
  - The `-r` option prevents the system from rebooting automatically after the `download` command has finished (default).
  - The `-R` option causes the system to reboot automatically after the `download` command has finished.

    Attention: Beginning in Data ONTAP 7.3.5, the `software update` options have changed; the `-r` option (no automatic reboot) is the default, and the `-R` option must be specified to override the `-r` option.

    However, if you are upgrading from any release earlier than Data ONTAP 7.3.5, you must include the `-r` option to prevent automatic reboot if you are performing a nondisruptive upgrade or if you are upgrading firmware.

    For more information, see the software(1) man page for the Data ONTAP version currently running on your system.

Example

If you are running Data ONTAP...	And you want to...	Then you can enter...
7.3.5 or later	Copy and install the image from your HTTP server	`software update http://www.example.com/downloads/pc_elf/my_73_setup_i.exe -d`
	Copy from your HTTP server and overwrite an existing image	`software update http://www.example.com/downloads/pc_elf/my_73_setup_i.exe -d -f`
	Copy and install the image from your HTTP server, then download the new system files to the boot device immediately after installing them	`software update http://www.example.com/downloads/pc_elf/my_73_setup_i.exe`
	Copy and install the image from your HTTP server to a single system, then download the new system files and reboot immediately	`software update http://www.example.com/downloads/pc_elf/my_73_setup_i.exe -R`

If you are running Data ONTAP...	And you want to...	Then you can enter...
7.3.4 or earlier	Copy and install the image from your HTTP server	**software update http://www.example.com/downloads/pc_elf/my_73_setup_i.exe -d -r**
	Copy from your HTTP server and overwrite an existing image	**software update http://www.example.com/downloads/pc_elf/my_73_setup_i.exe -d -r -f**
	Copy and install the image from your HTTP server, then download the new system files to the boot device immediately after installing them	**software update http://www.example.com/downloads/pc_elf/my_73_setup_i.exe -r**
	Copy and install the image from your HTTP server to a single system, then download the new system files and reboot immediately	**software update http://www.example.com/downloads/pc_elf/my_73_setup_i.exe**

When you use the `software update` command without the options, a message similar to the following appears on your storage system console:

```
software: You can cancel this operation by hitting Ctrl-C in the next 6
seconds.
software: Depending on system load, it might take many minutes
software: to complete this operation. Until it finishes, you will
software: not be able to use the console.
software: copying to <filename>
software: 100% file read from location.
software: /etc/software/<filename> has been copied.
software: installing software, this could take a few minutes...
software: Data ONTAP Package Manager Verifier 1
software: Validating metadata entries in /etc/boot/NPM_METADATA.txt
software: Checking sha1 checksum of file checksum file: /etc/boot/
NPM_FCSUM-pc.sha1.asc
software: Checking sha1 file checksums in /etc/boot/NPM_FCSUM-
pc.sha1.asc
software: installation of <filename> completed.
```

```
Mon Oct 2 13:26:17 PDT [filer: rc:info]: software: installation of
<filename> completed.
```

```
software: Reminder: You might need to upgrade Volume SnapMirror
destination
software: filers associated with this filer. Volume SnapMirror can not
mirror
software: if the version of ONTAP on the source filer is newer than
that on
software: the destination filer.
Mon Oct 2 13:26:17 PDT [filer: download.request:notice]
```

After you finish

Complete the installation by downloading to active/active configurations or single systems.

Related concepts

Downloading and rebooting new Data ONTAP software on page 65

Installing software images from the /etc/software directory

To complete this procedure, the new software image must be present in the `/etc/software` directory on your storage system, and your system must be running Data ONTAP 7.2 or later.

Step

1. From the storage system prompt, enter the following command:

   `software update` ***`file options`***

   - *`file`* is the name of the software image you copied to the `/etc/software` directory.
   - *`options`* is one or more of the following:
     - The `-d` option prevents the `download` command from being run automatically after the system files are installed.
     - The `-f` option overwrites the existing image in the `/etc/software` directory.
     - The `-r` option prevents the system from rebooting automatically after the `download` command has finished (default).
     - The `-R` option causes the system to reboot automatically after the `download` command has finished.

     Attention: Beginning in Data ONTAP 7.3.5, the `software update` options have changed; the `-r` option (no automatic reboot) is the default, and the `-R` option must be specified to override the `-r` option.

     However, if you are upgrading from any release earlier than Data ONTAP 7.3.5, you must include the `-r` option to prevent automatic reboot if you are performing a nondisruptive upgrade or if you are upgrading firmware.

For more information, see the software(1) man page for the Data ONTAP version currently running on your system.

Example

If you are running Data ONTAP...	And you want to...	Then you can enter...
7.3.5 or later	Install the new system files from the `/etc/software` directory	**`software update my_73_setup_i.exe -d`**
	Download the new system files to the boot device immediately after installing them	**`software update my_73_setup_i.exe`**
	Copy and install the image from your HTTP server	**`software update http://www.example.com/downloads/pc_elf/my_73_setup_i.exe`**
	Copy from your HTTP server and overwrite an existing image	**`software update http://www.example.com/downloads/pc_elf/my_73_setup_i.exe -f`**
	Perform an upgrade on a single system and reboot immediately	**`software update -R my_73_setup_i.exe`**

If you are running Data ONTAP...	And you want to...	Then you can enter...
7.3.4 or earlier	Install the new system files from the `/etc/software` directory	**`software update my_73_setup_i.exe -d -r`**
	Download the new system files to the boot device immediately after installing them	**`software update my_73_setup_i.exe -r`**
	Copy and install the image from your HTTP server	**`software update http://www.example.com/downloads/pc_elf/my_73_setup_i.exe`**
	Copy from your HTTP server and overwrite an existing image	**`software update http://www.example.com/downloads/pc_elf/my_73_setup_i.exe -f`**
	Perform an upgrade on a single system and reboot immediately	**`software update my_73_setup_i.exe`**

When you use the `software update` command without the options, a message similar to the following appears on your storage system console:

```
software: You can cancel this operation by hitting Ctrl-C in the next 6
seconds.
software: Depending on system load, it might take many minutes
software: to complete this operation. Until it finishes, you will
software: not be able to use the console.
software: copying to <filename>
software: 100% file read from location.
software: /etc/software/<filename> has been copied.
software: installing software, this could take a few minutes...
software: Data ONTAP Package Manager Verifier 1
software: Validating metadata entries in /etc/boot/NPM_METADATA.txt
software: Checking sha1 checksum of file checksum file: /etc/boot/
NPM_FCSUM-pc.sha1.asc
software: Checking sha1 file checksums in /etc/boot/NPM_FCSUM-
pc.sha1.asc
software: installation of <filename> completed.
Mon Oct 2 13:26:17 PDT [filer: rc:info]: software: installation of
<filename> completed.
```

```
software: Reminder: You might need to upgrade Volume SnapMirror
destination
software: filers associated with this filer. Volume SnapMirror can not
```

```
mirror
software: if the version of ONTAP on the source filer is newer than
that on
software: the destination filer.
Mon Oct 2 13:26:17 PDT [filer: download.request:notice]
```

After you finish

Complete the installation by downloading to active/active configurations or single systems.

Related concepts

Downloading and rebooting new Data ONTAP software on page 65

Installing Data ONTAP software images on systems running a Data ONTAP 7.1 release

You should use the `software install` command to extract and install system files on a Data ONTAP 7.1 system.

You can use the `software install` command to install a software image you have already copied to your storage system, or to copy and install the image from an HTTP server.

You must know the location of and have access to the software image. The `software install` command requires one of the following as an argument:

- The name of the software image you copied to the `/etc/software` directory.
- The URL of the HTTP server that you configured to serve software images.

Note: Beginning with Data ONTAP 7.3.1, the following processes are deprecated for extracting and installing Data ONTAP software images:

- Using the `tar` command from UNIX clients
- Using the setup.exe file and WinZip from Windows clients

These processes will not be supported in future release families.

The `software install` command is deprecated in the Data ONTAP 7.3 release family and will not be supported in future release families. It should only be used for upgrading Data ONTAP 7.1.x releases to 7.2 or later.

Next topics

Installing software images from an HTTP server on page 63
Installing software images from the /etc/software directory on page 64

Installing software images from an HTTP server

To complete this procedure on a Data ONTAP 7.1 system, you must know the URL of an HTTP server in your environment that is configured to serve software images.

Steps

1. From the storage system prompt, enter the following command:

   `software install` ***`url`***

   `url` is the URL of the HTTP server and subdirectory.

Example

`software install http://www.example.com/downloads/pc_elf/my_73_setup_i.exe`

The software is installed on your system, and you see a message similar to the following:

```
system> software: installing software, this could take a few minutes ...
software: installation completed.
Please type "download" to load the new software and
"reboot" subsequently for changes to take effect.
```

2. Complete the upgrade as described in the sections on downloading to single systems or active/active pairs.

Related concepts

Downloading and rebooting new Data ONTAP software on page 65

Installing software images from the /etc/software directory

To complete this procedure, the new software image must be present in the `/etc/software` directory on your storage system, and the system must be running Data ONTAP 7.1.

Steps

1. From the storage system prompt, enter the following command:

   `software install` ***`file`***

   `file` is the name of the software image you copied to the `/etc/software` directory.

   Example

   `software install my_73_setup_i.exe`

   The software is installed on your system, and you see a message similar to the following:

   ```
   software: installing software, this could take a few minutes ...
   software: installation completed.
   Please type "download" to load the new software and
   "reboot" subsequently for changes to take effect.
   ```

2. Complete the upgrade as described in the sections on downloading to single systems or active/active pairs.

Related concepts

Downloading and rebooting new Data ONTAP software on page 65

Downloading and rebooting new Data ONTAP software

The upgrade method you use depends on the system type and the kind of upgrade.

You can select one of the following four upgrade methods:

- Nondisruptive upgrade of active/active configurations between release families (major NDU)
- Nondisruptive upgrade of active/active configurations within a release family (minor NDU)
- Standard upgrade of active/active configurations
- Standard upgrade of single systems

You must select the appropriate procedure for your platform based on the type of system firmware.

If your system is a ...	Your system firmware type is ...	And your boot environment prompt is ...
• N7600, N7700, N7800, or N7900 • N6210, N6240, or N6270 • N6040, N6060, or N6070 • N5600 • N5300 • N3300, N3400, or N3600	BIOS	`>LOADER`
• N5500 • N5200 • N3700	CFE	`>CFE`

If you are upgrading systems in a SnapMirror environment, you must also follow these instructions:

- Upgrade them in the correct order.
- Suspend SnapMirror operations before performing a nondisruptive upgrade.

Next topics

Upgrading in a SnapMirror environment on page 66
Upgrading nondisruptively in a SnapMirror environment on page 67
Upgrading BIOS-based active/active configurations from an earlier release family nondisruptively on page 68
Upgrading BIOS-based active/active configurations within a release family nondisruptively on page 73

Upgrading BIOS-based active/active configurations using the standard method on page 76
Upgrading BIOS-based single systems on page 78
Upgrading CFE-based active/active configurations from an earlier release family nondisruptively on page 79
Upgrading CFE-based active/active configurations within a release family nondisruptively on page 85
Upgrading CFE-based active/active configurations using the standard method on page 89
Upgrading CFE-based single systems on page 92

Related concepts

Release family upgrade requirements on page 24
Standard upgrade requirements on page 30
Nondisruptive upgrade requirements on page 26

Upgrading in a SnapMirror environment

If you need to upgrade Data ONTAP on a system that uses SnapMirror for volume replication, you must upgrade systems with destination volumes *before* you upgrade systems that have source volumes.

About this task

Note: If you are upgrading nondisruptively, you must also suspend SnapMirror operations before upgrading and resume SnapMirror operations when the upgrade is finished.

SnapMirror source volumes can be replicated to single or multiple destination volumes. Replication to multiple destination volumes is also referred to as *cascading destinations*. When you upgrade Data ONTAP, you must identify all destination volumes and then upgrade the storage systems on which they reside before upgrading the systems where the source volumes reside. In addition, when you upgrade storage systems in a cascading series, you should upgrade the systems in order, beginning with the destination systems furthest logically in your topology from the source system.

Steps

1. Identify any destination volumes by entering the following command on the storage system with the source volume:

   `snapmirror destinations`

   The `snapmirror` command lists all destination volumes, including cascaded destinations.

2. Upgrade the systems that have destination volumes, beginning with the furthest system in the topology (that is, the last system in a series of cascading destinations).

3. Upgrade the system that has the source volume.

   Attention: You must upgrade the systems that have SnapMirror destination volumes *before* upgrading those that have source volumes. If you upgrade the source volumes first, SnapMirror

volume replication is disabled. To reenable SnapMirror volume replication, you must downgrade the source system or upgrade the destination system, so that the version of Data ONTAP on the source system is earlier than or the same as that on the destination system.

Related tasks

Identifying SnapMirror destination volumes on page 0

Upgrading nondisruptively in a SnapMirror environment

You must suspend SnapMirror operations before performing a nondisruptive upgrade of Data ONTAP.

About this task

The requirement to suspend SnapMirror operations applies to both synchronous and asynchronous SnapMirror modes.

For more information about SnapMirror operations, see the snapmirror(1) man page and the *Data ONTAP Data Protection Online Backup and Recovery Guide*.

Steps

1. Enter the following command on both source and destination systems to disable SnapMirror operations:

   `snapmirror off`

   As an alternative, you can set the `snapmirror.enable` option to `off`.

2. For each destination volume, enter the following command to allow existing SnapMirror transfers to finish:

   `snapmirror quiesce` ***`destination`***

   Example
   To quiesce transfers involving the destination volume toaster-cl1-cn:vol1, enter the following command:

   `snapmirror quiesce toaster-cl1-cn:vol1`

3. Complete the nondisruptive upgrade according to your upgrade plan.

4. Enter the following command to reenable SnapMirror operations:

   `snapmirror on`

5. Enter the following command to resume existing SnapMirror transfers:

   `snapmirror resume` ***`destination`***

Upgrading BIOS-based active/active configurations from an earlier release family nondisruptively

You can upgrade active/active configurations running BIOS firmware to a new Data ONTAP release family while maintaining storage system availability. This nondisruptive upgrade method has several steps: initiating a failover operation on one system, updating the "failed" system (and if necessary, its firmware), initiating giveback, and repeating the process on the other system. When repeating the process, you must use a special `cf` command if different release families are running on the two systems in the active/active configuration.

Before you begin

Before initiating the nondisruptive upgrade procedure, you need to verify that you have prepared for the upgrade by completing any prerequisite procedures. You must also ensure that you have installed Data ONTAP software onto your storage system.

Steps

1. Choose the following option that describes your configuration:

If you are upgrading from...	Then...
Data ONTAP 7.2.4 or later with AutoSupport enabled	Go to the next step.
Any release earlier than Data ONTAP 7.2.4, or your system is not configured to send AutoSupport messages	Trigger an AutoSupport notification by entering the following command at the console of each storage system controller: **`options autosupport.doit starting_NDU`**

   This AutoSupport notification includes a record of the system status just prior to upgrade. It saves useful troubleshooting information in case there is a problem with the upgrade process. This notification is sent automatically beginning with Data ONTAP 7.2.4.

2. At the console of each storage system, enter the following command to verify that the active/active configuration is enabled:

   `cf status`

   The `cf status` command output should be similar to the following:

   ```
   Cluster enabled, systemA is up.
   ```

   If the output indicates that the active/active configuration is not enabled, enter the following command to enable it:

   `cf enable`

Then verify that the active/active configuration is reenabled by entering the `cf status` command.

3. Choose the following option depending on whether you have already installed new system files.

If you...	Then...
Have already installed system files	Go to the next step.
Are installing and downloading system files in the same operation	At the console of each system, enter the following command: **`software update` *`file_name`* `-r`** Then go to Step 5. **Note:** Beginning in Data ONTAP 7.3.5, the `-r` option (no automatic reboot) is the default. However, until you are running a release that supports this option, you must continue to specify the `-r` option.

When you use the `software update` command without the `-d` option, the `download` command is executed by default.

4. At the console of each system, enter the following command to activate the new code on the storage system's boot device:

   `download`

   After some configuration reminders, the `download` command provides an acknowledgment similar to the following:

```
Tue Jun 19 10:03:22 GMT [download.request:notice]:
Operator requested download initiated
download: Downloading boot device
.......................
download: Downloading boot device (Service Area)
```

   Then a message similar to the following appears:

```
Tues Jun 19 10:11:51 GMT [download.requestDone:notice]:
Operator requested download completed
```

   Note: The storage system console is unavailable until the `download` procedure is complete.

5. Choose the following option that describes your system configuration.

If CIFS...	Then...
Is not in use in system A	Go to the next step.
Is in use in system A	Enter the following command: **`cifs terminate -t` *`nn`*** *nn* is a notification period (in minutes) appropriate for your clients after which CIFS services are terminated. After that period of time, proceed to the next step.

6. At the console of system B, enter the following command:

   cf takeover

   This command causes system A to shut down gracefully and leaves system B in takeover mode.

7. To display the LOADER boot prompt at the system A console, press Ctrl-C at the system A console when instructed after the boot sequence starts.

   You can also display the LOADER prompt by pressing Ctrl-C at the system A console when the "Waiting for giveback" message appears at the console of system A. When prompted to halt the node rather than wait, enter **y**.

8. After halting the node, check the Boot Loader messages for a warning similar to the following:
   `Warning: The CompactFlash contains newer firmware image (1.6.0). Please run 'update_flash' at Loader prompt to update your system firmware (1.5X3).`

If you...	Then ...
Do not see this warning.	BIOS firmware is updated automatically if needed; go to Step 12.
See this warning.	You must update BIOS firmware manually; go to the next step.

   After the new BIOS system firmware is installed, future system firmware updates take place automatically.

9. At the boot prompt, enter the following command to reset the system:

   bye

10. Display the LOADER boot prompt again at the system A console by repeating Step 7.

11. Enter the following command:

    update_flash

    The system updates the firmware, displays several status messages, and displays the boot prompt.

12. Enter the following command to reboot the system using the new firmware and software:

    bye

13. Enter the following command at the console of system B:

    cf giveback

    Attention: The `cf giveback` command can fail because of open client sessions (such as CIFS sessions), long-running operations, or operations that cannot be restarted (such as tape backup or SyncMirror resynchronization). If the `cf giveback` command fails, terminate any CIFS session or long-running operations gracefully (because the `-f` option will immediately terminate any CIFS sessions or long-running operations) and then enter the following command (with the `-f` option):

    cf giveback -f

For more information about the behavior of the `-f` option, see the cf(1) man page.

The command causes system A to reboot with the new system configuration—a Data ONTAP version and any new system firmware and hardware changes—and resume normal operation as active/active partner.

Note: At this point in the upgrade procedure—system A is running Data ONTAP 7.3 and system B is running an earlier Data ONTAP release family—the systems are in a state of "version mismatch." This means that normal active/active functions such as NVRAM mirroring and automatic takeover are not in effect. You might see error messages indicating version mismatch and mailbox format problems. This is expected behavior; it represents a temporary state in a major nondisruptive upgrade and not harmful.

Nonetheless, you should complete the upgrade procedure as quickly as possible; do not allow the two systems to remain in a state of version mismatch longer than necessary.

14. Choose the following option that describes your configuration.

If CIFS...	Then...
Is not in use in system B	Go to the next step.
Is in use in system B	Enter the following command: **`cifs terminate -t nn`** *nn* is a notification period (in minutes) appropriate for your clients after which CIFS services are terminated. After that period of time, proceed to the next step.

15. At the console of system A, enter the following command:

`cf takeover -n`

You see output similar to the following:

```
Waiting for partner to be cleanly shutdown using the
'halt' command
Press Ctrl-C to abort wait...
```

Note: The `-n` flag of the `cf takeover` command should only be used for major nondisruptive upgrades. If run during a minor nondisruptive upgrade or a non-upgrade takeover, it will generate an error and the command will terminate.

16. At the console of system B, enter the following command:

`halt`

This command causes system B to shut down cleanly, flushing file-system information in memory to disk.

17. After halting the node, check the Boot Loader messages for a warning similar to the following:

```
Warning: The CompactFlash contains newer firmware image (1.6.0). Please
run 'update_flash' at Loader prompt to update your system firmware
(1.5X3).
```

If...	Then...
You do not see this warning	BIOS firmware is updated automatically if needed; go to Step 21.
You see this warning	You must update BIOS firmware manually; go to the next step.

After the new BIOS system firmware is installed, future system firmware updates take place automatically.

18. At the boot prompt, enter the following command to reset the system:

```
bye
```

19. To display the LOADER boot prompt at the system B console, press Ctrl-C at the system B console when instructed after the boot sequence starts.

You can also display the LOADER prompt by pressing Ctrl-C at the system A console when the "Waiting for giveback" message appears at the console of system B. When prompted to halt the node rather than wait, enter **y**.

20. Enter the following command:

```
update_flash
```

The system updates the firmware, displays several status messages, and displays the boot prompt.

21. At the console of system B, enter the following command to reboot the system using the new system firmware (if it was installed) and software:

```
bye
```

22. Enter the following command at the console of system A:

```
cf giveback
```

Attention: The `cf giveback` command can fail because of open client sessions (such as CIFS sessions), long-running operations, or operations that cannot be restarted (such as tape backup or SyncMirror resynchronization). If the `cf giveback` command fails, terminate any CIFS session or long-running operations gracefully (because the `-f` option will immediately terminate any CIFS sessions or long-running operations) and then enter the following command (with the `-f` option):

```
cf giveback -f
```

For more information about the behavior of the `-f` option, see the cf(1) man page.

This command causes system B to reboot with the new system configuration—a Data ONTAP version and any system firmware and hardware changes—and resume normal operation as active/active partner.

When the reboot is finished, the two active/active nodes are running the same Data ONTAP version.

23. Choose the following option that describes your configuration.

If you are upgrading from...	Then...
Data ONTAP 7.2.4 or later with AutoSupport enabled	Your nondisruptive upgrade is complete.
Any release earlier than 7.2.4, or your system is not configured to send AutoSupport messages	Trigger another AutoSupport notification by entering the following command at the console of each storage system controller: `options autosupport.doit finishing_NDU`

This notification includes a record of the system status after upgrading. It saves useful troubleshooting information in case there is a problem with the upgrade process.

Upgrading BIOS-based active/active configurations within a release family nondisruptively

You can upgrade active/active configurations running BIOS firmware within a Data ONTAP release family while maintaining storage system availability. This nondisruptive upgrade method has several steps: initiating a failover operation on one system, updating the "failed" system (and if necessary, its firmware), initiating giveback, and repeating the process on the other system.

Before you begin

Before initiating the nondisruptive upgrade procedure, you need to prepare for the upgrade by completing any prerequisite procedures. You must also ensure that you installed the Data ONTAP software onto your storage system.

Steps

1. Choose the following option that describes your configuration.

If you are upgrading from...	Then...
Data ONTAP 7.2.4 or later with AutoSupport enabled	Go to the next step.
Any release earlier than Data ONTAP 7.2.4, or your system is not configured to send AutoSupport messages	Trigger an AutoSupport notification by entering the following command at the console of each storage system controller: `options autosupport.doit starting_NDU`

   This AutoSupport notification includes a record of the system status just prior to upgrade. It saves useful troubleshooting information in case there is a problem with the upgrade process. This notification is sent automatically beginning with Data ONTAP 7.2.4.

2. At the console of each storage system, enter the following command to verify that the active/active configuration is enabled:

`cf status`

The `cf status` command output should be similar to the following:

```
Cluster enabled, systemA is up.
```

If the output indicates that the active/active configuration is not enabled, enter the following command to enable it:

`cf enable`

Then verify that the active/active configuration is reenabled by entering the `cf status` command.

3. Choose the following option depending on whether you have already installed new system files.

If you...	Then...
Have already installed system files	Go to the next step.
Are installing and downloading system files in the same operation	At the console of each system, enter the following command: **`software update`** ***`file_name`*** **`-r`** Then go to Step 5. **Note:** Beginning in Data ONTAP 7.3.5, the `-r` option (no automatic reboot) is the default. However, until you are running a release that supports this option, you must continue to specify the `-r` option.

When you use the `software update` command without the `-d` option, the `download` command is executed by default.

4. At the console of each system, enter the following command to activate the new code on the storage system's boot device:

`download`

The `download` command provides an acknowledgment similar to the following:

```
Tue Jun 19 10:03:22 GMT [download.request:notice]:
Operator requested download initiated
download: Downloading boot device
.....................
download: Downloading boot device (Service Area)
```

Then a message similar to the following appears:

```
Tues Jun 19 10:11:51 GMT [download.requestDone:notice]:
Operator requested download completed
```

Note: The storage system console is unavailable until the `download` procedure is complete.

5. Choose the following option that describes your configuration.

If CIFS...	Then...
Is not in use in system A	Go to the next step.
Is in use in system A	Enter the following command: **cifs terminate -t *nn*** *nn* is a notification period (in minutes) appropriate for your clients after which CIFS services are terminated. After that period of time proceed to Step 3.

6. At the console of system B, enter the following command:

   cf takeover

   This command causes system A to shut down gracefully and leaves system B in takeover mode.

7. To display the LOADER boot prompt at the system A console, press Ctrl-C at the system A console when instructed after the boot sequence starts.

   You can also display the LOADER prompt by pressing Ctrl-C at the system A console when the "Waiting for giveback" message appears at the console of system A. When prompted to halt the node rather than wait, enter **y**.

8. Enter the following command to reboot the system using the new software:

   bye

9. Enter the following command at the console of system B:

   cf giveback

   Attention: The `cf giveback` command can fail because of open client sessions (such as CIFS sessions), long-running operations, or operations that cannot be restarted (such as tape backup or SyncMirror resynchronization). If the `cf giveback` command fails, terminate any CIFS session or long-running operations gracefully (because the `-f` option will immediately terminate any CIFS sessions or long-running operations) and then enter the following command (with the `-f` option):

   cf giveback -f

   For more information about the behavior of the `-f` option, see the cf(1) man page.

   The command causes system A to reboot with the new system configuration—a Data ONTAP version or other system firmware and hardware changes—and resume normal operation as an active/active partner.

10. Repeat Step 5 through Step 7 to update the partner storage system; in other words, bring down and update system B with partner A in takeover mode.

Upgrading BIOS-based active/active configurations using the standard method

If you can take active/active configurations running BIOS firmware offline to update software and other components, you can use the standard upgrade method. This method has several steps: disabling the active/active configuration from the console of one the systems, updating each system (and if necessary, its firmware), and finally reenabling the active/active configuration between the two systems.

Before you begin

Before initiating the standard upgrade procedure, you need to prepare for the upgrade by completing any prerequisite procedures. You must also ensure that you installed the Data ONTAP software onto the storage system.

Note: If you are upgrading a system running Data ONTAP 7.2 or later, you can use the `software update` command to complete all or part of this procedure.

Steps

1. Disable the active/active configuration by entering the following command at the console of one of the storage systems:

   `cf disable`

2. Choose the following option depending on whether you have already installed new system files:

If you...	Then...
Have already installed system files	Go to the next step.
Are installing and downloading system files in the same operation	At the console of each system, enter the following command: **`software update` *`file_name`* `-r`** Then go to Step 4. **Note:** Beginning in Data ONTAP 7.3.5, the `-r` option (no automatic reboot) is the default. However, until you are running a release that supports this option, you must continue to specify the `-r` option.

   When you use the `software update` command without the `-d` option, the `download` command is executed by default.

3. At the console of each system, enter the following command to activate the new code on the storage system's boot device:

   `download`

The `download` command provides an acknowledgment similar to the following:

```
Tue Jun 19 10:03:22 GMT [download.request:notice]:
Operator requested download initiated
download: Downloading boot device
.....................
download: Downloading boot device (Service Area)
```

Then a message similar to the following appears:

```
Tues Jun 19 10:11:51 GMT [download.requestDone:notice]:
Operator requested download completed
```

Note: The storage system console is unavailable until the `download` procedure is complete.

4. Enter the following command at the console of system A:

   `halt`

   After the system shuts down, the LOADER prompt appears.

5. After halting the system, check the Boot Loader messages for a warning similar to the following: `Warning: The CompactFlash contains newer firmware image (1.6.0). Please run 'update_flash' at Loader prompt to update your system firmware (1.5X3).`

If...	Then...
You do not see this warning.	BIOS firmware is updated automatically if needed; go to Step 7.
You see this warning.	You must update BIOS firmware manually; go to the next step.

   After the new BIOS system firmware is installed, future system firmware updates take place automatically.

6. Enter the following command:

   `update_flash`

   The system updates the firmware, displays several status messages, and displays the boot prompt.

7. At the boot prompt, enter the following command to reboot the system using the new software and, if applicable, the new firmware:

   `bye`

8. While the active/active configuration is disabled, repeat Step 4 through Step 7 at the console of system B.

   Attention: Do not proceed to Step 9 until both systems in the active/active configuration have been rebooted with the new version of Data ONTAP.

9. Reenable the active/active configuration by entering the following command on one of the storage systems:

   `cf enable`

Related tasks

Installing software images from the /etc/software directory on page 59

Upgrading BIOS-based single systems

You upgrade a single system running BIOS firmware by updating the system software and updating its firmware, then rebooting.

Before you begin

Before initiating this download procedure, verify that you have prepared for the upgrade by completing the prerequisite procedures. You must also install the Data ONTAP files to your storage system.

Note: If you are upgrading a system running Data ONTAP 7.2 or later, you can use the `software update` command to complete all or part of this procedure.

Steps

1. Choose the following option depending on whether you have already installed new system files:

If you ...	Then ...
Have already installed system files	Go to the next step.
Are installing and downloading system files in the same operation	At the storage system console, enter the following command: **`software update` *`file_name`* `-r`** Then go to Step 3. **Note:** Beginning in Data ONTAP 7.3.5, the `-r` option (no automatic reboot) is the default. However, until you are running a release that supports this option, you must continue to specify the `-r` option.

   When you use the `software update` command without the `-d` option, the `download` command is executed by default.

2. At the system console, enter the following command to activate the new code on the storage system's boot device:

   `download`

   The `download` command provides an acknowledgment similar to the following:

```
Tue Jun 19 10:03:22 GMT [download.request:notice]:
Operator requested download initiated
download: Downloading boot device
.....................
```

```
download: Downloading boot device (Service Area)
```

Then a message similar to the following appears:

```
Tues Jun 19 10:11:51 GMT [download.requestDone:notice]:
Operator requested download completed
```

Note: The storage system console is unavailable until the `download` procedure is complete.

3. Enter the following command to shut down the storage system:

   `halt`

   After the system shuts down, the LOADER boot environment prompt appears.

4. After halting the system, check the Boot Loader messages for a warning similar to the following:
   `Warning: The CompactFlash contains newer firmware image (1.6.0). Please run 'update_flash' at Loader prompt to update your system firmware (1.5X3).`

If ...	Then ...
You do not see this warning	BIOS firmware is updated automatically if needed; go to Step 6.
You see this warning	You must update BIOS firmware manually; go to the next step.

   After the new BIOS system firmware is installed, future system firmware updates take place automatically.

5. Enter the following command:

   `update_flash`

   The system updates the firmware, displays several status messages, and displays the boot prompt.

6. At the firmware environment boot prompt, enter the following command to reboot the system using the new software and, if applicable, the new firmware:

   `bye`

Related tasks

Installing software images from the /etc/software directory on page 59

Upgrading CFE-based active/active configurations from an earlier release family nondisruptively

You can upgrade active/active configurations running CFE firmware to a new Data ONTAP release family while maintaining storage system availability. This nondisruptive upgrade method has several steps: initiating a failover operation on one system, updating the "failed" system (and if necessary, its firmware), initiating giveback, and repeating the process on the other system. When repeating the

process, you must use a special `cf` command if different release families are running on the two systems in the active/active configuration.

Before you begin

Before initiating the nondisruptive upgrade procedure, you need to verify that you have prepared for the upgrade by completing any prerequisite procedures. You must also ensure that you have installed Data ONTAP software onto your storage system.

Steps

1. Choose the following option that describes your configuration:

If you are upgrading from ...	Then ...
Data ONTAP 7.2.4 or later with AutoSupport enabled	Go to the next step.
Any release earlier than Data ONTAP 7.2.4, or your system is not configured to send AutoSupport messages	Trigger an AutoSupport notification by entering the following command at the console of each storage system controller: **`options autosupport.doit starting_NDU`**

   This AutoSupport notification includes a record of the system status just prior to upgrade. It saves useful troubleshooting information in case there is a problem with the upgrade process. This notification is sent automatically beginning with Data ONTAP 7.2.4.

2. At the console of each storage system, enter the following command to verify that the active/active configuration is enabled:

   `cf status`

   The `cf status` command output should be similar to the following:

   ```
   Cluster enabled, systemA is up.
   ```

   If the output indicates that the active/active configuration is not enabled, enter the following command to enable it:

   `cf enable`

   Then verify that the active/active configuration is reenabled by entering the `cf status` command.

3. Choose the following option depending on whether you have already installed new system files:

If you ...	Then ...
Have already installed system files	Go to the next step.

If you ...	Then ...
Are installing and downloading system files in the same operation	At the console of each system, enter the following command: **`software update file_name -r`** Then go to Step 5. **Attention:** You must include the `-r` option to prevent automatic reboot. If the system reboots automatically, the upgrade will be disruptive.

When you use the `software update` command without the `-d` option, the `download` command is executed by default.

4. At the console of each system, enter the following command to activate the new code on the storage system's boot device:

   `download`

   The `download` command provides an acknowledgment similar to the following:

   ```
   Tue Jun 19 10:03:22 GMT [download.request:notice]:
   Operator requested download initiated
   download: Downloading boot device
   ......................
   download: Downloading boot device (Service Area)
   ```

   Then a message similar to the following appears:

   ```
   Tues Jun 19 10:11:51 GMT [download.requestDone:notice]:
   Operator requested download completed
   ```

   Note: The storage system console is unavailable until the `download` procedure is complete.

5. At the console of each system, enter the following commands to compare the installed version of system firmware with the version on the boot device:

   `sysconfig -a`

   `version -b`

   The `sysconfig -a` command output contains entries similar to the following:

   ```
   Firmware release:   CFE 3.1.0
   ```

   The `version -b` command output contains an entry similar to the following:

   ```
   1:/x86_elf/firmware/deux/firmware.img: Firmware 3.1.0
   ```

If the version of the newly loaded firmware displayed by the `version -b` command is...	Then...
The same as the installed firmware version displayed by `sysconfig -a`	Your storage system does not need a system firmware update.

If the version of the newly loaded firmware displayed by the `version -b` command is...	Then...
Later than the installed firmware version displayed by `sysconfig -a`	Your storage system needs a system firmware update.
Earlier than the installed firmware version displayed by `sysconfig -a`	*Do not* update system firmware with the `update_flash` command.

For more information about system firmware requirements, see *System firmware updates* on page 97.

6. Choose the following option that describes your configuration:

If CIFS ...	Then ...
Is not in use in system A	Go to the next step.
Is in use in system A	Enter the following command: **`cifs terminate -t nn`** where *nn* is a notification period (in minutes) appropriate for your clients. After that period of time, proceed to the next step.

7. At the console of system B, enter the following command:

   `cf takeover`

   This command causes system A to shut down gracefully and leaves system B in takeover mode.

8. To display the CFE boot prompt at the system A console, press Ctrl-C at the system A console when instructed after the boot sequence starts.

   You can also display the CFE prompt by pressing Ctrl-C at the system A console when the "Waiting for giveback" message appears at the console of system A. When prompted to halt the node rather than wait, enter **`y`**.

9. Choose the following option that describes your configuration:

If you ...	Then go to ...
Do not need to update system firmware	Step 13.
Need to update system firmware	The next step.

10. At the boot prompt, enter the following command to reset the system:

    `bye`

11. Display the CFE boot prompt again at the system A console completing one of the following procedures:

    - Press Ctrl-C at the system A console when instructed after the boot sequence starts.

- When the "Waiting for giveback" message appears at the console of system A, press Ctrl-C at the system A console.

  When prompted to halt the node rather than wait, enter the following command:

  `y`

12. Enter the following command:

`update_flash`

The system updates the firmware, displays several status messages, and displays the boot prompt.

13. Enter the following command to reboot the system using the new firmware and software:

`bye`

14. Enter the following command at the console of system B:

`cf giveback`

Attention: The `cf giveback` command can fail because of open client sessions (such as CIFS sessions), long-running operations, or operations that cannot be restarted (such as tape backup or SyncMirror resynchronization). If the `cf giveback` command fails, terminate any CIFS session or long-running operations gracefully (because the `-f` option will immediately terminate any CIFS sessions or long-running operations) and then enter the following command (with the `-f` option):

`cf giveback -f`

For more information about the behavior of the `-f` option, see the cf(1) man page.

The command causes system A to reboot with the new system configuration—a Data ONTAP version and any new system firmware and hardware changes—and resume normal operation as an active/active partner.

Note: At this point in the upgrade procedure—system A is running Data ONTAP 7.3 and system B is running an earlier Data ONTAP release family—the systems are in a state of "version mismatch." This means that normal active/active functions such as NVRAM mirroring and automatic takeover are not in effect. You might see error messages indicating version mismatch and mailbox format problems. This is expected behavior; it represents a temporary state in a major nondisruptive upgrade and not harmful.

Nonetheless, you should complete the upgrade procedure as quickly as possible; do not allow the two systems to remain in a state of version mismatch longer than necessary.

15. Choose the following option that describes your system configuration:

If CIFS ...	Then ...
Is not in use in system B	Go to the next step.

If CIFS ...	Then ...
Is in use in system B	Enter the following command: **`cifs terminate -t nn`** where *nn* is a notification period (in minutes) appropriate for your clients. After that period of time, proceed to the next step.

16. At the console of system A, enter the following command:

    `cf takeover -n`

    You see output similar to the following:

    ```
    Waiting for partner to be cleanly shutdown using the
    'halt' command
    Press Ctrl-C to abort wait...
    ```

    Note: The `-n` flag of the `cf takeover` command should only be used for major nondisruptive upgrades. If run during a minor nondisruptive upgrade or a non-upgrade takeover, it will generate an error and the command will terminate.

17. At the console of system B, enter the following command:

    `halt`

    This command causes system B to shut down cleanly, flushing file-system information in memory to disk.

18. Choose the following option that describes your upgrade scenario:

If you ...	Then go to ...
Do not need to update system firmware	Step 22.
Need to update system firmware	The next step.

19. At the boot prompt, enter the following command to reset the system:

    `bye`

20. To display the CFE boot prompt at the system B console, press Ctrl-C at the system B console when instructed after the boot sequence starts.

    You can also display the CFE prompt by pressing Ctrl-C at the system B console when the "Waiting for giveback" message appears at the console of system B. When prompted to halt the node rather than wait, enter **`y`**.

21. Enter the following command:

    `update_flash`

    The system updates the firmware, displays several status messages, and displays the boot prompt.

22. At the console of system B, enter the following command to reboot the system using the new system firmware (if it was installed) and software:

bye

23. Enter the following command at the console of system A:

cf giveback

Attention: The `cf giveback` command can fail because of open client sessions (such as CIFS sessions), long-running operations, or operations that cannot be restarted (such as tape backup or SyncMirror resynchronization). If the `cf giveback` command fails, terminate any CIFS session or long-running operations gracefully (because the `-f` option will immediately terminate any CIFS sessions or long-running operations) and then enter the following command (with the `-f` option):

cf giveback -f

For more information about the behavior of the `-f` option, see the cf(1) man page.

This command causes system B to reboot with the new system configuration—a Data ONTAP version and any system firmware and hardware changes—and resume normal operation as an active/active partner.

When the reboot finishes, the two active/active nodes are running the same Data ONTAP version.

24. Choose the following option that describes your configuration:

If you are upgrading from...	Then ...
Data ONTAP 7.2.4 or later with AutoSupport enabled	Your nondisruptive upgrade is complete.
Any release earlier than 7.2.4, or your system is not configured to send AutoSupport messages	Trigger another AutoSupport notification by entering the following command at the console of each storage system controller: **options autosupport.doit finishing_NDU**

This notification includes a record of the system status after upgrading. It saves useful troubleshooting information in case there is a problem with the upgrade process.

Upgrading CFE-based active/active configurations within a release family nondisruptively

You can upgrade active/active configurations running CFE firmware within a Data ONTAP release family while maintaining storage system availability. This nondisruptive upgrade method has several

steps: initiating a failover operation on one system, updating the "failed" system (and if necessary, its firmware), initiating giveback, and repeating the process on the other system.

Before you begin

Before initiating the nondisruptive upgrade procedure, you need to prepare for the upgrade by completing any prerequisite procedures. You must also ensure that you installed the Data ONTAP software onto your storage system.

Steps

1. At the console of each storage system, enter the following command to verify that the active/active configuration is enabled:

   `cf status`

   The `cf status` command output should be similar to the following:

   ```
   Cluster enabled, systemA is up.
   ```

   If the output indicates that the active/active configuration is not enabled, enter the following command to enable it:

   `cf enable`

   Then verify that the active/active configuration is reenabled by entering the `cf status` command.

2. Choose the following option depending on whether you have already installed new system files:

If you ...	Then ...
Have already installed system files	Go to the next step.
Are installing and downloading system files in the same operation	At the console of each system, enter the following command: **`software update`** ***`file_name`*** **`-r`** Then go to Step 5. **Attention:** You must include the `-r` option to prevent automatic reboot. If the system reboots automatically, the upgrade will be disruptive.

   When you use the `software update` command without the `-d` option, the `download` command is executed by default.

3. At the console of each system, enter the following command to activate the new code on the storage system's boot device:

   `download`

   The `download` command provides an acknowledgment similar to the following:

```
Tue Jun 19 10:03:22 GMT [download.request:notice]:
Operator requested download initiated
download: Downloading boot device
.....................
download: Downloading boot device (Service Area)
```

Then a message similar to the following appears:

```
Tues Jun 19 10:11:51 GMT [download.requestDone:notice]:
Operator requested download completed
```

Note: The storage system console is unavailable until the `download` procedure is complete.

4. At the console of each system, enter the following commands to compare the installed version of system firmware with the version on the boot device:

   `sysconfig -a`

   `version -b`

   The `sysconfig -a` command output contains entries similar to the following:

   ```
   Firmware release:   CFE 3.1.0
   ```

   The `version -b` command output contains an entry similar to the following:

   ```
   1:/x86_elf/firmware/deux/firmware.img: Firmware 3.1.0
   ```

If the version of the newly loaded firmware displayed by the `version -b` command is ...	**Then ...**
The same as the installed firmware version displayed by `sysconfig -a`	Your storage system does not need a system firmware update.
Later than the installed firmware version displayed by `sysconfig -a`	Your storage system needs a system firmware update.
Earlier than the installed firmware version displayed by `sysconfig -a`	*Do not* update system firmware with the `update_flash` command.

5. Choose the following option that describes your configuration:

If CIFS ...	**Then ...**
Is not in use in system A	Go to the next step.
Is in use in system A	Enter the following command: **`cifs terminate -t nn`** where *nn* is a notification period (in minutes) appropriate for your clients. After that period of time, proceed to the next step.

6. At the console of system B, enter the following command:

cf takeover

This command causes system A to shut down gracefully and leaves system B in takeover mode.

7. To display the CFE boot prompt at the system A console, press Ctrl-C at the system A console when instructed after the boot sequence starts.

   You can also display the CFE prompt by pressing Ctrl-C at the system A console when the "Waiting for giveback" message appears at the console of system A. When prompted to halt the node rather than wait, enter **y**.

8. Choose the following option that describes your configuration:

If you ...	Then go to ...
Do not need to update system firmware	Step 13.
Need to update system firmware	The next step.

9. At the boot prompt, enter the following command to reset the system:

   bye

10. Display the CFE boot prompt again at the system A console by pressing Ctrl-C at the system A console when instructed after the boot sequence starts.

    You can also display the CFE prompt by pressing Ctrl-C at the system A console when the "Waiting for giveback" message appears at the console of system A. When prompted to halt the node rather than wait, enter **y**.

11. Enter the following command:

    update_flash

    The system updates the firmware, displays several status messages, and displays the boot prompt.

12. Enter the following command to reboot the system using the new firmware and software:

    bye

13. Enter the following command at the console of system B:

    cf giveback

    Attention: The `cf giveback` command can fail because of open client sessions (such as CIFS sessions), long-running operations, or operations that cannot be restarted (such as tape backup or SyncMirror resynchronization). If the `cf giveback` command fails, terminate any CIFS session or long-running operations gracefully (because the `-f` option will immediately terminate any CIFS sessions or long-running operations) and then enter the following command (with the `-f` option):

    cf giveback -f

    For more information about the behavior of the `-f` option, see the cf(1) man page.

The command causes system A to reboot with the new system configuration—a Data ONTAP version or other system firmware and hardware changes—and resume normal operation as an active/active partner.

14. Repeat Step 4 through 12 to update the partner system; that is, bring down and update system B with partner A in takeover mode.

Upgrading CFE-based active/active configurations using the standard method

If you can take active/active configurations running CFE firmware offline to update software and other components, you can use the standard upgrade method. This method has several steps: disabling the active/active configuration from the console of one the systems, updating each system (and if necessary, its firmware), and finally reenabling the active/active configuration between the two systems.

Before you begin

Before initiating the standard upgrade procedure, you need to prepare for the upgrade by completing any prerequisite procedures. You must also ensure that you installed the Data ONTAP software onto the storage system.

Note: If you are upgrading a system running Data ONTAP 7.2 or later, you can use the `software update` command to complete all or part of this procedure.

Steps

1. Disable the active/active configuration by entering the following command at the console of one of the storage systems:

```
cf disable
```

2. Choose the following option depending on whether you have already installed new system files:

If you...	Then...
Have already installed system files	Go to the next step.
Are installing and downloading system files in the same operation	At the console of each system, enter the following command: **`software update`** ***`file_name`*** **`-r`** Then go to Step 4. **Attention:** You must include the `-r` option to prevent automatic reboot.

When you use the `software update` command without the `-d` option, the `download` command is executed by default.

3. At the console of each system, enter the following command to activate the new code on the storage system's boot device:

   `download`

   The `download` command provides an acknowledgment similar to the following:

   ```
   Tue Jun 19 10:03:22 GMT [download.request:notice]:
   Operator requested download initiated
   download: Downloading boot device
   ......................
   download: Downloading boot device (Service Area)
   ```

   Then a message similar to the following appears:

   ```
   Tues Jun 19 10:11:51 GMT [download.requestDone:notice]:
   Operator requested download completed
   ```

   Note: The storage system console is unavailable until the `download` procedure is complete.

4. At the console of each system, enter the following commands to compare the installed version of system firmware with the version on the boot device:

   `sysconfig -a`

   `version -b`

   The `sysconfig -a` command output contains entries similar to the following:

   ```
   Firmware release:   CFE 3.1.0
   ```

   The `version -b` command output contains an entry similar to the following:

   ```
   1:/x86_elf/firmware/deux/firmware.img: Firmware 3.1.0
   ```

If the version of the newly loaded firmware displayed by the `version -b` command is...	**Then...**
The same as the installed firmware version displayed by `sysconfig -a`	Your storage system does not need a system firmware update.
Later than the installed firmware version displayed by `sysconfig -a`	Your storage system needs a system firmware update.
Earlier than the installed firmware version displayed by `sysconfig -a`	*Do not* update system firmware with the `update_flash` command.

5. Enter the following command to shut down the storage system:

   `halt`

   After the system shuts down, the firmware prompt appears.

6. Choose the following option that describes your configuration:

If you...	Then...
Do not need to update system firmware	Go to Step 7.
Need to update system firmware	Enter the following command: **`update_flash`**

The command provides an acknowledgment similar to the following:

```
Reading flash0a: Done. 209152 bytes read

Reading flash0a: Done. 20957 bytes read
Programming......done.
209152 bytes written
Reading fatfs://ide0.0/X86_ELF/firmware/DEUX/firmware.img: Done.
65524 bytes read
Flash image contains CFE version 3.1.0
Flash image is 655360 bytes, flags 00000001,CRC A3E307FD

Programming...done. 655360 bytes written
```

The system updates the firmware, displays several status messages, and displays the CFE prompt.

7. At the boot prompt, enter the following command to reboot the system using the new software and, if applicable, the new firmware:

   `bye`

8. While the active/active configuration is disabled, repeat Step 4 through Step 7 at the console of the partner storage system.

   Attention: Do not proceed to Step 9 until both systems in the active/active configuration have been rebooted with the new version of Data ONTAP.

9. Reenable the active/active configuration by entering the following command on one of the storage systems:

   `cf enable`

Related tasks

Installing software images from the /etc/software directory on page 59

Upgrading CFE-based single systems

You upgrade a single system running CFE firmware by updating the system software and updating its firmware, then rebooting.

Before you begin

Before initiating this download procedure, verify that you have prepared for the upgrade by completing the prerequisite procedures. You must also install the Data ONTAP files to your storage system.

Note: If you are upgrading a system running Data ONTAP 7.2 or later, you can use the `software update` command to complete all or part of this procedure.

Steps

1. Choose the following option depending on whether you have already installed new system files:

If you ...	Then ...
Have already installed system files	Go to the next step.
Are installing and downloading system files in the same operation	At the storage system console, enter the following command: **`software update`** ***`file_name`*** **`-r`** Then go to Step 3. **Attention:** You must include the `-r` option to prevent automatic reboot.

   When you use the `software update` command without the `-d` option, the `download` command is executed by default.

2. At the system console, enter the following command to activate the new code on the storage system's boot device:

   `download`

   The `download` command provides an acknowledgment similar to the following:

```
Tue Jun 19 10:03:22 GMT [download.request:notice]:
Operator requested download initiated
download: Downloading boot device
.....................
download: Downloading boot device (Service Area)
```

   Then a message similar to the following appears:

```
Tues Jun 19 10:11:51 GMT [download.requestDone:notice]:
Operator requested download completed
```

Note: The storage system console is unavailable until the `download` procedure is complete.

3. Enter the following commands to compare the installed version of system firmware with the version on the boot device:

   `sysconfig -a`

   `version -b`

   The `sysconfig -a` command output contains entries similar to the following:

   ```
   Firmware release:   CFE 3.1.0
   ```

   The `version -b` command output contains an entry similar to the following:

   ```
   1:/x86_elf/firmware/deux/firmware.img: Firmware 3.1.0
   ```

If the version of the newly loaded firmware displayed by the `version -b` command is...	**Then...**
The same as the installed firmware version displayed by `sysconfig -a`	Your storage system does not need a system firmware update.
Later than the installed firmware version displayed by `sysconfig -a`	Your storage system needs a system firmware update.
Earlier than the installed firmware version displayed by `sysconfig -a`	*Do not* update system firmware with the `update_flash` command.

4. Enter the following command to shut down the storage system:

   `halt`

   After the system shuts down, the firmware prompt appears.

5. Choose the following option that describes your configuration.

If you...	**Then...**
Do not need to update system firmware	Go to the next step.
Need to update system firmware	Enter the following command: **`update_flash`**

   The command provides an acknowledgment similar to the following:

   ```
   Reading flash0a: Done. 209152 bytes read

   Reading flash0a: Done. 20957 bytes read
   Programming......done.
   209152 bytes written
   Reading fatfs://ide0.0/X86_ELF/firmware/DEUX/firmware.img: Done.
   65524 bytes read
   Flash image contains CFE version 3.1.0
   Flash image is 655360 bytes, flags 00000001,CRC A3E307FD
   ```

```
Programming...done. 655360 bytes written
```

The system updates the firmware, displays several status messages, and displays the CFE prompt.

6. At the firmware environment boot prompt, enter the following command to reboot the system using the new software and, if applicable, the new firmware:

   bye

Related tasks

Installing software images from the /etc/software directory on page 59

Updating IBM customer contact information

Data ONTAP 7.2.5 and later releases include improved AutoSupport reporting features. To take advantage of these features, you must enter IBM customer contact information after completing the upgrade.

There are two ways to enter IBM customer contact information after upgrading.

- Running the `setup` at the storage system command line.
- Entering values in the customer contact options at the storage system command line.
  For more information about customer contact options, see the *Data ONTAP System Administration Guide*.

Either of these procedures can be used to update customer contact information after initial system setup or upgrade.

Entering customer contact information with the setup command

You can run the `setup` command after upgrading to this release to enter required IBM customer contact information.

Before you begin

The upgrade to Data ONTAP 7.2.5 or later must be complete before you update IBM customer contact information.

About this task

You need to gather contact information and machine location information to enter when completing this task.

For more information, about the `setup` command, see the setup(1) man page.

Steps

1. Record the customer contact information for the upgraded system.

   Use the detailed descriptions in the "Required IBM customer information" section of the *Data ONTAP Software Setup Guide* to gather this information.

2. At the storage system command line, enter the following command:

   `setup`

The setup display describes the files that will be rewritten when you run the command. You will be able to preserve values you have already entered.

3. Enter **y** to continue.

   Your current system configuration is displayed (the output of the `sysconfig` command, followed by a series of configuration prompts). The values that you already entered for these parameters are given in square brackets.

4. Press **Enter** to accept the each of the existing values.

   Continue until you see the prompts for customer contact information.

5. Enter the contact information you gathered for the following values:
   ```
   Name of primary contact (Required)
   Phone number of primary contact (Required)
   Alternate phone number of primary contact
   Primary Contact e-mail address or IBM WebID
   Name of secondary contact
   Phone number of secondary contact
   Alternate phone number of secondary contact
   Secondary Contact e-mail address or IBM WebID
   ```

6. Enter the machine location you gathered for the following values:
   ```
   Business name (Required)
   Business address (Required)
   City where business resides (Required)
   State where business resides
   2-character country code (Required)
   Postal code where business resides
   ```

7. When setup is complete, to transfer the information you've entered to the storage system, enter the following command, as directed by the prompt on the screen.

   reboot

   Note: If you do not enter `reboot`, the information you entered does not take effect.

8. If you are configuring a pair of storage systems in an active/active configuration and have not configured the other storage system, repeat these instructions to set up the other storage system in the configuration.

Updating firmware

Because upgrading Data ONTAP includes upgrading your firmware, you must consider the requirements for upgrading system, disk, and disk shelf firmware, as well as firmware for other components that might be installed on your system. You might also need to update firmware between Data ONTAP upgrades.

Next topics

System firmware updates

When you perform a Data ONTAP software upgrade, the firmware service image included with the Data ONTAP upgrade package is copied to your storage system's boot device. You can also update system firmware by downloading the most recent firmware for your system from the IBM NAS support site and installing the files.

Firmware update procedures depend on the type of firmware that runs the storage system.

If your system firmware type is…	Your system firmware update takes place...
BIOS (`>LOADER` boot prompt) • N7600, N7700, N7800, or N7900 • N6210, N6240, or N6270 • N6040, N6060, or N6070 • N5600 • N5300 • N3300, N3400, or N3600	Automatically during the Data ONTAP upgrade, once the minimum BIOS version has been installed.

If your system firmware type is…	Your system firmware update takes place...
CFE (`>CFE` boot prompt) • N5500 • N5200 • N3700	Manually. During the Data ONTAP upgrade, you must verify that the new firmware version is more recent than the installed version and update the running version if necessary. **Note:** If you upgrade Data ONTAP using the nondisruptive method, it is a best practice to obtain the latest system firmware from the IBM NAS support site and install it *before* upgrading Data ONTAP nondisruptively.

For more information about your boot environment, see your *Data ONTAP System Administration Guide*.

If you are upgrading system firmware between Data ONTAP upgrades, you can use the nondisruptive or standard methods to update system firmware manually. You can obtain system firmware and information about how to install it from the IBM NAS support site.

Next topics

Automatic BIOS system firmware updates on page 98
Determining whether your CFE-based system needs a system firmware update on page 99
Updating BIOS firmware nondisruptively on page 100
Updating CFE firmware nondisruptively on page 102
Updating system firmware using the standard method on page 104

Automatic BIOS system firmware updates

Beginning with the Data ONTAP 7.3 release, the minimum BIOS release required to support Data ONTAP also enables automatic BIOS updates.

After the minimum version is running, subsequent updates take place automatically during the boot sequence whenever Data ONTAP detects that a version resident on the boot device is more recent than the running version.

However, to update firmware from an earlier version to the latest version available, you must run the `update_flash` command manually from the boot prompt on the system being upgraded. Subsequent system firmware updates are automatic.

The following are the minimum BIOS system firmware versions required to support Data ONTAP.

Platform	Minimum version
N7600, N7700, N7800, or N7900	BIOS 1.5X2 or later
N6040, N6060, or N6070	
N5600	BIOS 2.2X1 or later
N5300	
N3400	BIOS/NABL 6.0 or later

N6210, N6240, or N6270 platforms ship with the minimum system firmware versions. All subsequent firmware updates are automatic. It is not necessary to run the `update_flash` command on these platforms for normal system firmware updates.

Determining whether your CFE-based system needs a system firmware update

Before upgrading Data ONTAP nondisruptively on a CFE-based system, you should compare the versions of firmware on your system with the latest version available from the IBM NAS support site.

About this task

You should perform this task before obtaining and installing Data ONTAP Service Images.

Steps

1. Display the installed version of your storage system's current system firmware by entering the following command:

   `sysconfig -a`

   The command output will include an entry similar to the following:

   ```
   Firmware release:   CFE 3.1.0
   ```

2. Display the system firmware version on your boot device by entering the following command:

   `version -b`

   The `version -b` command output contains an entry similar to the following:

   ```
   1:/x86_elf/firmware/deux/firmware.img: Firmware 3.1.0
   ```

3. Go to the IBM NAS support site and locate the most recent system firmware available for your storage system.

If the latest firmware version on the IBM NAS support site is...	Then ...
Later than either the installed firmware or the firmware on the boot device	Copy the system firmware files to your storage system according to the instructions on the IBM NAS support site.
The same as either the installed firmware or the firmware on the boot device	You do not need to update system firmware.

Note: The installed system firmware and the version on the boot device should be the same. If the system firmware on the boot device is the same as the most recent version on the IBM NAS support site, but later than the installed version, you should update system firmware with the `update_flash` command before upgrading Data ONTAP nondisruptively.

Updating BIOS firmware nondisruptively

The nondisruptive update method is appropriate when you need to maintain service availability during the firmware update.

Before you begin

You should ensure that your active/active configuration is functioning correctly and meets the requirements for nondisruptive upgrades.

You must download firmware from the IBM NAS support site on your Windows or UNIX client or your HTTP server before you begin this procedure.

Steps

1. Obtain the firmware download files using the `software update` or `software install` command, following directions on the IBM NAS support site.
2. On each storage system, referred to as system A and system B in the following steps, enter the following command as directed:

   `priv set advanced`

   The asterisk (*) after the storage system name indicates that you are in advanced mode.
3. On each storage system, enter the `download -d` command in `priv set advanced` mode as directed.

   If necessary, format the service partition according to the instructions.
4. Take one of the following actions:

If CIFS...	Then...
Is not in use in system A.	Go to Step 5.

If CIFS...	Then...
Is in use in system A.	a. Enter the following command: **`cifs terminate -t nn`** *nn* is a notification (in seconds) appropriate for your clients. After that period of time, proceed to Step 5. b. Wait for *nn* seconds and then go to Step 5.

5. If the automatic giveback option (`cf.giveback.auto.enable`) is set to `on`, disable automatic giveback by entering the following command on one of your storage systems in the active/active configuration:

   `options cf.giveback.auto.enable off`

   After the upgrade procedure, reset this option to `on` (if desired).

6. At the console of system B, enter the following command:

   `cf takeover`

   This command causes system A to shut down gracefully and leaves system B in takeover mode.

7. To display the LOADER boot prompt at the system A console, press Ctrl-C at the system A console when instructed after the boot sequence starts.

   You can also display the LOADER prompt by pressing Ctrl-C at the system A console when the "Waiting for giveback" message appears at the console of system A. When prompted to halt the node rather than wait, enter **`y`**.

8. After halting the node, check the Boot Loader messages for a warning similar to the following:
   `Warning: The CompactFlash contains newer firmware image (1.6.0). Please run 'update_flash' at Loader prompt to update your system firmware (1.5X3).`

If you...	Then ...
Do not see this warning.	BIOS firmware is updated automatically if needed; go to Step 12.
See this warning.	You must update BIOS firmware manually; go to the next step.

   After the new BIOS system firmware is installed, future system firmware updates take place automatically.

9. At the boot prompt, enter the following command to reset the system:

   `bye`

10. Display the LOADER boot prompt again at the system A console by repeating Step 7.

11. Enter the following command:

    `update_flash`

    The system updates the firmware, displays several status messages, and displays the boot prompt.

12. Enter the following command to reboot the system using the new firmware and software:

    bye

13. Enter the following command at the console of system B:

    cf giveback

    Attention: The `cf giveback` command can fail because of open client sessions (such as CIFS sessions), long-running operations, or operations that cannot be restarted (such as tape backup or SyncMirror resynchronization). If the `cf giveback` command fails, terminate any CIFS session or long-running operations gracefully (because the `-f` option will immediately terminate any CIFS sessions or long-running operations) and then enter the following command (with the `-f` option):

    cf giveback -f

    For more information about the behavior of the `-f` option, see the cf(1) man page.

    The command causes system A to reboot with the new firmware and resume normal operation as an active/active partner.

14. Repeat Step 4 through Step 14 to update the partner storage system; that is, bring down and update system B with partner A in takeover mode.

After you finish

If desired, reenable automatic giveback.

Updating CFE firmware nondisruptively

The nondisruptive update method is appropriate when you need to maintain service availability during a firmware update on CFE-based systems.

Before you begin

You should ensure that your active/active configuration is functioning correctly and meets the requirements for nondisruptive upgrades.

This procedure supplements firmware download instructions available on the IBM NAS support site along with firmware files.

Steps

1. Obtain the firmware download files using the `software update` or `software install` command, following directions on the IBM NAS support site.
2. On each storage system, referred to as system A and system B in the following steps, enter the following command as directed:

   priv set advanced

The prompt now displays an asterisk (*) after the storage system name to indicate that you are in advanced mode.

3. On each storage system, enter the `download -d` command in `priv set advanced` mode as directed.

   If necessary, format the service partition according to the instructions.

4. Take one of the following actions:

If CIFS...	Then...
Is not in use in system A.	Go to Step 5.
Is in use in system A.	Enter the following command: **`cifs terminate -t` *`nn`*** where *nn* is a notification (in seconds) appropriate for your clients. After that period of time proceed to Step 5.

5. If the automatic giveback option (`cf.giveback.auto.enable`) is set to `on`, disable automatic giveback by entering the following command on one of your storage systems in the active/active configuration:

   `options cf.giveback.auto.enable off`

   After the upgrade procedure, reset this option to `on` (if desired).

6. At the console of system B, enter the following command:

   `cf takeover`

   This command causes system A to shut down gracefully and leaves system B in takeover mode.

7. To display the `CFE` boot prompt at the system A console, press Ctrl-C at the system A console when instructed after the boot sequence starts.

   You can also display the LOADER prompt by pressing Ctrl-C at the system A console when the "Waiting for giveback" message appears at the console of system A. When prompted to halt the node rather than wait, enter **`y`**.

8. At the boot prompt, enter the following command to reset the system:

   `bye`

9. Display the prompt again at the system A console, press Ctrl-C at the system A console when instructed after the boot sequence starts.

   You can also display the LOADER prompt by pressing Ctrl-C at the system A console when the "Waiting for giveback" message appears at the console of system A. When prompted to halt the node rather than wait, enter **`y`**.

10. Enter the following command:

    `update_flash`

The system updates the firmware, displays several status messages, and displays the boot prompt.

11. Enter the following command to reboot the storage system using the new firmware and software:

    bye

12. Enter the following command at the console of system B:

    cf giveback

    Attention: The `cf giveback` command can fail because of open client sessions (such as CIFS sessions), long-running operations, or operations that cannot be restarted (such as tape backup or SyncMirror resynchronization). If the `cf giveback` command fails, terminate any CIFS session or long-running operations gracefully (because the `-f` option will immediately terminate any CIFS sessions or long-running operations) and then enter the following command (with the `-f` option):

    cf giveback -f

    For more information about the behavior of the `-f` option, see the cf(1) man page.

    The command causes system A to reboot with the new system firmware and resume normal operation as an active/active partner.

13. Repeat Step 4 through Step 12 to update the partner storage system; in other words, bring down and update system B with partner A in takeover mode.

Related concepts

Nondisruptive upgrade requirements on page 26

Updating system firmware using the standard method

The standard firmware update method is appropriate when you can schedule downtime for the system firmware update.

Before you begin

You must obtain the system firmware from the IBM NAS support site on your Windows or UNIX client or your HTTP server before you begin this procedure.

Steps

1. On each system you are upgrading, enter the following command:

   priv set advanced

   The asterisk (*) after the storage system name indicates that you are in advanced mode.

2. On each storage system, enter the `download -d` command in `priv set advanced` mode as directed.

   If necessary, format the service partition according to the instructions.

3. On either system, disable the active/active configuration by entering the following command:

   ```
   cf disable
   ```

4. Continue installing the firmware on each system by following directions from the IBM NAS support site.
5. Reenable the active/active configuration by entering the following command on one of the systems:

   ```
   cf enable
   ```

Disk firmware updates

You should update to the latest disk firmware version when you upgrade Data ONTAP. In some upgrade scenarios, disk firmware updates are mandatory.

Next topics

How disk firmware is updated

Disk firmware is automatically updated in certain circumstances.

Disk firmware is updated automatically when one of the following is true:

- You add new disks or a disk shelf.

  Note: When hot-adding SAS shelves, firmware is not updated automatically. You must manually check and update any out-of-date drive, shelf, and ACP firmware.

- Data ONTAP detects disk firmware updates in the /etc/disk_fw directory.
  Data ONTAP scans the /etc/disk_fw directory for new disk firmware every two minutes.

Each storage system is shipped with an `/etc/disk_fw` directory that contains the latest firmware revisions at that time.

Disk firmware updates can be added to this directory at the following times:

- During a Data ONTAP upgrade
  Disk firmware updates are often included with an upgrade to a new release family. Disk firmware updates are occasionally included in Data ONTAP upgrades within release families. This is the most common way to update disk firmware.
- During a manual firmware update
  You might be directed to download a disk firmware update from the IBM NAS support site in the event that you encounter problems with certain disk types or you receive a notice from IBM.

Each disk drive manufacturer has its own disk drive firmware. Therefore, disk firmware updates can include updates to firmware for one or more disk drive types. Because your storage system might use drives from multiple drive manufacturers, whether you are affected by a disk firmware update depends on the types and numbers of drives on your system.

Service availability during disk firmware updates

When you upgrade to the current release, the availability of storage system services during a disk firmware update depends on the type of RAID protection on aggregates containing the disks.

Disk firmware updates can take place in two ways:

- Background (nondisruptive) disk firmware update
  Nondisruptive disk firmware updates take place automatically in the background when the disks are members of aggregates of the following types:
  - RAID-DP
  - Mirrored RAID-DP (RAID-DP with SyncMirror software)
  - Mirrored RAID4 (RAID4 with SyncMirror software)
- Standard disk firmware update
  In Data ONTAP 7.2 and later, disk firmware updates for RAID4 aggregates must complete before the new Data ONTAP version can finish booting. Storage system services are not available until the disk firmware update finishes.

For example, if a storage system contains a RAID-DP and a RAID4 aggregate and disks in both aggregates require a disk firmware update, the storage system cannot service requests until the RAID4 aggregate's disk firmware is updated, even though the RAID-DP aggregate's disks are updating firmware in the background.

Next topics

Verifying RAID protection type on page 106
Understanding background disk firmware updates on page 107
Understanding standard disk firmware updates on page 108

Verifying RAID protection type

You should check the RAID type of your root volume before you update its firmware, because if any volume, including the root volume, is configured with RAID4 protection, a standard disk firmware update (interrupting storage system services) will take place at the next reboot when new disk firmware is present on the system.

Step

1. At the storage system command line, enter the following command:

   ```
   aggr status
   ```

   You see output similar to the following:

```
     Aggr State      Status          Options
data2_vol online     raid-dp, flex
data1_vol online     raid-dp, flex
vol0      online     raid4, flex     root
```

Note: In some storage systems, RAID4 is configured on the root volume by default. Be sure to check the RAID type of your root volume before you update its firmware, and reconfigure it if necessary, if you require a nondisruptive disk firmware update.

Understanding background disk firmware updates

There are many important issues to consider when performing a background disk firmware update.

When a storage system configured with RAID-DP or SyncMirror reboots and there is new disk firmware present, the affected drives are automatically and sequentially taken offline, and the storage system responds normally to read and write requests. If any request affects an offline drive, the read requests are satisfied by reconstructing data from other disks in the RAID group, while write requests are written to a log. When the disk firmware update is complete, the drive is brought back online after resynchronizing any write operations that took place while the drive was offline.

During a background disk firmware update, the storage system functions normally. You will see status messages as disks are taken offline to update firmware and brought back online when the firmware update is complete. Background disk firmware updates proceed sequentially for active data disks and for spare disks. Sequential disk firmware updates ensure that there will be no data loss through double-disk failure.

Offline drives are marked with the annotation "offline" in the `vol status -r` command output. While a spare disk is offline, it cannot be added to a volume or selected as a replacement drive for reconstruction operations. However, a disk would normally remain offline for a very short time (a few minutes at most) and therefore would not interfere with normal system operation.

The background disk firmware update will be completed unless the following conditions are encountered:

- Degraded volumes are on the storage system.
- Disks needing a firmware update are present in a volume or plex that is in an offline state.

Automatic background disk firmware updates will resume when these conditions are addressed. For more information about determining volume status and state, see the *Data ONTAP Storage Management Guide*.

Automatic background disk firmware updates are overridden when the `disk_fw_update` command is issued.

Note: Automatic background disk firmware updates are enabled by the `raid.background_disk_fw_update.enable` option, which is set to `on` by default. The value of this option can be overridden during an active/active takeover, when the `disk_fw_update` command is issued, or when a disk firmware update is required for disks in a RAID4 aggregate. You are advised not to change the default value unless you are directed to by technical support.

Related concepts

Command for updating disk firmware on page 108

Understanding standard disk firmware updates

During a standard disk firmware update, the disks of the affected drive types are not available.

In Data ONTAP RAID4 aggregates (as well as in all volume and aggregate configurations in earlier Data ONTAP releases), standard disk updates take place automatically during the first reboot after the appearance of new disk firmware on the system. Because disk drives must be spun down and spun back up to install new firmware, disk firmware updates can take many minutes depending on the number of drive types and disk drives per type on your storage system.

Note: If you upgrade RAID protection to RAID-DP, disk firmware updates take place in the background and are nondisruptive.

When to update disk firmware manually

If you receive error messages about firmware compatibility, you must manually update your disk firmware.

Manually update disk firmware with the `disk_fw_update` command.

You must also update disk firmware manually if you hot-add SAS shelves.

Note: When you upgrade the storage system software, disk firmware is updated automatically as part of the storage system software upgrade process. A manual update is not necessary unless the new firmware is not compatible with the storage system disks.

Related concepts

Command for updating disk firmware on page 108

Command for updating disk firmware

You need to use the `disk_fw_update` command from the storage system console to update firmware on all disks or a on specified disk on a storage system.

The `disk_fw_update` command updates disks for which firmware files are present in the `/etc/disk_fw` directory and which need to be updated. It does not update other disks.

The `disk_fw_update` command is applicable to SCSI, Fibre Channel, SATA, and SAS disks.

For more information, see the disk_fw_update(1) man page.

Attention: This command makes disks inaccessible for up to two minutes, so network sessions using the storage system should be terminated before running the command. This is particularly true for CIFS sessions, which otherwise are terminated while this command executes.

This command overrides any background disk firmware update that is in progress.

Disk shelf firmware updates

You should update to the latest disk shelf firmware version when you upgrade Data ONTAP. In some upgrade scenarios, disk shelf firmware updates are mandatory.

Note: Disk shelf firmware updates are mandatory when hot-adding a disk shelf. See your disk shelf documentation for more information.

Next topics

How disk shelf firmware is updated

When you upgrade Data ONTAP, disk shelf firmware (firmware for modules on disk shelves) is updated automatically if the firmware on the shelves is older than the firmware that is bundled with the Data ONTAP system files. You can also update disk shelf firmware by downloading the most recent firmware for your shelf modules from the IBM NAS support site and installing the files.

The module (AT series, ESH series, or SAS IOM series) in a disk shelf provides for the interconnect of the disks to the host bus adapter interface, including signal integrity when disks are swapped. There are two modules in the middle of the rear of the disk shelf, one for Channel A and one for Channel B. SAS modules can also be internal components in N3300, N3400, and N3600 systems. Updated firmware for these modules is made available periodically.

Each storage system is shipped with an `/etc/shelf_fw` directory that contains the latest disk shelf firmware versions available at that time.

Disk shelf firmware updates can be added to this directory at the following times:

- After a Data ONTAP upgrade
  Disk shelf firmware updates are often included in Data ONTAP upgrade packages. If the version in `/etc/shelf_fw` is higher than the installed version, the new version will be downloaded and installed during the `reboot` or `cf giveback` phase as part of the Data ONTAP upgrade process.
- During a manual firmware update
  You might need to download a disk shelf firmware update from the IBM NAS support site if you plan to perform a nondisruptive upgrade of Data ONTAP software, or if you receive a notice from IBM.
- When you hot-add a SAS shelf

Data ONTAP scans the `/etc/shelf_fw` directory for new firmware every two minutes (on systems with software-based disk ownership). If new disk shelf firmware is detected—that is, if there is a disk shelf firmware file in the `/etc/shelf_fw` directory that has a higher revision number than the

current firmware on the shelf module—the new firmware is automatically downloaded to the disk shelf module.

The following events in Data ONTAP can also trigger an automatic disk shelf firmware update when there is new firmware in the /`etc/shelf_fw` directory:

- The `reboot` command is issued.
- The `cf giveback` command is issued.
- New disk drives are inserted.
- New shelf modules are inserted.
- N Series Health Trigger AutoSupport messages are sent.

Note: If your system does not use software-based disk ownership, Data ONTAP does not scan the `/etc/shelf_fw` directory for new disk shelf firmware. However, the other trigger events are still applicable if software-based disk ownership is not used. For more information about software-based disk ownership, see the *Data ONTAP Storage Management Guide*.

For more information about disk shelves and disk shelf modules, see the *Data ONTAP Active/Active Configuration Guide* and the *Hardware and Service Guide* for your shelves.

Service availability during disk shelf firmware updates

When you upgrade to the current Data ONTAP release, the availability of storage system services during a disk shelf firmware update depends on the type of shelf modules your system uses.

The following table summarizes Data ONTAP service availability during disk shelf firmware updates for these modules:

Module	Disk shelf model	System downtime required?
AT-FCX	EXN1000	With Multipath Storage and firmware version 37: No **Note:** Multipath Storage can be implemented in active/active configurations or standalone systems. AT-FCX firmware can be upgraded nondisruptively in either configuration. Without Multipath Storage: Yes
ESH4	EXN4000 or EXN2000	No
ESH2	EXN2000	

Module	Disk shelf model	System downtime required?
SAS	External shelves	No
	N3300, N3400, or N3600 internal shelves	With firmware version 0500 and later: No With firmware version 0400 and earlier: Yes

Attention:

You cannot use the nondisruptive method to upgrade Data ONTAP under the following circumstances:

- AT-FCX disk shelves are attached to your system, unless you use Multipath Storage and unless the firmware for these modules is version 37 or higher.
- You have internal SAS modules in a N3300, N3400, or N3600 system, unless the firmware for these modules is version 0500 or higher.

Detecting outdated disk shelf firmware

If you want to perform a nondisruptive upgrade of Data ONTAP software when there are AT-based disk shelves attached to your system, or if you are directed to update disk shelf firmware, you must find out what firmware is installed on disk shelves attached to your system.

Steps

1. At the storage system command line, enter the following command:

   `sysconfig -v`

2. Locate the shelf information in the `sysconfig -v` output.

   Example

   ```
   Shelf 1: AT-FCX  Firmware rev. AT-FCX A: 36  AT-FCX B: 36
   Shelf 2: AT-FCX  Firmware rev. AT-FCX A: 36  AT-FCX B: 36
   ```

3. Go to the disk shelf firmware information on the IBM NAS support site and determine the most recent firmware version for your shelves.

4. Take the appropriate action.

If the disk shelf firmware version in the `sysconfig -v` output is ...	Then ...
The same as the most recent version on the IBM NAS support site	No disk shelf firmware update is required at this time.

If the disk shelf firmware version in the `sysconfig -v` output is ...	Then ...
Earlier than the most recent version on the IBM NAS support site	Update your disk shelf firmware manually.

Updating disk shelf firmware manually

You must run the `storage download shelf` command after downloading new disk shelf firmware from the IBM NAS support site.

About this task

By running the `storage download shelf` command once, you upgrade all eligible modules connected to both controllers in active/active configurations.

The command updates the modules sequentially:

- ESH series and SAS IOM series
  The command begins with the module that is currently reporting SCSI Enclosure Services (SES) status.
- AT series and SAS modules in N3300, N3400, and N3600 systems
  The command first updates all A modules, then all B modules.

Attention: Do not place firmware files in the `/etc/shelf_fw` directory unless you intend to update disk shelf firmware immediately. Several events in Data ONTAP can trigger an automatic disk shelf firmware update if there is a disk shelf firmware file in the `/etc/shelf_fw` directory that has a higher revision number than the current firmware on the shelf module.

Do not use the nondisruptive method (that is, the `cf takeover` and `cf giveback` commands) to update disk shelf firmware. Doing so will prevent access to data on disk shelves for a much longer period than using the `storage download shelf` command.

Steps

1. Find and download the most recent firmware for your shelves on the IBM NAS support site.
2. Contact IBM support for instructions to extract your firmware files to the `/etc/shelf_fw` directory in the root volume of your storage system.
3. Choose the following option that describes your configuration.

If you are running CIFS on systems with one of the following configurations ...	Then ...
• ESH-based disk shelves • SAS-based disk shelves • AT-FCX-based disk shelves running firmware version 37 or higher • N3400 internal shelves	Go to the next step.
• AT-based disk shelves • AT-FCX-based disk shelves running firmware version 36 or lower • N3300/N3600 internal shelves	Enter the following command: **`cifs terminate -t nn`** where *nn* is a notification period (in minutes) appropriate for your clients. After that period of time, proceed to the next step.

4. Enter the following command at the storage system console to access the advanced administrative commands:

   `priv set advanced`

   The prompt now displays an asterisk (*) after the storage system name to indicate that you are in the advanced mode.

5. Depending on your upgrade scenario, enter one of the following commands to upgrade the disk shelf firmware.

If you want to upgrade the disk shelf firmware on ...	Then enter the following command at the storage system console:
All the disk shelves in your system	**`storage download shelf`**
The shelves attached to a specific adapter	**`storage download shelf adapter_name`**

6. To confirm that you want to upgrade the firmware, enter the following key:

   `y`

7. Enter the following command to verify the new disk shelf firmware:

   `sysconfig -v`

8. Enter the following command to return to the standard administrative console prompt:

   `priv set admin`

9. If you terminated CIFS before updating shelf firmware, reenable it by entering the following command:

   `cifs restart`

Updating ACP firmware

If your disk shelves include Shelf Alternate Control Path Management (ACP) functionality, you can update ACP firmware by running the `storage download acp` command after downloading new ACP processor firmware from the IBM NAS support site.

Before you begin

ACP interfaces must be cabled properly and ACP software must be configured correctly. For more information, see the *Data ONTAP Storage Management Guide* and the *Installation and Service Guide* for your disk shelf.

About this task

When you upgrade Data ONTAP, ACP firmware (firmware for ACP processors on disk shelves) is updated automatically if the firmware in the ACP processors is older than the firmware that is bundled with the Data ONTAP system files. However, it might be necessary to update ACP firmware (for example, when hot-adding a disk shelf) by downloading the most recent firmware from the IBM NAS support site and installing the files.

Note: Installing ACP firmware can take several minutes, but it will not disrupt client access during that time. However, normal ACP recovery capabilities will not be available while the firmware upgrade is in progress.

Steps

1. Find and download the most recent ACP firmware on the IBM NAS support site.
2. Contact IBM support for instructions to extract your firmware files to the `/etc/acpp_fw` directory in the root volume of your storage system.
3. Enter the following command to update the ACP firmware:

   `storage download acp`

   For more information about the command, see the storage(1) man page.
4. Enter the following command to verify the new ACP firmware:

   `storage show acp`

   You should see command output similar to the following while the ACP firmware is being updated:

```
Alternate Control Path:  Enabled
Ethernet Interface:      e0c
ACP Status:              Active
ACP IP Address:          192.168.0.67
ACP Domain:              192.168.0.0
ACP Netmask:             255.255.252.0
ACP Connectivity Status: Full Connectivity
```

```
Shelf_Module  Reset_Cnt  IP_Address     FW_Version  Module_Type  Status
------------------------------------------------------------------------
8a.00.A       000        192.168.2.60   01.10       IOM6       inactive
                                                    (upgrading firmware)
8a.00.B       000        192.168.2.112  02.00       IOM6         active
8a.02.A       000        192.168.1.218  01.10       IOM3         active
8a.02.B       000        192.168.1.78   01.10       IOM3         active
8a.10.A       000        192.168.3.77   01.10       IOM3         active
8a.10.B       000        192.168.3.83   01.10       IOM3         active
```

When the update has completed, you will see output similar to the following when you reissue the command:

```
Shelf_Module  Reset_Cnt  IP_Address     FW_Version  Module_Type  Status
------------------------------------------------------------------------
8a.00.A       000        192.168.2.60   02.00       IOM6         active
8a.00.B       000        192.168.2.112  02.00       IOM6         active
8a.02.A       000        192.168.1.218  01.10       IOM3         active
8a.02.B       000        192.168.1.78   01.10       IOM3         active
8a.10.A       000        192.168.3.77   01.10       IOM3         active
8a.10.B       000        192.168.3.83   01.10       IOM3         active
```

Service Processor firmware updates

Service Processor (SP) is a remote management device that is included in N6210, N6240, or N6270 systems. You can upgrade the SP firmware by downloading and updating the SP firmware using the Data ONTAP CLI or the SP CLI.

For information about what the SP is and how it works, see the *Data ONTAP System Administration Guide*.

Next topics

Using the Data ONTAP CLI to update the SP firmware on page 115
Using the SP CLI to update the SP firmware on page 116

Using the Data ONTAP CLI to update the SP firmware

You can update the SP firmware at the storage system prompt.

Before you begin

You must have the following items before you can download and update the firmware:

- Access to a Web server on a network accessible to your storage system
- The name and IP address of the Web server
- Access to the storage system serial console

Steps

1. Go to Firmware Instructions for the Service Processor at the IBM NAS support site.
2. Click the `SP_FW.zip` link to download the file from the IBM NAS support site to your HTTP server.
3. At the storage system prompt, enter the following command:

   `software update http://`*`Web_server`*`/SP_FW.zip -f`
4. When the `software update` command is finished, enter the following command at the storage system prompt:

   `sp update`
5. When the system prompts you to update SP, enter **`y`** to continue.

Result

SP is updated and you are prompted to reboot SP. Wait approximately 60 seconds to allow SP to reboot.

Note: If your console connection is not through SP, the connection remains active during the SP reboot.

If your console connection is through SP, you lose your console connection to the storage system. In approximately one minute, SP reboots and automatically re-establishes the connection.

Related information

http://www.ibm.com/storage/support/nas/

Using the SP CLI to update the SP firmware

You can update the SP firmware at the SP prompt.

Before you begin

You must have the following items before you can download and update the firmware:

- Access to a Web server on a network accessible to your storage system
- The name and IP address of the Web server
- Access to the storage system SP CLI

Steps

1. Go to Firmware Instructions for the Service Processor at the IBM NAS support site.
2. Click the `SP_FM.tar.gz` link to download the file from the IBM NAS support site to your HTTP server.

3. Log in to SP by entering the following command at the administration host:

   ssh *username@SP_IP_address*

4. At the SP prompt, enter the following command:

   sp update http://*Web_server_addr*/SP_FW.tar.gz

5. When you are prompted to reboot SP, enter the following command at the SP prompt:

   sp reboot

Related information

http://www.ibm.com/storage/support/nas/

RLM firmware updates

You can upgrade the Remote LAN Module (RLM) firmware by downloading and updating the RLM firmware using the Data ONTAP CLI or the RLM CLI.

For information about what the RLM is and how it works, see the *Data ONTAP System Administration Guide*.

Next topics

Requirements for RLM firmware version 4.0 and later

RLM firmware versions 4.0 and later require a different layout on flash media. You must ensure that you are running the latest 3.1.*x* RLM firmware to enable the transition to the new layout, then update to the 4.0 or later firmware.

You must be running the latest 3.1.*x* to update to 4.0. If you are running a firmware version earlier than 3.1, you must first perform an intermediate update to the latest 3.1.*x* firmware, then update from 3.1 to 4.0 in a separate operation.

Attention: Regardless of whether you update RLM firmware from the Data ONTAP CLI or the RLM CLI, *do not* update directly from a firmware version earlier than 3.1 to 4.0 or later. Doing so will corrupt the RLM flash device.

If you are updating to version 4.0 or later from either the Data ONTAP CLI or the RLM CLI, you must run the `rlm update` command with the `-f` option for a full image update. Further updates do not require the `-f` option.

If you are updating RLM firmware from the RLM CLI, you can use the normal procedure.

Note: Beginning with Data ONTAP 7.3.3, the RLM supports IPv6. To send RLM traffic over IPv6, you must be running RLM version 4.0 and IPv6 must be enabled on the storage system.

If you do not plan to send RLM traffic over IPv6 on Data ONTAP 7.3 releases, it is not required to update RLM firmware to 4.0 or later. However, firmware version 4.0 includes other enhancements, and it is a best practice to be running the latest firmware on your RLM.

For information about configuring the RLM, see the *Data ONTAP System Administration Guide*.

Using the Data ONTAP CLI to update the RLM firmware

You can update RLM firmware at the storage system prompt.

Before you begin

You must have the following items to download and update the firmware:

- Access to a Web server on a network accessible to your storage system
- The name and IP address of the Web server
- Access to the storage system's serial console

Steps

1. Enter the following command to display the current RLM firmware version:

   `rlm status`

   You see a display similar to the following:

```
      Remote LAN Module           Status: Online
               Part Number:        000-00000
               Revision:           A0
               Serial Number:      00000
               Firmware Version:   1.2
               Mgmt MAC Address:   00:00:00:00:00:00
               Ethernet Link:      up
               Using DHCP:         no
```

2. Complete the steps as directed in the following table based on your RLM firmware version.

If the firmware version is...	Then...
Earlier than 3.1	Complete Steps 3 through 7 to upgrade to the latest 3.1.*x* version. If you want to update to version 4.0 or later, you must also complete Steps 8 through 13.
3.1.*x*	Complete Steps 8 through 13.
4.0 or later	Complete Steps 3 through 7.

3. Go to Firmware Instructions for the Remote LAN Module at the IBM NAS support site.

4. Click the `RLM_FM.zip` link to download the file from the IBM NAS support site to your HTTP server.

   You should download the latest 3.1.*x* or 4.0 firmware, depending on the update that is required.

   If the latest 4.*x* firmware on the IBM NAS support site is the same as the version running on your RLM, it is not necessary to update RLM firmware at this time.

5. Enter the following command at the storage system prompt:

   `software update http://`*`Web_server`*`/RLM_FW.zip -f`

6. When the `software update` command is finished, enter the following command at the storage system prompt:

   `rlm update`

   Messages inform you of the progress of the update.

7. When the system prompts you to update RLM, enter **`y`** to continue.

   RLM is updated and you are prompted to reboot RLM. Wait approximately 60 seconds to allow RLM to reboot.

   Note: If your console connection is not through RLM, it stays active during reboot.

If...	**Then...**
You have already updated to firmware version 4.0, or you are not planning to update to 4.0.	The procedure is complete.
You are updating firmware to version 4.0 or higher for the first time.	Proceed to the next step.

8. If you have not already done so, download the version 4.0 firmware as described in Steps 3 and 4.

9. Enter the following command at the storage system prompt:

   `software update http://`*`Web_server`*`/RLM_FW.zip -f`

10. When the `software update` command is finished, enter the following command at the storage system console to access the advanced administrative commands:

    `priv set advanced`

    The prompt now displays an asterisk (*) after the storage system name to indicate that you are in the advanced mode.

11. Enter the following command at the storage system prompt:

    `rlm update -f`

    Note: Be sure to use the `-f` option to enable the new flash layout for IPv6.

    Messages inform you of the progress of the update.

12. When the system prompts you to update RLM, enter **y** to continue.

    RLM is updated and you are prompted to reboot RLM. Wait approximately 60 seconds to allow RLM to reboot.

    Note: If your console connection is not through RLM, it stays active during reboot.

13. Enter the following command to return to the standard administrative console prompt:

    ```
    priv set admin
    ```

Using the RLM CLI to update the RLM firmware

You can update the RLM firmware at the RLM prompt.

Before you begin

You must have the following items to download and update the firmware:

- Access to a Web server on a network accessible to your storage system
- The name and IP address of the Web server
- Access to the storage system's serial console

Steps

1. Enter the following command to display the current RLM firmware version:

   ```
   rlm status
   ```

   You see a display similar to the following:

   ```
   Remote LAN Module           Status: Online
            Part Number:        000-00000
            Revision:           A0
            Serial Number:      00000
            Firmware Version:   1.2
            Mgmt MAC Address:   00:00:00:00:00:00
            Ethernet Link:      up
            Using DHCP:         no
   ```

2. Complete the steps as directed in the following table based on your RLM firmware version.

If the firmware version is...	Then...
Earlier than 3.1	Complete Steps 3 through 7 to upgrade to the latest 3.1.*x* version. If you want to update to version 4.0 or later, you must also complete Steps 8 through 13.
3.1.*x*	Complete Steps 8 through 11.
4.0 or later	Complete Steps 3 through 7.

3. Go to Firmware Instructions for the Remote LAN Module at the IBM NAS support site.

4. Click the `RLM_FM.tar.gz` link to download the file from the IBM NAS support site to your HTTP server.

   You should download the latest 3.1.*x* or 4.0 firmware, depending on the update that is required.

   If the latest 4.*x* firmware on the IBM NAS support site is the same as the version running on your RLM, it is not necessary to update firmware at this time.

5. Log in to the RLM by entering the following command at the administration host:

   ssh *username@RLM_IP_address*

6. Enter the following command at the RLM prompt:

   rlm update http://*Web_server_addr*/RLM_FW.tar.gz

7. When you are prompted to reboot the RLM, enter the following command at the RLM prompt:

   rlm reboot

   Note: If your console connection is through the RLM, you lose your console connection to the storage system. In approximately one minute, the RLM reboots and automatically re-establishes the connection.

If...	Then...
You have already updated to firmware version 4.0, or you are not planning to update to 4.0.	The procedure is complete.
You are updating firmware to version 4.0 or higher for the first time.	Proceed to the next step.

8. If you have not already done so, download the version 4.0 firmware as described in Steps 3 and 4.

9. Enter the following command at the RLM prompt:

   rlm update -f http://*Web_server_addr*/RLM_FW.tar.gz

10. When you are prompted to reboot the RLM, enter the following command at the RLM prompt:

    rlm reboot

    Note: If your console connection is through the RLM, you lose your console connection to the storage system. In approximately one minute, the RLM reboots and automatically re-establishes the connection.

RLM firmware update problems

A RLM firmware update failure can occur for a number of reasons. You can troubleshoot a firmware failure by searching for EMS events.

A firmware update failure can occur for one of the following reasons:

- The firmware image is incorrect or corrupted.
- A communication error occurred while sending firmware to the RLM.

- The update failed when you attempted to install the new firmware at the RLM.
- The storage system was reset during the update.
- There was a power loss during the update.

You can troubleshoot a firmware failure by searching for EMS events.

For more information about the Event Management System (EMS), see the ems(1) man page.

Next topics

Troubleshooting RLM firmware update problems with the Data ONTAP CLI on page 122
Troubleshooting RLM firmware update problems with the RLM CLI on page 122

Troubleshooting RLM firmware update problems with the Data ONTAP CLI

You can troubleshoot a firmware update using the Data ONTAP CLI.

Steps

1. Verify that RLM is online by entering the following command at the storage system prompt:

   `rlm status`

2. Update the RLM firmware by following the instructions described in "Using the Data ONTAP CLI to update the RLM firmware."
3. Verify that you are using the correct filename (*`filename`*`.zip`) of the RLM firmware.
4. Reboot RLM by entering the following command at the storage system prompt:

   `rlm reboot`

   It takes approximately one minute for the RLM to reboot.

5. If the RLM does not reboot after one minute, repeat Steps 1 through 4.

   If the RLM still does not reboot, contact technical support for assistance.

Related tasks

Using the Data ONTAP CLI to update the RLM firmware on page 118

Troubleshooting RLM firmware update problems with the RLM CLI

You can troubleshoot a firmware update using the RLM CLI.

Steps

1. Verify that RLM is online by entering the following command at the storage system prompt:

   `rlm status`

2. From a browser, access the RLM firmware file on your Web server.

3. Verify that you are using the correct filename (*`filename`*`.tar.gz`) of the RLM firmware.
4. Update the firmware by entering the following command at the RLM prompt:

   `rlm update http://`*`path_hostname`*`/RLM.FW.tar.gz [-f]`

   If this command fails, replace *`path_hostname`* with the corresponding IP address.

   The `-f` option issues a full image update.
5. Reboot RLM by entering the following command at the storage system prompt:

   `rlm reboot`

Related tasks

Using the RLM CLI to update the RLM firmware on page 120

BMC firmware updates

Baseboard Management Controller (BMC) firmware is bundled with the Data ONTAP software image. When you perform a Data ONTAP software upgrade on a system with a BMC, the BMC firmware included with the Data ONTAP upgrade image is installed on your storage system's boot device if the firmware in the image is a later version than the firmware on your system.

If new BMC firmware was installed, you must run the `update_bmc` boot-loader macro to load the new BMC firmware on the BMC device. You can load the BMC firmware using the nondisruptive method in Active/active configurations, or you can use the standard method in both active/active and single-system configurations.

For information about what the BMC is and how it works, see the *Data ONTAP System Administration Guide*.

Next topics

Detecting outdated BMC firmware on page 124
Updating BMC firmware nondisruptively on page 125
Updating BMC firmware using the standard method on page 127

Related concepts

Installing Data ONTAP software images on systems running Data ONTAP 7.2 or later on page 55

Detecting outdated BMC firmware

After upgrading Data ONTAP software, you should determine if new BMC firmware was loaded onto your system.

Steps

1. At the storage system prompt, enter the following command to identify the currently installed BMC firmware version:

   `bmc status`

   Example

   ```
   storage_system> bmc status
            Baseboard Management Controller:
            Firmware Version: 1.1
   ```

2. At the storage system prompt, enter the following command to identify the version of the BMC firmware on the boot device:

   `version -b`

   The console displays the contents of the boot device's File Allocation Table (FAT) file system, including the BMC firmware version.

   Example

   ```
   storage_system> version -b
   1:/x86_elf/kernel/primary.krn: OS 7.2.2L1X9
   1:/backup/x86_elf/kernel/primary.krn: OS Rgb-shuarN_070510_0030
   1:/x86_elf/diag/diag.krn:  4.8
   1:/x86_elf/firmware/deux/firmware.img: Firmware 3.1.0
   1:/x86_elf/firmware/SB_XIV/firmware.img: BIOS/NABL Firmware 3.0
   1:/x86_elf/firmware/SB_XIV/bmc.img: BMC Firmware 1.0
   ```

3. Compare the output of the `bmc status` and `version -b` commands.

If ...	Then ...
The commands show the same BMC firmware version	No BMC firmware update is required at this time.
The BMC firmware version in the `version -b` output is later than the version in the `bmc status` status	Use the nondisruptive or standard method to update BMC firmware.

Updating BMC firmware nondisruptively

The nondisruptive update method is appropriate when you need to maintain service availability during BMC firmware updates. To use this method, your storage systems must be in active/active configurations.

Before you begin

You must have determined if new BMC firmware is present on your system before performing this procedure.

Steps

1. On each storage system, referred to as system A and system B in the following steps, enter the following command:

   `priv set advanced`

   The prompt displays an asterisk (*) after the storage system name to indicate that you are in advanced mode.

2. Take one of the following actions:

If CIFS...	Then...
Is not in use in system A.	Go to Step 3.
Is in use in system A.	Enter the following command: **`cifs terminate -t nn`** *nn* is a notification period (in minutes) appropriate for your clients after which CIFS services are terminated. After that period of time, proceed to Step 3.

3. If the automatic giveback option (`cf.giveback.auto.enable`) is set to `on`, disable automatic giveback by entering the following command on one of your systems in the active/active configuration:

   `options cf.giveback.auto.enable off`

   After the upgrade procedure, reset this option to `on` (if desired).

4. At the console of system B, enter the following command:

   `cf takeover`

   This command causes system A to shut down gracefully and leaves system B in takeover mode.

5. To display the `LOADER` boot prompt at the system A console, press Ctrl-C at the system A console when instructed after the boot sequence starts.

You can also display the `LOADER` prompt by pressing Ctrl-C at the system A console when the "Waiting for giveback" message appears at the console of system A. When prompted to halt the node rather than wait, enter **`y`**.

6. At the `LOADER` prompt, enter the following command to reset the system:

   `bye`

7. Display the `LOADER` boot prompt again at the system A console by repeating Step 5.

8. Enter the following command from the `LOADER` prompt:

   `update_bmc`

   The `update_bmc` macro updates the BMC firmware from the image on the boot device and displays a message on the console.

   Example

   ```
   LOADER> update_bmc
   BMC firmware version: 1.2
   Programming: this might take up to 120 seconds to complete...


   pre-init time           [bmc.reset.power:notice]: Hard reset by
   external power-cycle.
   BMC Release 1.2
   Press ^G to enter BMC command shell

   Important: In order for the BMC firmware changes to fully take effect,
   it is necessary to reboot using the "bye" command before starting ONTAP
   ```

   If the new BMC firmware also has a new non-volatile memory management (NVMEM) battery firmware image, the battery firmware is updated automatically.

9. Enter the following command to reboot the storage system using the new firmware and software:

   `bye`

10. When the "Waiting for giveback" message appears on the console of system B, enter the following command:

    `cf giveback`

    This command causes system A to reboot with the new firmware and resume normal operation as the active/active configuration partner.

11. Repeat Step 2 through Step 10 to update the partner system; that is, bring down and update system B with partner A in takeover mode.

12. Enter the following command to return to the standard administrative console prompt:

    `priv set admin`

Updating BMC firmware using the standard method

The standard firmware update method is appropriate when you can schedule downtime for system firmware updates.

Before you begin

You must have determined if new BMC firmware is present on your system before performing this procedure.

Steps

1. Enter the following command at the storage system prompt:

   `halt`

   The storage system console displays the boot environment prompt.

2. Enter the following command from the `LOADER` prompt:

   `update_bmc`

   The `update_bmc` macro updates the BMC firmware from the image on the boot device and displays a message on the console.

   Example

   ```
   LOADER> update_bmc
   BMC firmware version: 1.2
   Programming: this might take up to 120 seconds to complete...


   pre-init time           [bmc.reset.power:notice]: Hard reset by
   external power-cycle.
   BMC Release 1.2
   Press ^G to enter BMC command shell

   Important: In order for the BMC firmware changes to fully take effect,
   it is necessary to reboot using the "bye" command before starting ONTAP
   ```

   If the new BMC firmware also has a new non-volatile memory management (NVMEM) battery firmware image, the battery firmware is updated automatically.

3. After the BMC firmware is updated, enter the following command from the `LOADER` prompt to restart the system:

   `bye`

Flash Cache firmware updates

Firmware for Flash Cache (formerly Performance Acceleration Module II or PAM II) devices is included with distribution files for Data ONTAP upgrades. If the running firmware is older than the firmware that is bundled with the Data ONTAP system files, it is updated automatically.

If you are upgrading Data ONTAP nondisruptively (NDU), Flash Cache firmware is updated nondisruptively. This is because the reboot required for Flash Cache firmware upgrades take place before the final reboot of the `cf giveback` process. Consequently, if your system includes Flash Cache devices, you might see multiple reboots during a Data ONTAP NDU; this is expected behavior.

Firmware updates are not available for the original 16-GB PAM devices. This process refers only to Flash Cache (256-GB, 512-GB, and 1-TB) devices.

For information about what Flash Cache is and how it works, see the *Data ONTAP System Administration Guide*.

Reversion to a previous release

When you create a back-out plan for your Data ONTAP upgrade, you should review reversion guidelines and notices to familiarize yourself with issues you might need to resolve if a reversion becomes necessary. You should contact technical support if you need to revert to a previous release of Data ONTAP.

Telephone
1-800-IBM-SERV (1-800-426-7378)

You might encounter issues if you upgrade and then decide to revert to a previous version of Data ONTAP, because features introduced in a new release might be incompatible with features of the previous release. This is especially true if you are reverting to a release earlier than the immediately previous Data ONTAP release family.

For example, if you are reverting to a release in the Data ONTAP 7.1 family from a release in the 7.3 family, you must review and resolve reversion issues associated with the 7.1 and 7.2 release families before reverting.

In some cases, you cannot revert to an earlier version of Data ONTAP.

Next topics

General guidelines for reverting from the Data ONTAP 7.3 release family

You must follow some guidelines before you revert to a previous Data ONTAP version.

The following guidelines apply when you plan to revert from the 7.3 release family to an earlier version:

- You must disable any 7.3 release family features before reverting.
- In some cases, you cannot revert to a Data ONTAP release earlier than the one that initially shipped with your system.
  If you need functionality from an earlier Data ONTAP release, contact your IBM representative.

- If you added hardware components after upgrading from an earlier Data ONTAP release, you must verify that the components will continue to work when you revert to the earlier release.

  Note: If you upgraded Data ONTAP for new hardware support, you must disconnect the new hardware and reconfigure your system before reverting.
- You cannot revert if an upgrade is in progress. You must complete the upgrade before reverting.
- Before reverting to an earlier release family, you must delete any Snapshot copies made on Data ONTAP release families later than the target release.
- In some cases, the file system identifiers (FSIDs) of volumes on your storage system are rewritten during a revert to be compatible with the version to which you are reverting. Volumes with FSIDs that were rewritten need to be remounted.
- FlexVol volumes must be online before reverting.

  If you are reverting to an earlier Data ONTAP release that supports FlexVol volumes, you cannot complete the reversion if there are FlexVol volumes in an offline or restricted state. You must bring these volumes online or destroy them before continuing with the reversion process.

  Note: Space guarantees are honored only for online volumes. If you take a volume offline, any committed but unused space for that volume becomes available for other volumes in that aggregate. When you bring that volume back online, there might not be sufficient available space in the aggregate to fulfill its space guarantees.

  For more information about space guarantees, see the *Data ONTAP Storage Management Guide*.
- Space guarantees do not persist through reversions to earlier Data ONTAP software versions that support FlexVol volumes.

  When you revert to an earlier release, writes to a specified FlexVol volume or writes to files with space reservations enabled could fail if there is not sufficient space in the aggregate.

  For more information about space guarantees, see the *Data ONTAP Storage Management Guide*.

Guidelines for reverting systems with SnapMirror enabled

If you have enabled SnapMirror data protection on your systems, there are issues to resolve before reverting.

Next topics

Order for SnapMirror system reversions on page 131
Preservation of SnapMirror relationships after reversion on page 131

Order for SnapMirror system reversions

If you are reverting on storage systems that are running SnapMirror software, you must revert the systems that have SnapMirror source volumes before you revert the systems that have SnapMirror destination volumes.

This requirement applies to both asynchronous and synchronous SnapMirror for volume replication. It does not apply to SnapMirror for qtree replication.

Note: Before reverting a storage system with SnapMirror source volumes, you must also disable any features not supported in the earlier release. This means that after reverting, you will no longer be able to mirror certain volumes or their contents to the destination system, even if the destination system supports that feature.

Preservation of SnapMirror relationships after reversion

During a revert operation, all the Snapshot copies created by the newer version of Data ONTAP are deleted. By performing certain tasks for the Snapshot copy on the source before you upgrade to the newer version of Data ONTAP, you can preserve SnapMirror relationships if you need to revert.

After upgrading Data ONTAP, the older SnapMirror Snapshot copies are gradually replaced with the newer Snapshot copies. If you revert to an older version of Data ONTAP after this replacement, there are no Snapshot copies available for the SnapMirror relationship, and the SnapMirror relationship would need to be initialized again. This means that the initial SnapMirror baseline transfer required for setting up the replication relationship would need to be performed.

To avoid the need to initialize the SnapMirror relationship again after a revert operation, use one of the following options based on whether you use volume or qtree SnapMirror.

Volume SnapMirror	Creating a manual Snapshot copy on the SnapMirror source before upgrading to the newer version of Data ONTAP, and updating the SnapMirror destination with the changes before upgrading to the newer version of Data ONTAP, enable the SnapMirror relationship to continue with incremental updates, after a revert operation. The manually created Snapshot copy enables you to restore the SnapMirror relationship.
Qtree SnapMirror	Renaming the common Snapshot copy for the qtree SnapMirror relationship on the SnapMirror source before upgrading to the newer version of Data ONTAP, and updating the SnapMirror destination with the changes before upgrading to the newer version of Data ONTAP, enable the SnapMirror relationship to continue with the incremental updates, after a revert operation. The renamed Snapshot copy enables you to restore the SnapMirror relationship.

Attention: After the upgrade, use discretion when deleting any of the older Snapshot copies. After you are sure that a revert operation is not required, you can delete the Snapshot copies from the older version of Data ONTAP.

Issues when reverting to earlier Data ONTAP 7.3 releases

You must understand and resolve issues before you revert from the current Data ONTAP 7.3.*x* release.

Next topics

Downgrading deduplicated volumes with increased maximum size to Data ONTAP 7.3

Data ONTAP 7.3.1 and later releases support larger maximum size values for deduplicated volumes. However, if you have increased the size of any deduplicated volume beyond the volume size that is supported in the Data ONTAP 7.3 release, then that volume goes offline when the system boots with ONTAP 7.3.

To prevent this, you should downgrade to ONTAP 7.3P3 or higher. When you do, the affected volumes will not go offline and deduplication will be disabled on those volumes.

Note: This limitation applies even if you increase and later shrink the volume to sizes supported in the Data ONTAP 7.3 release.

Reversion of deduplicated volumes with increased maximum size

Data ONTAP 7.3.1 and later releases support larger maximum sizes for deduplicated volumes. However, if you have increased the size of any deduplicated volume beyond the size supported in an earlier Data ONTAP release and you want to revert to that earlier release, you are prompted to undo block sharing (undo deduplication) for that volume. If this happens, contact technical support.

Note:

- You will be prompted to undo block sharing on the volume even if you increased and then shrunk the volume to sizes supported in previous Data ONTAP releases.

- If you undo sharing on a volume that was a volume SnapMirror source, the first SnapMirror operation after the revert will transfer data proportional to the data that was no longer shared.

For more information about deduplication, see the *Data ONTAP Storage Management Guide*.

Reverting a SnapMirror destination system with volumes that use deduplication or clone operations

For a volume SnapMirror relationship, the destination storage system should use an identical or later release of Data ONTAP than the source system.

In releases prior to Data ONTAP 7.3.1, when replicating volumes with deduplication, the near-line functionality license was required on the destination system. However, for Data ONTAP 7.3.1 and later releases, it is not essential to enable the near-line functionality license on the destination system for replicating such volumes. Therefore, if you revert from Data ONTAP 7.3.1 or later to a prior release, you should ensure that the near-line functionality license is enabled on the destination system. Otherwise, after the revert operation, volume SnapMirror updates fail for any volumes on the source that use deduplication.

Note: When using SnapMirror to replicate volumes that use deduplication or clone operations, the destination system should support deduplication.

For more information about the near-line functionality license and the storage systems that support deduplication, see the *Data ONTAP Storage Management Guide*.

Reverting when IPv6 is enabled

Starting with Data ONTAP 7.3.1, you can enable IPv6 on your storage system. However, if you have enabled IPv6 on your system and want to revert to an earlier Data ONTAP release, you must take steps *before* reverting.

For more information about IPv6, see the *Data ONTAP Network Management Guide*.

Next topics

Downgrading to Data ONTAP 7.3 when IPv6 is enabled on page 133
Reverting to a release family earlier than Data ONTAP 7.3 when IPv6 is enabled on page 135

Downgrading to Data ONTAP 7.3 when IPv6 is enabled

If you have enabled IPv6 on your system and you downgrade to Data ONTAP 7.3, IPv6 is disabled automatically.

About this task

If a network interface is configured with both IPv4 and IPv6 addresses, the IPv6 address is ignored after reverting and network traffic is sent over IPv4 addresses only. However, any configuration with only an IPv6 address must be reconfigured with an IPv4 address. In particular, you must manually

reconfigure the vFiler units, CIFS, DNS servers, NIS servers, and the configuration files inside the /etc directory for IPv4 networking.

Steps

1. If you have configured IPv6 addresses on any of your system's vFiler units, reconfigure the vFiler units with IPv4 addresses.

   Note: Any vFiler units with IPv6 addresses cannot be reached after reverting.

2. If you have configured your storage system to query DNS or NIS servers with IPv6 addresses, supply IPv4 addresses for these servers or identify other DNS or NIS servers with IPv4 addresses.

   Note: If the /etc/registry file contains both IPv4 and IPv6 addresses for the options nis.servers command, only IPv4 addresses are bound to the NIS servers after reverting. The IPv6 addresses specified for the options nis.servers command in the /etc/registry file are ignored and removed after the system is rebooted.

3. Delete any IPv6 entries in the configuration files before reverting.

   IPv6 addresses present in the following configuration files are ignored:

   - /etc/hosts
   - /etc/rc
   - /etc/registry
   - /etc/dgateways
   - /etc/usermap.cfg
   - /etc/resolv.conf
   - /etc/exports
   - /etc/snapmirror.conf
   - /etc/snapmirror.allow

   IPv6 entries in the Network Status Monitor (NSM) are skipped while sending NSM notifications to clients. Therefore, NSM notifications are sent only to IPv4 clients.

   The exports rules for loading the /etc/exports file skip the IPv6 addresses present in each export rule. The entire exports rule is not skipped; only the IPv6 addresses in the exports rule are skipped.

   Note: The skipped IPv6 addresses are not removed from the /etc/exports file after reverting. You can edit the file manually and remove the IPv6 addresses. You must remove the IPv6 addresses from the /etc/exports file if, after reverting to Data ONTAP 7.3, you again want to revert to a previous release family.

   You can use the exportfs -w command to write the export rules stored in the memory to the /etc/exports file. Therefore, all IPv6 addresses are removed from the /etc/exports file.

4. Reboot the storage system.
5. Verify the IPv4 connectivity before reverting.

Reverting to a release family earlier than Data ONTAP 7.3 when IPv6 is enabled

If you have enabled IPv6 on your system and you want to revert to an earlier release family (such as a Data ONTAP 7.2.*x* release), you must manually disable IPv6 *before* reverting. You should also manually remove any IPv6 configurations from vFiler units, DNS and NIS servers, and CIFS service.

Steps

1. If you have configured IPv6 addresses on any of your system's vFiler units, reconfigure the vFiler units with IPv4 addresses.

   Any vFiler units with IPv6 addresses cannot be reached after reverting.

2. If you have configured your storage system to query DNS or NIS servers with IPv6 addresses, supply IPv4 addresses for these servers or identify other DNS or NIS servers with IPv4 addresses.

   Queries to any DNS or NIS servers with IPv6 addresses fail after reverting.

3. If CIFS over IPv6 is enabled, reconfigure the CIFS service over IPv6 by entering the following command:

   `cifs setup`

4. If the usermap file—`/etc/usermap.cfg`—contains IPv6 addresses, delete the IPv6 entries.

   Usermap entries that contain IPv6 addresses will not work in the reverted release.

5. If CIFS auditing is enabled, enter the following command to save your audit files manually:

   `cifs audit save`

   If you do not save your audit files, any CIFS requests that were serviced over IPv6 will not be available after reverting.

6. Optionally, delete the SNMP traphosts with IPv6 addresses from the `/etc/registry` file or add IPv4 traphosts.

   If you do not delete the IPv6 SNMP traphost entries from the `/etc/registry` file, these entries are overwritten when new SNMP traphosts are added.

7. Disable IPv6 on the storage system by entering the following command:

   `options ip.v6.enable off`

   The IPv6 entries are automatically removed from the `/etc/exports` file and the NSM database.

8. Reboot the storage system.
9. Verify the IPv4 connectivity before reverting.

Reverting when SnapLock is enabled

SnapLock technology is supported in Data ONTAP 7.3.1 and later releases, but it is only supported in certain earlier releases. Before reverting a system with SnapLock enabled, be sure that the target release supports both SnapLock and the functionality you need.

For more information about SnapLock, see the *Data ONTAP Archive and Compliance Management Guide*.

Next topics

Reverting with SnapLock volumes halts the system

If your storage system (running Data ONTAP 7.3.1 or later) contains SnapLock Compliance or Enterprise volumes or aggregates and you attempt to revert to Data ONTAP 7.3 or any earlier release that does not support SnapLock, the system halts.

For information about recovering from this reversion problem, see the *Data ONTAP Archive and Compliance Management Guide*.

Reverting when SnapLock logging is enabled

Data ONTAP 7.3.1 and later releases provide logging capabilities for SnapLock technology. If you revert to a release that supports SnapLock but that does not support the SnapLock logging feature, all the active SnapLock log files are archived; that is, they are committed to WORM state.

Reverting when deduplication is enabled on SnapLock volumes

Beginning with Data ONTAP 7.3.1, deduplication is supported on all SnapLock volumes. However, if you revert to a Data ONTAP version that does not support deduplication on SnapLock volumes, you must remove the block sharing done by deduplication. Otherwise, the reversion fails. For assistance in removing block sharing, contact technical support.

For more information about deduplication, see the *Data ONTAP Storage Management Guide*.

Reverting when privileged delete functionality is enabled

The SnapLock privileged delete functionality is introduced in the Data ONTAP 7.3 release family starting with release Data ONTAP 7.3.1. If you revert to any release prior to Data ONTAP 7.3, the privileged delete state of the SnapLock Enterprise volume is maintained.

For more information about privileged delete functionality, refer to *Data ONTAP Archive and Compliance Management Guide*

Reverting archival Snapshot copies

In Data ONTAP 7.3.1 and later releases, a user-configurable option allows you to enable or disable taking archival Snapshot copies at the end of the data transfer. When you revert from Data ONTAP 7.3.1 or later to an earlier release, Snapshot copies are taken for all volumes regardless of settings for archival Snapshot copies for the volume in later releases.

For more information about archival Snapshot copies and the user-configurable option, see the *Data ONTAP Data Protection Online Backup and Recovery Guide*.

Reverting systems when a FlexClone file or FlexClone LUN operation is in progress

Starting with Data ONTAP 7.3.1, you can clone files and LUNs in a FlexVol volume using the FlexClone technology. If you are using FlexClone technology and want to revert to a release earlier than Data ONTAP 7.3, you should ensure that no FlexClone file or FlexClone LUN operations are in progress.

If any cloning operation is in progress, the presence of temporary Snapshot copies which are used by FlexClone file and LUN operation causes the revert process to fail.

When you revert to Data ONTAP 7.3 and the FlexClone operations are in progress, the partially cloned files and temporarily created Snapshot copies are not deleted. You must manually delete the partially cloned files and temporary Snapshot copies.

Note: In Data ONTAP 7.3.1 the commands related to FlexClone files and LUNs are available in the `priv set advanced` mode.

When you revert to Data ONTAP 7.3.2 or earlier, the FlexClone files and FlexClone LUNs commands are not available in the nondefault vfiler context.

For more information about FlexClone volumes, FlexClone files and LUNs, see the *Data ONTAP Storage Management Guide*.

Reverting when Kerberos Multi Realm support is enabled

In Data ONTAP 7.3.1 and later releases, you can configure Data ONTAP to use both Active Directory and UNIX-based KDC types simultaneously. This configuration is sometimes referred to as a Kerberos Multi Realm configuration. However, if you have enabled Multi Realm support on your system and want to revert to an earlier Data ONTAP release, you must take steps *before* reverting.

For more information, see the section on Kerberos security services in the *Data ONTAP File Access and Protocols Management Guide*.

Next topics

Downgrading to Data ONTAP 7.3 when Kerberos Multi Realm support is enabled on page 138
Reverting to an earlier release family when Kerberos Multi Realm support is enabled on page 138

Downgrading to Data ONTAP 7.3 when Kerberos Multi Realm support is enabled

If you enable Kerberos Multi Realm support in Data ONTAP 7.3.1 or later and then downgrade to Data ONTAP 7.3, you must first disable Kerberos authentication for NFS. If you reenable Kerberos authentication for NFS after the downgrade and you want to reuse your UNIX keytab file, you must rename the keytab file from `/etc/UNIX_krb5.keytab` to `/etc/krb5.keytab`.

Steps

1. Disable Kerberos for NFS by entering `nfs setup` and answering `y` at the prompt.

```
tpubs-ex1> nfs setup
Kerberos is presently enabled for NFS.
Disable Kerberos for NFS? y
Kerberos now disabled for NFS.
NFS setup complete.
```

2. Downgrade from Data ONTAP 7.3.1 to Data ONTAP 7.3.
3. If you reenable Kerberos authentication for NFS after the downgrade and you want to reuse your UNIX keytab file, you must rename the keytab file from `/etc/UNIX_krb5.keytab` to `/etc/krb5.keytab`.

   Note: If you reenable Kerberos authentication for NFS for Data ONTAP 7.3 and later decide to upgrade again to 7.3.1, you must rename the keytab file from `/etc/krb5.keytab` to `/etc/UNIX_ krb5.keytab` after upgrading, even if you do not run the `nfs setup` command.

Reverting to an earlier release family when Kerberos Multi Realm support is enabled

If you enable Kerberos Multi Realm support in Data ONTAP 7.3.1 or later and then revert to a Data ONTAP release earlier than 7.3, Data ONTAP automatically disables Kerberos for NFS. You can reenable Kerberos for NFS after such a reversion by running the `nfs setup` command.

Steps

1. Revert Data ONTAP 7.3.1 or later to a Data ONTAP release earlier than 7.3.

   If Kerberos Multi Realm support was enabled in Data ONTAP 7.3.1 or later, Data ONTAP displays the following message:

```
**************************************************
Kerberos for NFS will be disabled. If you wish to run
Kerberos for NFS on the reverted release, you need to run
"nfs setup" after revert. If the configuration being used
for NFS after revert will be the same as at present, the NFS
keytab file /etc/UNIX_krb5.keytab can be reused
by renaming it to /etc/krb5.keytab.
**************************************************
```

2. To reenable Kerberos for NFS (and disable Kerberos for CIFS) after the reversion, enter the following command:

   ```
   nfs setup
   ```

   For more information, see the *Data ONTAP File Access and Protocols Management Guide*.

3. To reuse your UNIX keytab file, rename it from `/etc/UNIX_krb5.keytab` to `/etc/krb5.keytab`.

Issues when reverting to Data ONTAP 7.2

You must understand and resolve issues before you revert to the Data ONTAP 7.2 release family.

Next topics

FlexCache reversion limitations

If your storage system has FlexCache volumes, you must ensure that the appropriate license is installed after reverting to a supported release.

FlexCache configurations in Data ONTAP 7.3 and later releases require the new flexcache_nfs license. If you revert to Data ONTAP 7.2.4 or later, the new flexcache_nfs license remains valid. However, if you revert to a Data ONTAP release earlier than 7.2.4, you will not be able to access data in FlexCache volumes unless the old flex_cache license is enabled.

The following Data ONTAP releases support FlexCache volumes:

- 7.3 release family; all releases
- 7.2 release family; Data ONTAP 7.2.1 and later (7.2.4 and later is recommended)

Attention: If you need FlexCache, do not revert to any release earlier than 7.2.1 in the 7.2 release family, or to any release in the Data ONTAP 7.1 release family. You will not be able to access data on FlexCache volumes after reverting to any of these releases.

Deduplication reversion limitations

If you use deduplication, you must ensure that there is adequate free space in the deduplicated volumes and reenable deduplication after reverting to the Data ONTAP 7.2 release family. You also need to run the `sis start -s` command on each deduplicated volume.

In Data ONTAP 7.3 and later releases, the deduplication fingerprint database for a volume is stored in the containing aggregate. When you revert to an earlier release, you must ensure that the volume has free space equal to at least 6 percent of its data usage. This space allows the fingerprint database to be recreated in the volume. If sufficient space is not available in the volume, you cannot deduplicate new blocks with ones that existed before the reversion.

For example, if a FlexVol volume has 5 TB of total data (1 TB used and 4 TB saved as reported by the `df -s` command), 300 GB (6 percent of 5 TB) must be available after the revert.

For all Data ONTAP releases earlier than 7.3, after ensuring that this space is available, you must run the `sis start -s` command on every deduplicated volume to rebuild the fingerprint database and reenable deduplication. System resource availability should be considered when determining how many simultaneous deduplication processes to run.

In Data ONTAP 7.3 and later releases, the deduplication fingerprint database for a volume is stored in the containing aggregate. When you revert to an earlier release, you must ensure that the volume has free space equal to at least 6 percent of its data usage. This space allows the fingerprint database to be recreated in the volume.

For more information about deduplication, see the *Data ONTAP Storage Management Guide*.

SnapMirror and SnapVault restart checkpoints deleted during reversion

Starting with Data ONTAP 7.3, when you revert to an earlier version, all aborted qtree SnapMirror and SnapVault transfers with restart checkpoints restart from the beginning because all restart checkpoints are deleted during the reversion process.

SnapVault licenses might need to be removed before reverting

Beginning with Data ONTAP 7.3, you can enable both primary and secondary licenses for SnapVault on the same active/active system node or on a single-node system. However, if both primary and secondary licenses are installed on the same storage system, SnapVault stops functioning after reverting to a Data ONTAP release earlier that 7.3. To continue using SnapVault, you must remove one of the two licenses before reverting.

SnapVault restore processes must be complete before reverting

If you are running SnapVault on Data ONTAP 7.3 or later, you must ensure that any SnapVault restore process has completed before reverting to a Data ONTAP release earlier than 7.3. If a SnapVault restore process is detected, the revert operation will not be allowed to proceed.

You can ensure that no restore process is running by using the following command on the SnapVault secondary storage system:

snapvault abort -h *[dst_system:]dst_path*

You must execute this command with the *dst_path* argument for each SnapVault process that is in progress (pending).

The `snapvault abort` process should be allowed to complete before initiating the revert procedure.

Note: The SnapVault restore process cannot be restarted after reverting. If an ongoing SnapVault restore process is critical, allow it to complete before initiating the revert process.

For more information, see the snapvault(1) man page.

Large NFSv4 ACLs removed when reverting from Data ONTAP 7.3

Beginning with Data ONTAP 7.3, the maximum number of Access Control Entries (ACEs) in an Access Control List (ACL) is increased from 192 to 400. If you revert to a release earlier than 7.3, any NFSv4 ACLs with more than 192 ACEs are removed. Files and directories that were created with any of the large ACLs do not have their permissions changed (mode bits are preserved).

Note: If you revert a SnapMirror source system where large NFSv4 ACLs were set on mirrored files or directories, the corresponding files and directories on the destination system will have restrictive ACLs set, which allow only the owner to access them. For more information about reverting SnapMirror systems, see the general guidelines for reverting.

FPolicy reversion issue with file names having long extensions

Starting with Data ONTAP 7.3, the file name extension length supported by FPolicy for file screening is increased to 260 characters. However, if you added longer extensions to the list of extensions to be screened in Data ONTAP 7.3 and you then revert to an earlier version, the file names with the long extensions are not screened by FPolicy after reverting. You should check your FPolicy extension list before reverting.

Issues when reverting to Data ONTAP 7.1

You must understand and resolve issues before you revert to the Data ONTAP 7.1 release family.

Next topics

Volumes in excess of 200 must be destroyed before reverting to Data ONTAP 7.1.x on page 142
SnapLock autocommit option must be disabled before reverting on page 142

Volumes in excess of 200 must be destroyed before reverting to Data ONTAP 7.1.x

Data ONTAP 7.2 introduced support for up to 500 FlexVol volumes. If you are reverting to any release earlier than Data ONTAP 7.2 and there are more than 200 volumes in your system, you must destroy some of the volumes to bring the number of volumes to 200 or fewer.

SnapLock autocommit option must be disabled before reverting

If you are using the `snaplock.autocommit_period` option, you must disable this option by setting it to `none` before reverting to any release earlier than Data ONTAP 7.2.

Optimal service availability during upgrades

Service availability during Data ONTAP upgrades can be optimized through planning and configuration. In many cases, upgrades can be completely nondisruptive from the clients' perspective.

Next topics

How upgrades impact service availability on page 143
Service and protocol considerations on page 144

How upgrades impact service availability

You can review the factors that can affect the availability of storage system services before you begin the upgrade.

The following factors impact service availability:

- Whether the systems being upgraded (upgrade host) are single nodes or active/active configuration partners

  Systems in active/active configurations are designed to provide optimal service availability.
- The types of protocols used and services licensed, and their susceptibility to timeout errors
- Whether you need to make decisions about Data ONTAP issues and new features between or within release families

  Upgrading between Data ONTAP release families involves more steps and is potentially more disruptive than upgrades within a release family.
- Whether a system firmware update is required

  System firmware updates require a system halt and reboot. This can disrupt services in single systems and standard active/active configuration upgrades but does not affect services in nondisruptive active/active configuration upgrades.
- Whether a disk shelf firmware update is required

  Nondisruptive firmware upgrades are available for many disk shelf and module configurations.
- Whether disk firmware updates are required and what type of RAID protection applies to those disks
- The types of applications in use and their susceptibility to timeout errors

  The availability of client applications during upgrades depends on features, protocols, and configuration. See your application documentation for more information.

Note: All hardware and software upgrades in any storage solution are potentially at least somewhat disruptive to storage system services. Make sure that you review upgrade options carefully to determine the best method of upgrading for maintaining optimal service availability.

Related concepts

Upgrade host requirements on page 21
Service and protocol considerations on page 144
Updating firmware on page 97
Disk shelf firmware updates on page 109
Disk firmware updates on page 105

Service and protocol considerations

In general, services based on stateless protocols—such as NFS, FCP, and iSCSI—are less susceptible to service interruptions during upgrades than session-oriented protocols—such as CIFS, FTP, NDMP, and HTTP.

During an upgrade, the storage system must be rebooted (by issuing the `reboot` command or by initiating an active/active configuration takeover and giveback) to load the new software. Services based on stateless protocols usually remain available during nondisruptive upgrades of systems in an active/active configuration.

Stateless protocols usually include a timeout procedure. For example, if a message is sent and receipt is not acknowledged within a timeout period, a transmission error is assumed to have occurred. In a storage system environment, if the client's timeout period is greater than the disruption period on the storage system (for example, the amount of time a reboot or active/active configuration giveback takes), the client does not perceive a disruption of storage system services.

In session-oriented protocols, there is no concept of timeout to protect the service from disruption. If session-oriented storage system services are disrupted, state information about any operation in progress is lost and the user must restart the operation.

Next topics

Considerations for stateless protocols on page 144
Considerations for session-oriented protocols on page 145

Considerations for stateless protocols

Configurations that include client connections using stateless protocols generally do not experience adverse effects during upgrade if the clients are configured according to recommended guidelines.

- NFS hard mounts
  No adverse behavior on the clients. Clients might receive some messages similar to the following until the storage system reboots:
  `NFS server not responding, retrying`
  In general, read/write directories should be hard mounted. Hard mounts are the default type of mount.
- NFS soft mounts
  You should not use soft mounts when there is a possibility of frequent NFS timeouts. Race conditions can occur as a result of these timeouts, which can lead to data corruption. Furthermore,

some applications cannot properly handle errors that occur when a NFS operation reaches a timeout using soft mounts.

Some of the situations that can cause frequent timeouts are nondisruptive upgrades or any takeover/giveback event in an active/active configuration.

In general, soft mounts should be used only when solely reading from a disk. Even then, understand that the mount is unreliable.

- SAN protocols

  No adverse behavior on FC or iSCSI clients provided they are configured according to recommended guidelines.

  For compatibility and configuration information about FCP and iSCSI products, see the appropriate matrix at the N series Service and Support Web site at http://www.ibm.com/storage/support/nas/.

Considerations for session-oriented protocols

Storage systems and session-oriented protocols might cause adverse effects on clients and applications in the following areas during upgrades.

- CIFS

  Client sessions are terminated. You should inform users to end their sessions before you upgrade. To do so, issue the following command before the active/active configuration takeover:

  ```
  cifs terminate -t
  ```

  Alternatively, issue the following command before the reboot:

  ```
  reboot -t
  ```

  Note: The Microsoft Server Message Block (SMB) 2.0 protocol does not enable CIFS sessions to survive takeover and giveback operations in active/active configurations. Therefore, you cannot upgrade Data ONTAP nondisruptively if the SMB 2.0 protocol is active between your storage system and Windows clients.

- FTP, NDMP, and HTTP

  State is lost and the client user must retry the operation.

- Backups and restores

  State is lost and the client user must retry the operation.

  Attention: Do not initiate a backup or restore during or immediately before an upgrade. Doing so might result in data loss.

- Applications (for example, Oracle or Exchange)

  Effects depend on the applications. For timeout-based applications, you might be able to change the timeout setting to longer than the Data ONTAP reboot time to minimize adverse effects.

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