Lenovo

ThinkSystem DE Series
Upgrading ThinkSystem SAN OS
Release 11.70.2

Machine Types: DE2000H (7Y70, 7Y71), DE4000H (7Y74, 7Y75, 7Y77), DE4000F (7Y76), DE6000H (7Y78, 7Y80), DE6000F (7Y79), DE120S (7Y63), DE240S (7Y68), and DE600S (7Y69)

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Chapter 1. Overview of upgrading the ThinkSystem SAN OS

You can upgrade your operating system and system hardware components to the latest version of ThinkSystem SAN OS software and firmware.

These upgrade procedures include separate instructions for the following:

- Multiple controllers — Includes procedures for upgrading ThinkSystem SAN OS software on multiple storage arrays of the same type.
- Drive — Includes instructions for upgrading the drive's firmware.

Before you begin the upgrade, be sure to review the Upgrade considerations.

Chapter 2. Upgrade considerations

To ensure a successful upgrade, review the following upgrade considerations.

2.1. Controller upgrades

Review these key considerations before upgrading controllers.

2.1.1. Current versions

For multiple controllers, use the ThinkSystem SAN Manager interface. Go to the **Manage** page for discovered storage arrays. The versions are shown in the **ThinkSystem SAN OS Software** column. The controller firmware and NVSRAM information is available in a pop-up dialog box when you click on the ThinkSystem SAN OS version in each row.

2.1.2. Components included in the upgrade

The following components are included in the ThinkSystem SAN OS upgrade process:

- **System Manager** — System Manager is the software that manages the storage array.
- **Controller firmware** — Controller firmware manages the I/O between hosts and volumes.
- **Controller NVSRAM** — Controller NVSRAM is a controller file that specifies the default settings for the controllers.
- **IOM firmware** — The I/O module (IOM) firmware manages the connection between a controller and a drive shelf. It also monitors the status of the components.
- **Supervisor software** — Supervisor software is the virtual machine on a controller in which the software runs.

2.1.3. Components to upgrade separately

The following components must be upgraded separately:

- **Multipath/failover driver** — As part of the upgrade process, the host's multipath/failover driver might also need to be upgraded so the host can interact with the controllers correctly. If hosts running operating systems other than Microsoft Windows have I/O connections to your storage system, upgrade the multipath drivers for those hosts. See the procedures in the Express Guides for your operating system. For compatibility information, refer to the Lenovo Storage Interoperation Center (LSIC).
- **ThinkSystem SAN Manager** — SAN Manager is the software that manages multiple storage systems, including the DE2000H, DE4000H, and DE6000H models. To upgrade SAN Manager, go to the online help for SAN Manager.
- **Utilities** — Other management utilities require separate upgrades, such as the Lenovo ThinkSystem Host Utilities for Windows for DE Series, the Lenovo ThinkSystem Host Utilities for Linux for DE Series, and the Lenovo ThinkSystem DSM Installer for DE Series.

- **Drive firmware** — See the separate instructions for upgrading the drive firmware.

2.1.4. Dual controllers and I/O processing

If a storage array contains two controllers and you have a multipath driver installed, the storage array can continue to process I/O while the upgrade occurs. During the upgrade, the following process occurs:

1. Controller A fails over all its LUNs to controller B.
2. Upgrade occurs on controller A.
3. Controller A takes back its LUNs and all of controller B's LUNs.
4. Upgrade occurs on controller B.

After the upgrade completes, you might need to manually redistribute volumes between the controllers to ensure volumes return to the correct owning controller.

2.1.5. Health check

A pre-upgrade health check runs as part of the upgrade process. This health check assesses all storage array components to make sure the upgrade can proceed. The following conditions might prevent the upgrade:

- Failed assigned drives
- Hot spares in use
- Incomplete volume groups
- Exclusive operations running
- Missing volumes
- Controller in non-optimal status
- Excess number of event log events
- Configuration database validation failure
- Drives with old versions of DACstore

You also can run the pre-upgrade health check separately without doing an upgrade.

2.1.6. Immediate or staged upgrade

You can activate the upgrade immediately or stage it for a later time. You might choose to activate later for these reasons:

- **Time of day** — Activating the software can take a long time, so you might want to wait until I/O loads are lighter. Depending on the I/O load and cache size, a controller upgrade can typically take between 15 to 25 minutes to complete. The controllers reboot and fail over during activation so performance might be lower than usual until the upgrade completes.

- **Type of package** — You might want to test the new software and firmware on one storage array before upgrading the files on other storage arrays.

2.2. Drive firmware upgrade

Review these key considerations before upgrading your drive firmware.

2.2.1. Drive compatibility

Each drive firmware file contains information about the drive type on which the firmware runs. You can download the specified firmware file only to a compatible drive. System Manager automatically checks compatibility during the upgrade process.

2.2.2. Drive upgrade methods

There are two types of drive firmware upgrade methods: online and offline.

Online upgrade	Offline upgrade
During an online upgrade, drives are upgraded sequentially, one at a time. The storage array continues processing I/O while the upgrade occurs. You do not have to stop I/O. If a drive can do an online upgrade, the online method is used automatically. Drives that can do an online upgrade include the following: • Drives in an Optimal pool • Drives in an Optimal redundant volume group (RAID 1, RAID 5, and RAID 6) • Unassigned drives • Standby hot spare drives Doing an online drive firmware upgrade can take several hours exposing the storage array to potential volume failures. Volume failure could occur in these cases: • In a RAID 1 or RAID 5 volume group, one drive fails while a different drive in the volume group is being upgraded. • In a RAID 6 pool or volume group, two drives fail while a different drive in the pool or volume group is being upgraded.	During an offline upgrade, all drives of the same drive type are upgraded at the same time. This method requires stopping I/O activity to the volumes associated with the selected drives. Because multiple drives can be upgraded concurrently (in parallel), the overall downtime is significantly reduced. If a drive can do only an offline upgrade, the offline method is used automatically. The following drives MUST use the offline method: • Drives in a non-redundant volume group (RAID 0) • Drives in a non-optimal pool or volume group • Drives in SSD cache

Chapter 3. Upgrade software and firmware for controllers

Follow this procedure to upgrade multiple controllers of the same type with ThinkSystem SAN Manager.

3.1. Before you begin

- Review Upgrade considerations.
- Determine if you want to activate your software upgrade now or later. You might choose to activate later for these reasons:
  - **Time of day** — Activating the software can take a long time, so you might want to wait until I/O loads are lighter. The controllers fail over during activation, so performance might be lower than usual until the upgrade completes.
  - **Type of package** — You might want to test the new OS software on one storage array before you upgrade the files on other storage arrays.
- Review these precautions:

Risk of data loss or risk of damage to the storage array - Do not make changes to the storage array while the upgrade is occurring. Maintain power to the storage array.

3.2. Step 1: Perform pre-upgrade health check

A health check runs as part of the upgrade process, but you also can run a health check separately before you begin. The health check assesses components of the storage array to make sure that the upgrade can proceed.

Steps

1. Open SAN Manager.
2. From the main view, select **Manage**, and then select **Upgrade Center** > **Pre-Upgrade Health Check**.

   The Pre-Upgrade Health Check dialog box opens and lists all the discovered storage systems.
3. If needed, filter or sort the storage systems in the list, so you can view all systems that are not currently in the Optimal state.
4. Select the check boxes for the storage systems that you want to run through the health check.
5. Click **Start**.

   The progress is shown in the dialog box while the health check is performed.
6. When the health check completes, you can click on the ellipses (…) to the right of each row to

view more information and perform other tasks.

If any arrays fail the health check, you can skip that particular array and continue the upgrade for the others, or you can stop the entire process and troubleshoot the arrays that did not pass.

3.3. Step 2: Download software files from support site

In this step, you go to the Lenovo Data Center Support site to save the new downloadable package (DLP) software files to your management host system.

Steps

1. If your storage array contains only one controller or a multipath driver is not in use, stop I/O activity to the storage array to prevent application errors. If you have a multipath driver installed, you do not need to stop I/O activity.
2. From SAN Manager's main view, select **Manage**, and then select one or more storage arrays that you want to upgrade.
3. Select **Upgrade Center** > **Upgrade ThinkSystem SAN OS Software**.

   The Upgrade ThinkSystem SAN OS software page appears.
4. Download the latest ThinkSystem SAN OS software package from the Lenovo Data Center Support to your local machine.
   a. Click **Add new file to software repository**.
   b. Click the link for finding the latest **ThinkSystem SAN OS Downloads**.
   c. Click the **Download Latest Release** link.
   d. Follow the remaining instructions to download the ThinkSystem SAN OS file and the NVSRAM file to your local machine.

3.4. Step 3: Transfer software files to the controllers

You load the ThinkSystem SAN OS software file and the NVSRAM file into the repository so it is accessible to the SAN Manager Upgrade Center.

Risk of data loss or risk of damage to the storage array - Do not make changes to the storage array while the upgrade is occurring. Maintain power to the storage array.

Steps

1. From SAN Manager's main view, select **Manage**, and then select one or more storage arrays that you want to upgrade.

2. Select **Upgrade Center** > **Upgrade ThinkSystem SAN OS Software**.

   The Upgrade ThinkSystem SAN OS software page appears.

3. Download the latest ThinkSystem SAN OS software package from the Lenovo Data Center Support to your local machine.

   a. Click **Add new file to software repository**.

   b. Click the link for finding the latest **ThinkSystem SAN OS Downloads**.

   c. Click the **Download Latest Release** link.

   d. Follow the remaining instructions to download the ThinkSystem SAN OS file and the NVSRAM file to your local machine.

4. Select the OS software file and the NVSRAM file that you want to use to upgrade the controllers:

   a. From the **Select a ThinkSystem SAN OS software file** drop-down, select the OS file that you downloaded to your local machine.

      If there are multiple files available, the files are sorted from newest date to oldest date.

      

      The software repository lists all software files associated with the Web Services Proxy. If you do not see the file that you want to use, you can click the link, **Add new file to software repository**, to browse to the location where the OS file that you want to add resides.

   b. From the **Select an NVSRAM file** drop-down, select the controller file that you want to use.

      If there are multiple files, the files are sorted from newest date to oldest date.

5. In the Compatible Storage Array table, review the storage arrays that are compatible with the OS software file that you selected, and then select the arrays you want to upgrade.

   - The storage arrays that you selected in the Manage view and that are compatible with the selected firmware file are selected by default in the Compatible Storage Array table.
   - The storage arrays that cannot be updated with the selected firmware file are not selectable in the Compatible Storage Array table as indicated by the status **Incompatible**.

6. (Optional) To transfer the software file to the storage arrays without activating them, select the **Transfer the OS software to the storage arrays, mark it as staged, and activate at a later time** check box.

7. Click **Start**.

8. Depending on whether you chose to activate now or later, do one of the following:

   - Type **TRANSFER** to confirm that you want to transfer the proposed OS software versions on the arrays you selected to upgrade, and then click **Transfer**.

To activate the transferred software, select **Upgrade Center** > **Activate Staged OS Software**.

- Type **UPGRADE** to confirm that you want to transfer and activate the proposed OS software versions on the arrays you selected to upgrade, and then click **Upgrade**.

  The system transfers the software file to each storage array you selected to upgrade and then activates that file by initiating a reboot.

The following actions occur during the upgrade operation:

- A pre-upgrade health check runs as part of the upgrade process. The pre-upgrade health check assesses all storage array components to make sure that the upgrade can proceed.
- If any health check fails for a storage array, the upgrade stops. You can click the ellipsis (…) and select **Save Log** to review the errors. You can also choose to override the health check error and then click **Continue** to proceed with the upgrade.
- You can cancel the upgrade operation after the pre-upgrade health check.

9. (Optional) Once the upgrade has completed, you can see a list of what was upgraded for a specific storage array by clicking the ellipsis (…) and then selecting **Save Log**.

   The file is saved in the Downloads folder for your browser with the name`upgrade_log-<date>.json`.

3.5. Step 4: Activate staged software files (optional)

You can choose to activate the software file immediately or wait until a more convenient time. This procedure assumes you chose to activate the software file at a later time.

You cannot stop the activation process after it starts.

Steps

1. From SAN Manager's main view, select **Manage**. If necessary, click the Status column to sort all storage arrays with a status of "OS Upgrade (awaiting activation)."
2. Select one or more storage arrays that you want to activate software for, and then select **Upgrade Center** > **Activate Staged OS Software**.

   The following actions occur during the upgrade operation:

   - A pre-upgrade health check runs as part of the activate process. The pre-upgrade health check assesses all storage array components to make sure that the activation can proceed.
   - If any health check fails for a storage array, the activation stops. You can click the ellipsis (…) and select **Save Log** to review the errors. You can also choose to override the health check error and then click **Continue** to proceed with the activation.
   - You can cancel the activate operation after the pre-upgrade health check. On successful

completion of the pre-upgrade health check, activation occurs. The time it takes to activate depends on your storage array configuration and the components that you are activating.

3. (Optional) After the activation is complete, you can see a list of what was activated for a specific storage array by clicking the ellipsis (…) and then selecting **Save Log**.

   The file is saved in the Downloads folder for your browser with the name `activate_log-<date>.json`.

3.6. Result

Your controller software upgrade is complete. You can resume normal operations.

Chapter 4. Upgrade drive firmware

Follow this procedure to upgrade your drives' firmware, which ensures you have all the latest features and fixes.

4.1. Step 1: Download drive firmware files from support site

In this step, you go to the Lenovo Data Center Support site to download the drive firmware files to your management client.

Steps

1. In ThinkSystem System Manager, select **Support** > **Upgrade Center**.
2. Under Drive Firmware upgrade, click **Lenovo Support**.
3. On the Lenovo Support web site, click the **Downloads** tab, and then select **Firmware**.
4. Select **Disk Drive & Firmware Matrix**.
5. Follow the remaining instructions.

4.2. Step 2: Begin drive firmware upgrade

In this step, you upgrade the drives' firmware.

Before you begin

- You have backed up your data using disk-to-disk backup, volume copy (to a volume group not affected by the planned firmware upgrade), or a remote mirror.
- The storage array has an Optimal status.
- All drives have an Optimal status.
- No configuration changes are running on the storage array.
- If the drives are capable of only an offline upgrade, I/O activity to all volumes associated with the drives is stopped.

Steps

1. Under Drive Firmware upgrade, click **Begin Upgrade**.

   A dialog box appears, which lists the drive firmware files currently in use.

2. Extract (unzip) the files you downloaded from the Support site.
3. Click **Browse**, and select the new drive firmware files that you downloaded from the Support site.

Drive firmware files have a filename similar to D_HUC101212CSS600_30602291_MS01_2800_0002 with the extension of .dlp.

You can select up to four drive firmware files, one at a time. If more than one drive firmware file is compatible with the same drive, you get a file conflict error. Decide which drive firmware file you want to use for the upgrade and remove the other one.

4. Click **Next**.

   The Select Drives dialog box appears, which lists the drives that you can upgrade with the selected files.

   Only drives that are compatible appear.

   The selected firmware for the drive appears in the **Proposed Firmware** information area. If you must change the firmware, click **Back** to return to the previous dialog.

5. Select the type of upgrade you want to perform:
   - **Online (default)** — Shows the drives that can support a firmware download *while the storage array is processing I/O*. You do not have to stop I/O to the associated volumes using these drives when you select this upgrade method. These drives are upgraded one at a time while the storage array is processing I/O to those drives.
   - **Offline (parallel)** — Shows the drives that can support a firmware download *only while all I/O activity is stopped* on any volumes that use the drives. You must stop all I/O activity on any volumes that use the drives you are upgrading when you select this upgrade method. Drives that do not have redundancy must be processed as an offline operation. This requirement includes any drive associated with SSD cache, a RAID 0 volume group, or any pool or volume group that is degraded. The offline (parallel) upgrade is typically faster than the online (default) method.
6. In the first column of the table, select the drive or drives you want to upgrade.
7. Click **Start**, and confirm that you want to perform the operation.

   If you need to stop the upgrade, click **Stop**. Any firmware downloads currently in progress complete. Any firmware downloads that have not started are canceled.

   

   Stopping the drive firmware upgrade might result in data loss or unavailable drives.

8. (Optional) To see a list of what was upgraded, click **Save Log**.

   The file is saved in the Downloads folder for your browser with the name `drive_upgrade_log-timestamp.txt`.

9. If any of the following errors occur during the upgrade procedure, take the appropriate recommended action.

If you encounter this firmware download error…	Then do the following…
• Failed assigned drives	One reason for the failure might be that the drive does not have the appropriate signature. Make sure that the affected drive is an authorized drive. Contact technical support for more information. When replacing a drive, make sure that the replacement drive has a capacity equal to or greater than the failed drive you are replacing. You can replace the failed drive while the storage array is receiving I/O.
Check storage array	• Make sure that an IP address has been assigned to each controller. • Make sure that all cables connected to the controller are not damaged. • Make sure that all cables are tightly connected.
Integrated hot spare drives	This error condition must be corrected before you can upgrade the firmware. Launch System Manager and use the Recovery Guru to resolve the problem.
Incomplete volume groups	If one or more volume groups or disk pools are incomplete, you must correct this error condition before you can upgrade the firmware. Launch System Manager and use the Recovery Guru to resolve the problem.
Exclusive operations (other than background media/parity scan) currently running on any volume groups	If one or more exclusive operations are in progress, the operations must complete before the firmware can be upgraded. Use System Manager to monitor the progress of the operations.
Missing volumes	You must correct the missing volume condition before the firmware can be upgraded. Launch System Manager and use the Recovery Guru to resolve the problem.

If you encounter this firmware download error…	Then do the following…
Either controller in a state other than Optimal	One of the storage array controllers needs attention. This condition must be corrected before the firmware can be upgraded. Launch System Manager and use the Recovery Guru to resolve the problem.
Mismatched Storage Partition information between Controller Object Graphs	An error occurred while validating the data on the controllers. Contact technical support to resolve this issue.
SPM Verify Database Controller check fails	A storage partitions mapping database error occurred on a controller. Contact technical support to resolve this issue.
Configuration Database Validation (if supported by the storage array's controller version)	A configuration database error occurred on a controller. Contact technical support to resolve this issue.
MEL Related Checks	Contact technical support to resolve this issue.
More than 10 DDE Informational or Critical MEL events were reported in the last 7 days	Contact technical support to resolve this issue.
More than 2 Page 2C Critical MEL Events were reported in the last 7 days	Contact technical support to resolve this issue.
More than 2 Degraded Drive Channel Critical MEL events were reported in the last 7 days	Contact technical support to resolve this issue.
More than 4 critical MEL entries in the last 7 days	Contact technical support to resolve this issue.

4.3. Result

Your drive firmware upgrade is complete. You can resume normal operations.

Chapter 5. Appendix

5.1. Contacting support

You can contact Support to obtain help for your issue.

You can receive hardware service through a Lenovo Authorized Service Provider. To locate a service provider authorized by Lenovo to provide warranty service, go to https://datacentersupport.lenovo.com/serviceprovider and use filter searching for different countries. For Lenovo support telephone numbers, see https://datacentersupport.lenovo.com/supportphonelist for your region support details.

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