

NAS 352

Online RAID Level Migration and Capacity Expansion

Migrate and expand
a storage volume

ASUSTOR COLLEGE

COURSE OBJECTIVES

Upon completion of this course you should be able to:

1. Have a general understanding of RAID migration and capacity expansion
2. Be able to migrate and expand a storage volume

PREREQUISITES

Course Prerequisites:

NAS 351: Introduction to RAID

Students are expected to have a working knowledge of:

RAID

OUTLINE

1. Introduction to RAID Migration

1.1 About RAID migration and capacity expansion

2. Configuring your NAS

2.1 Migrating to a different RAID level and expanding capacity

3. Expanding the Capacity of your NAS

3.1 Replacing existing hard disks with larger disks

1. Introduction to RAID Migration

1.1 About RAID migration and capacity expansion

With ASUSTOR NAS it is possible to change the RAID levels of your storage volumes and add hard disks to volumes to expand storage space. All this is done while the NAS Unit is online. You won't lose any of your currently stored data and you can continue to access your files while migration and expansion is in progress.

However, certain limitations exist with respect to migration and expansion between various configurations. Please see the following chart for a summary of the migration and expansion possibilities that are supported by ASUSTOR NAS.

Current Configuration Current RAID level of the Volume * No. of Hard Disks	No. of Disks to be Added	Action	New Configuration New RAID level * No. of Hard Disks
RAID 5 * 3	1	Add hard disks to existing volume	RAID 5 * 4
RAID 5 * 3	2	Add hard disks to existing volume	RAID 5 * 5
RAID 5 * 3	3	Add hard disks to existing volume	RAID 5 * 6
RAID 5 * 3	4	Add hard disks to existing volume	RAID 5 * 7
RAID 5 * 3	5	Add hard disks to existing volume	RAID 5 * 8
RAID 5 * 3	6	Add hard disks to existing volume	RAID 5 * 9
RAID 5 * 3	7	Add hard disks to existing volume	RAID 5 * 10
RAID 5 * 3	8	Add hard disks to existing volume	RAID 5 * 11
RAID 5 * 3	9	Add hard disks to existing volume	RAID 5 * 12

RAID 5 * 4	1	Add hard disks to existing volume	RAID 5 * 5
RAID 5 * 4	2	Add hard disks to existing volume	RAID 5 * 6
RAID 5 * 4	3	Add hard disks to existing volume	RAID 5 * 7
RAID 5 * 4	4	Add hard disks to existing volume	RAID 5 * 8
RAID 5 * 4	5	Add hard disks to existing volume	RAID 5 * 9
RAID 5 * 4	6	Add hard disks to existing volume	RAID 5 * 10
RAID 5 * 4	7	Add hard disks to existing volume	RAID 5 * 11
RAID 5 * 4	8	Add hard disks to existing volume	RAID 5 * 12
RAID 5 * 5	1	Add hard disks to existing volume	RAID 5 * 6
RAID 5 * 5	2	Add hard disks to existing volume	RAID 5 * 7
RAID 5 * 5	3	Add hard disks to existing volume	RAID 5 * 8
RAID 5 * 5	4	Add hard disks to existing volume	RAID 5 * 9
RAID 5 * 5	5	Add hard disks to existing volume	RAID 5 * 10
RAID 5 * 5	6	Add hard disks to existing volume	RAID 5 * 11
RAID 5 * 5	7	Add hard disks to existing volume	RAID 5 * 12
RAID 5 * 6	1	Add hard disks to existing volume	RAID 5 * 7

RAID 5 * 6	2	Add hard disks to existing volume	RAID 5 * 8
RAID 5 * 6	3	Add hard disks to existing volume	RAID 5 * 9
RAID 5 * 6	4	Add hard disks to existing volume	RAID 5 * 10
RAID 5 * 6	5	Add hard disks to existing volume	RAID 5 * 11
RAID 5 * 6	6	Add hard disks to existing volume	RAID 5 * 12
RAID 5 * 7	1	Add hard disks to existing volume	RAID 5 * 8
RAID 5 * 7	2	Add hard disks to existing volume	RAID 5 * 9
RAID 5 * 7	3	Add hard disks to existing volume	RAID 5 * 10
RAID 5 * 7	4	Add hard disks to existing volume	RAID 5 * 11
RAID 5 * 7	5	Add hard disks to existing volume	RAID 5 * 12
RAID 5 * 8	1	Add hard disks to existing volume	RAID 5 * 9
RAID 5 * 8	2	Add hard disks to existing volume	RAID 5 * 10
RAID 5 * 8	3	Add hard disks to existing volume	RAID 5 * 11
RAID 5 * 8	4	Add hard disks to existing volume	RAID 5 * 12
RAID 5 * 9	1	Add hard disks to existing volume	RAID 5 * 10
RAID 5 * 9	1	Add hard disks to existing volume	RAID 5 * 11

RAID 5 * 9	1	Add hard disks to existing volume	RAID 5 * 12
RAID 5 * 10	1	Add hard disks to existing volume	RAID 5 * 11
RAID 5 * 10	2	Add hard disks to existing volume	RAID 5 * 12
RAID 5 * 11	1	Add hard disks to existing volume	RAID 5 * 12
RAID 6 * 4	1	Add hard disks to existing volume	RAID 6 * 5
RAID 6 * 4	2	Add hard disks to existing volume	RAID 6 * 6
RAID 6 * 4	3	Add hard disks to existing volume	RAID 6 * 7
RAID 6 * 4	4	Add hard disks to existing volume	RAID 6 * 8
RAID 6 * 4	5	Add hard disks to existing volume	RAID 6 * 9
RAID 6 * 4	6	Add hard disks to existing volume	RAID 6 * 10
RAID 6 * 4	7	Add hard disks to existing volume	RAID 6 * 11
RAID 6 * 4	8	Add hard disks to existing volume	RAID 6 * 12
RAID 6 * 5	1	Add hard disks to existing volume	RAID 6 * 6
RAID 6 * 5	2	Add hard disks to existing volume	RAID 6 * 7
RAID 6 * 5	3	Add hard disks to existing volume	RAID 6 * 8
RAID 6 * 5	4	Add hard disks to existing volume	RAID 6 * 9

RAID 6 * 5	5	Add hard disks to existing volume	RAID 6 * 10
RAID 6 * 5	6	Add hard disks to existing volume	RAID 6 * 11
RAID 6 * 5	7	Add hard disks to existing volume	RAID 6 * 12
RAID 6 * 6	1	Add hard disks to existing volume	RAID 6 * 7
RAID 6 * 6	2	Add hard disks to existing volume	RAID 6 * 8
RAID 6 * 6	3	Add hard disks to existing volume	RAID 6 * 9
RAID 6 * 6	4	Add hard disks to existing volume	RAID 6 * 10
RAID 6 * 6	5	Add hard disks to existing volume	RAID 6 * 11
RAID 6 * 6	6	Add hard disks to existing volume	RAID 6 * 12
RAID 6 * 7	1	Add hard disks to existing volume	RAID 6 * 8
RAID 6 * 7	2	Add hard disks to existing volume	RAID 6 * 9
RAID 6 * 7	3	Add hard disks to existing volume	RAID 6 * 10
RAID 6 * 7	4	Add hard disks to existing volume	RAID 6 * 11
RAID 6 * 7	5	Add hard disks to existing volume	RAID 6 * 12
RAID 6 * 8	1	Add hard disks to existing volume	RAID 6 * 9
RAID 6 * 8	2	Add hard disks to existing volume	RAID 6 * 10

RAID 6 * 8	3	Add hard disks to existing volume	RAID 6 * 11
RAID 6 * 8	4	Add hard disks to existing volume	RAID 6 * 12
RAID 6 * 9	1	Add hard disks to existing volume	RAID 6 * 10
RAID 6 * 9	1	Add hard disks to existing volume	RAID 6 * 11
RAID 6 * 9	1	Add hard disks to existing volume	RAID 6 * 12
RAID 6 * 10	1	Add hard disks to existing volume	RAID 6 * 11
RAID 6 * 10	2	Add hard disks to existing volume	RAID 6 * 12
RAID 6 * 11	1	Add hard disks to existing volume	RAID 6 * 12
RAID 10 * 4	2	Add hard disks to existing volume	RAID 10 * 6
RAID 10 * 4	4	Add hard disks to existing volume	RAID 10 * 8
RAID 10 * 4	6	Add hard disks to existing volume	RAID 10 * 10
RAID 10 * 4	8	Add hard disks to existing volume	RAID 10 * 12
RAID 10 * 6	2	Add hard disks to existing volume	RAID 10 * 8
RAID 10 * 6	4	Add hard disks to existing volume	RAID 10 * 10
RAID 10 * 6	6	Add hard disks to existing volume	RAID 10 * 12
RAID 10 * 8	2	Add hard disks to existing volume	RAID 10 * 10

RAID 10 * 8	4	Add hard disks to existing volume	RAID 10 * 12
RAID 10 * 10	2	Add hard disks to existing volume	RAID 10 * 12
Single * 1	1	RAID level migration	RAID 1 * 2
Single * 1	2	RAID level migration	RAID 5 * 3
Single * 1	3	RAID level migration	RAID 5 * 4
Single * 1	4	RAID level migration	RAID 5 * 5
Single * 1	5	RAID level migration	RAID 5 * 6
Single * 1	6	RAID level migration	RAID 5 * 7
Single * 1	7	RAID level migration	RAID 5 * 8
Single * 1	8	RAID level migration	RAID 5 * 9
Single * 1	9	RAID level migration	RAID 5 * 10
Single * 1	10	RAID level migration	RAID 5 * 11
Single * 1	11	RAID level migration	RAID 5 * 12
Single * 1	3	RAID level migration	RAID 6 * 4
Single * 1	4	RAID level migration	RAID 6 * 5
Single * 1	5	RAID level migration	RAID 6 * 6
Single * 1	6	RAID level migration	RAID 6 * 7
Single * 1	7	RAID level migration	RAID 6 * 8
Single * 1	8	RAID level migration	RAID 6 * 9
Single * 1	9	RAID level migration	RAID 6 * 10
Single * 1	10	RAID level migration	RAID 6 * 11
Single * 1	11	RAID level migration	RAID 6 * 12
Single * 1	3	RAID level migration	RAID 10 * 4

Single * 1	5	RAID level migration	RAID 10 * 6
Single * 1	7	RAID level migration	RAID 10 * 8
Single * 1	9	RAID level migration	RAID 10 * 10
Single * 1	11	RAID level migration	RAID 10 * 12
RAID 1 * 2	1	RAID level migration	RAID 5 * 3
RAID 1 * 2	2	RAID level migration	RAID 5 * 4
RAID 1 * 2	3	RAID level migration	RAID 5 * 5
RAID 1 * 2	4	RAID level migration	RAID 5 * 6
RAID 1 * 2	5	RAID level migration	RAID 5 * 7
RAID 1 * 2	6	RAID level migration	RAID 5 * 8
RAID 1 * 2	7	RAID level migration	RAID 5 * 9
RAID 1 * 2	8	RAID level migration	RAID 5 * 10
RAID 1 * 2	9	RAID level migration	RAID 5 * 11
RAID 1 * 2	10	RAID level migration	RAID 5 * 12
RAID 1 * 2	2	RAID level migration	RAID 6 * 4
RAID 1 * 2	3	RAID level migration	RAID 6 * 5
RAID 1 * 2	4	RAID level migration	RAID 6 * 6
RAID 1 * 2	5	RAID level migration	RAID 6 * 7
RAID 1 * 2	6	RAID level migration	RAID 6 * 8
RAID 1 * 2	7	RAID level migration	RAID 6 * 9
RAID 1 * 2	8	RAID level migration	RAID 6 * 10
RAID 1 * 2	9	RAID level migration	RAID 6 * 11
RAID 1 * 2	10	RAID level migration	RAID 6 * 12
RAID 1 * 2	2	RAID level migration	RAID 10 * 4

RAID 1 * 2	4	RAID level migration	RAID 10 * 6
RAID 1 * 2	6	RAID level migration	RAID 10 * 8
RAID 1 * 2	8	RAID level migration	RAID 10 * 10
RAID 1 * 2	10	RAID level migration	RAID 10 * 12
RAID 5 * 3	1	RAID level migration	RAID 6 * 4
RAID 5 * 3	2	RAID level migration	RAID 6 * 5
RAID 5 * 3	3	RAID level migration	RAID 6 * 6
RAID 5 * 3	4	RAID level migration	RAID 6 * 7
RAID 5 * 3	5	RAID level migration	RAID 6 * 8
RAID 5 * 3	6	RAID level migration	RAID 6 * 9
RAID 5 * 3	7	RAID level migration	RAID 6 * 10
RAID 5 * 3	8	RAID level migration	RAID 6 * 11
RAID 5 * 3	9	RAID level migration	RAID 6 * 12

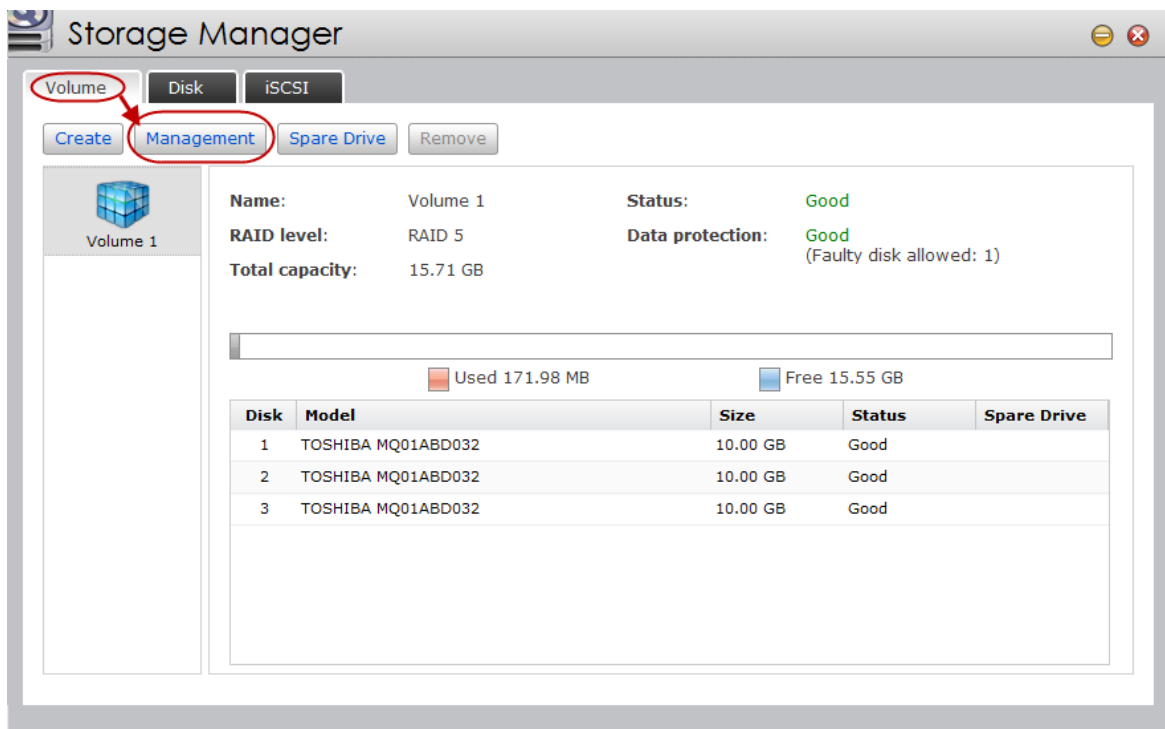
2. Configuring your NAS

2.1 Migrating to a different RAID level and expanding capacity

In the following example we will walk you through the process of using the Volume Setup Wizard to add storage capacity to an existing volume and to migrate it to a different RAID level. In our example, we will be migrating and expanding from a 3 disk RAID 5 configuration to a 4 disk RAID 6 configuration. Please note that in the example we have already inserted a new disk into the ASUSTOR NAS that is ready to be added to our existing volume.

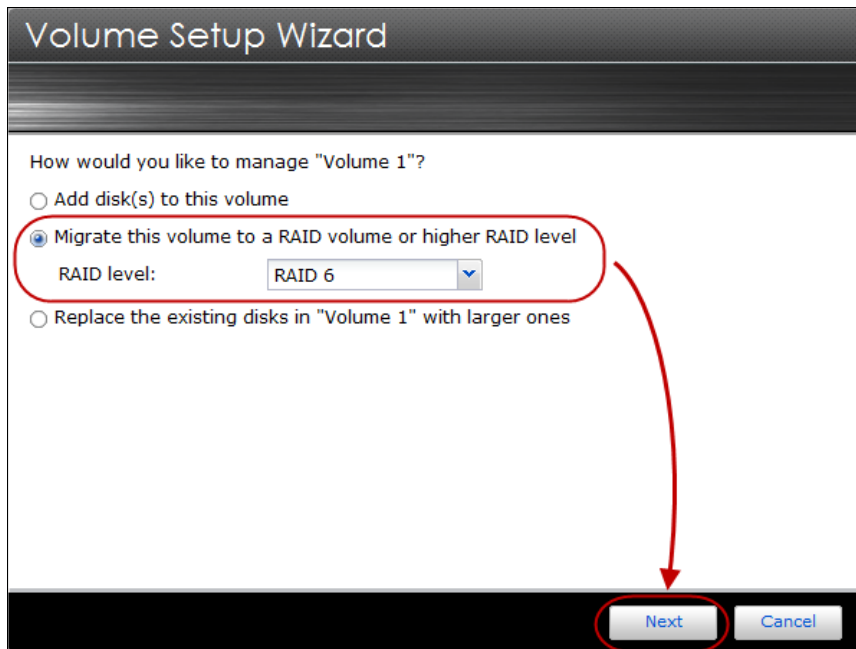
STEP 1

Open **[Storage Manager]** and click on **[Management]** under the [Volume] tab.



STEP 2

The Volume Setup Wizard window will now appear. Select the **[Migrate this volume to a RAID volume or higher RAID level]** radio button and select **[RAID 6]** from the RAID level drop-down list. Click **[Next]** to continue.



Volume Setup Wizard

How would you like to manage "Volume 1"?

☐ Add disk(s) to this volume

☒ Migrate this volume to a RAID volume or higher RAID level

RAID level: RAID 6

☐ Replace the existing disks in "Volume 1" with larger ones

Next Cancel

A red circle highlights the "Migrate this volume to a RAID volume or higher RAID level" radio button and the "RAID 6" dropdown menu. A red arrow points from this circle to the "Next" button at the bottom right.

STEP 3

Select the corresponding check box for the disk that you would like to add to the existing volume and click **[Next]**.



Volume Setup Wizard

It is recommended that you add a disk equal to the size of the smallest disk in Volume1

	Disk	Model	Size	Status
<input checked="" type="checkbox"/>	4	TOSHIBA MQ01ABD032	10.00 GB	Good

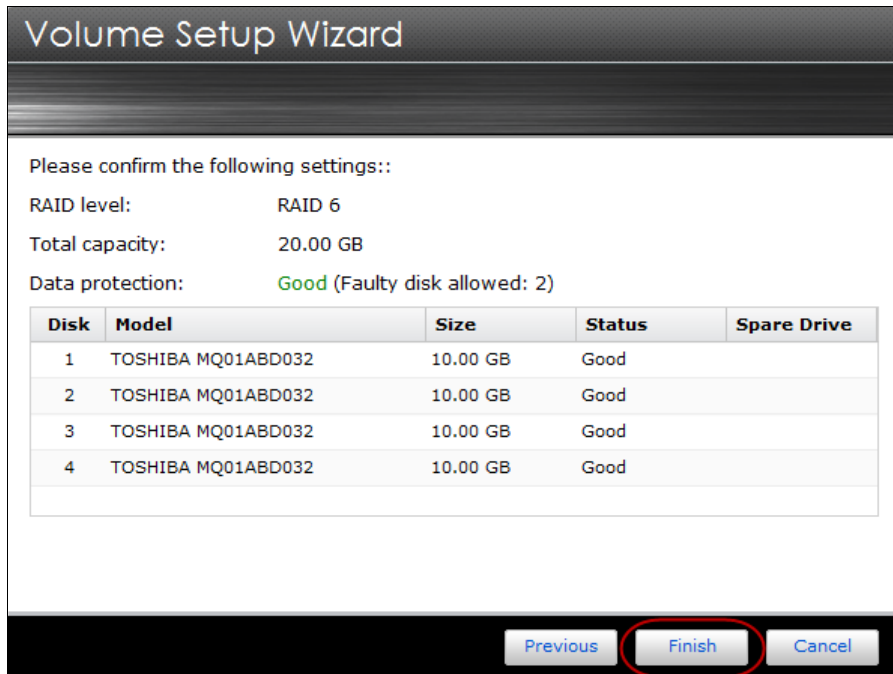
Available RAID level for migration: RAID 6

Previous Next Cancel

A red circle highlights the first row of the disk table (Disk 4, TOSHIBA MQ01ABD032, 10.00 GB, Good). A red arrow points from this circle to the "Next" button at the bottom right.

STEP 4

Look over a final summary of the settings for the new volume. Once you're done, confirm these settings by clicking **[Finish]**.



The screenshot shows the 'Volume Setup Wizard' window. It displays the following configuration summary:

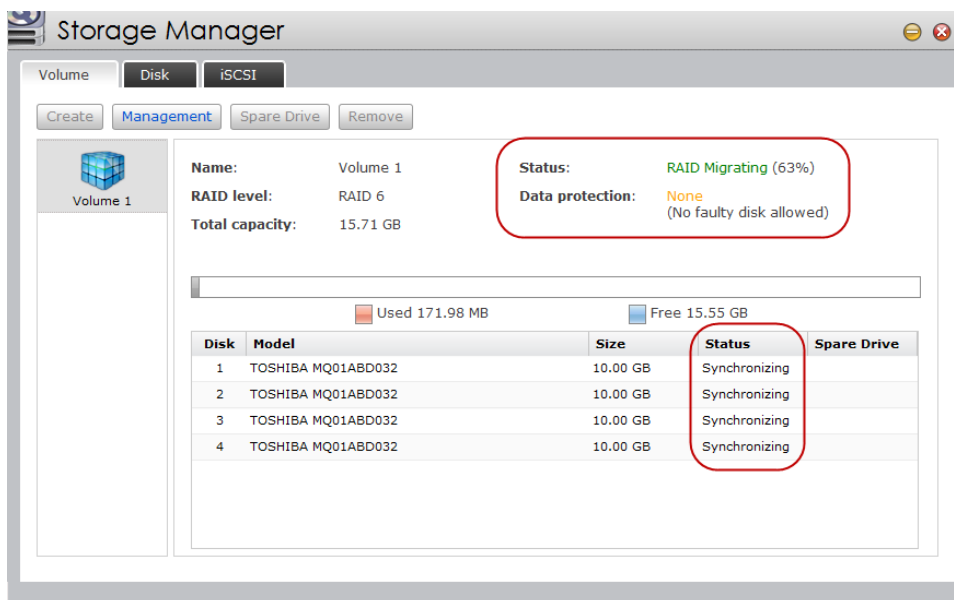
- RAID level: RAID 6
- Total capacity: 20.00 GB
- Data protection: Good (Faulty disk allowed: 2)

Disk	Model	Size	Status	Spare Drive
1	TOSHIBA MQ01ABD032	10.00 GB	Good	
2	TOSHIBA MQ01ABD032	10.00 GB	Good	
3	TOSHIBA MQ01ABD032	10.00 GB	Good	
4	TOSHIBA MQ01ABD032	10.00 GB	Good	

At the bottom of the window, there are three buttons: 'Previous', 'Finish', and 'Cancel'. The 'Finish' button is highlighted with a red circle.

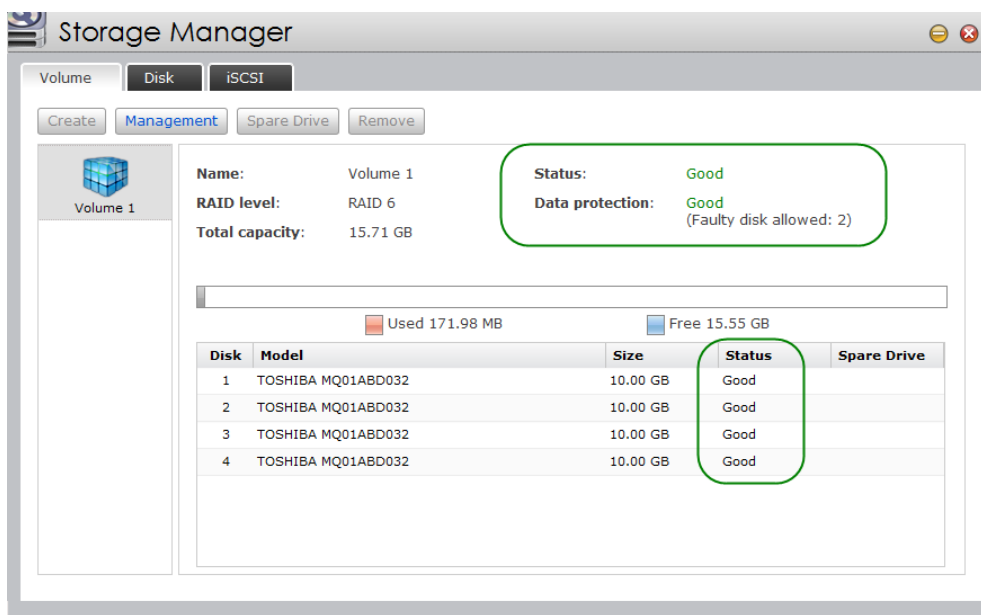
STEP 5

You will now be able to see that the volume is in the process of migrating and that the disks are synchronizing. This means that a portion of the data from the original three hard disks is being synchronized to the newly added disk. Moreover, because the volume is changing from a RAID 5 configuration to a RAID 6 configuration, the data distribution pattern across the disks will be altered. During this process, you will still be able to read and write data on the NAS. The total time required to complete migration will differ depending on the capacity of the hard disks and total amount of data. Please wait patiently.



STEP 6

This is what the screen should look like once the volume is ready for use.



3. Expanding the Capacity of your NAS

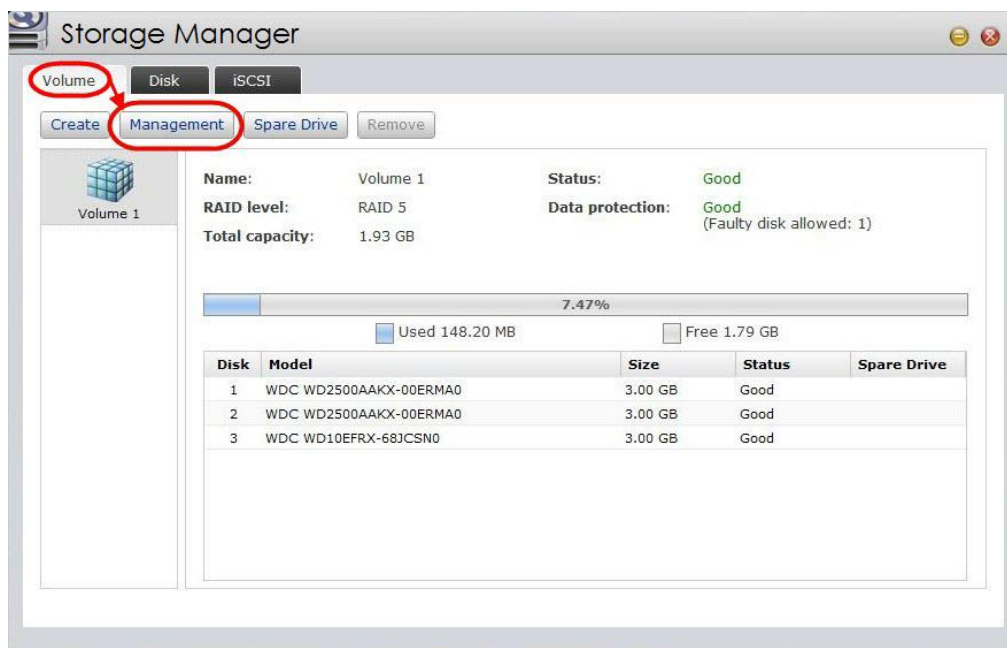
3.1 Replacing existing hard disks with larger disks

In the following example we will walk you through the process of using the Volume Setup Wizard to expand the storage capacity of an existing volume by replacing its hard disks with higher capacity ones. We will be demonstrating this process using Volume 1.

Note: This function is only supported on RAID 1, RAID 5, RAID 6 and RAID 10 volumes.

STEP 1

Open **[Storage Manager]** and click on **[Management]** under the **[Volume]** tab.



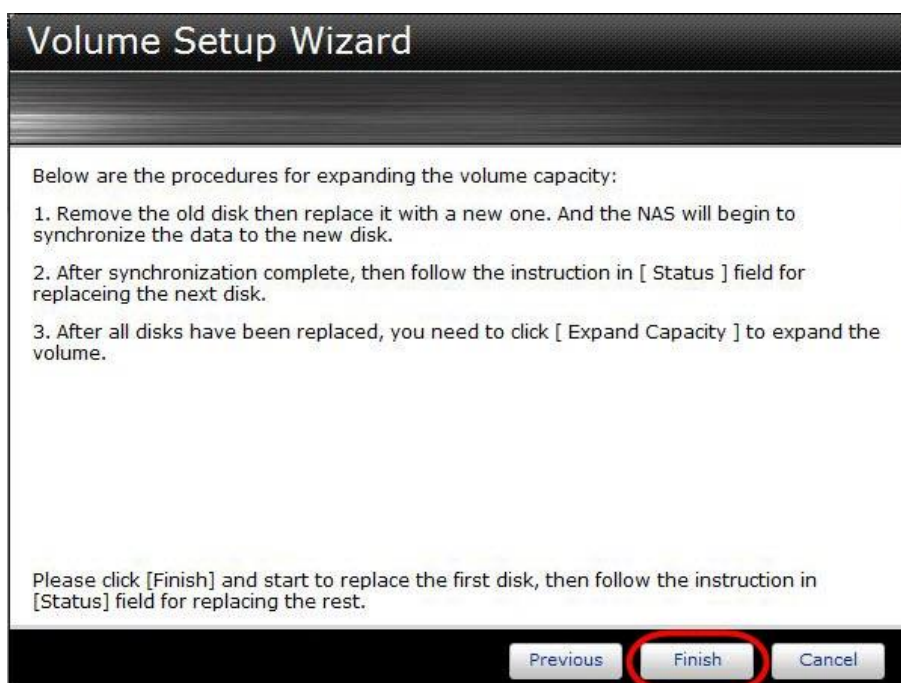
STEP 2

The Volume Setup Wizard will now appear. Select the **[Replace the existing disks in "Volume 1" with larger ones]** radio button and then click **[Next]**.



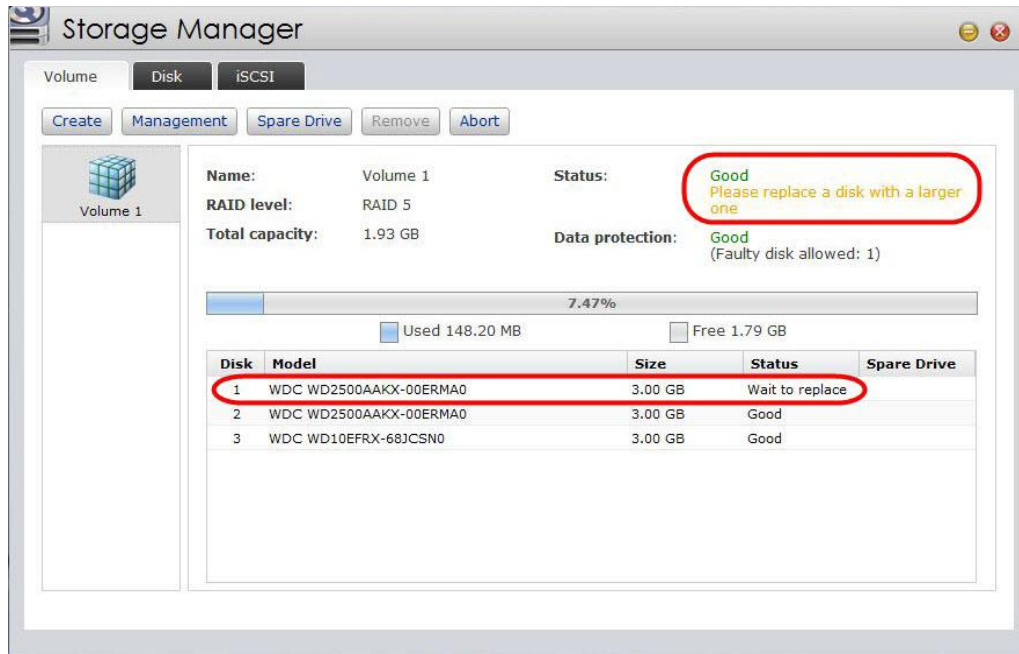
STEP 3

Take a look over the procedures for expanding volume capacity and then click **[Finish]** once you are done.



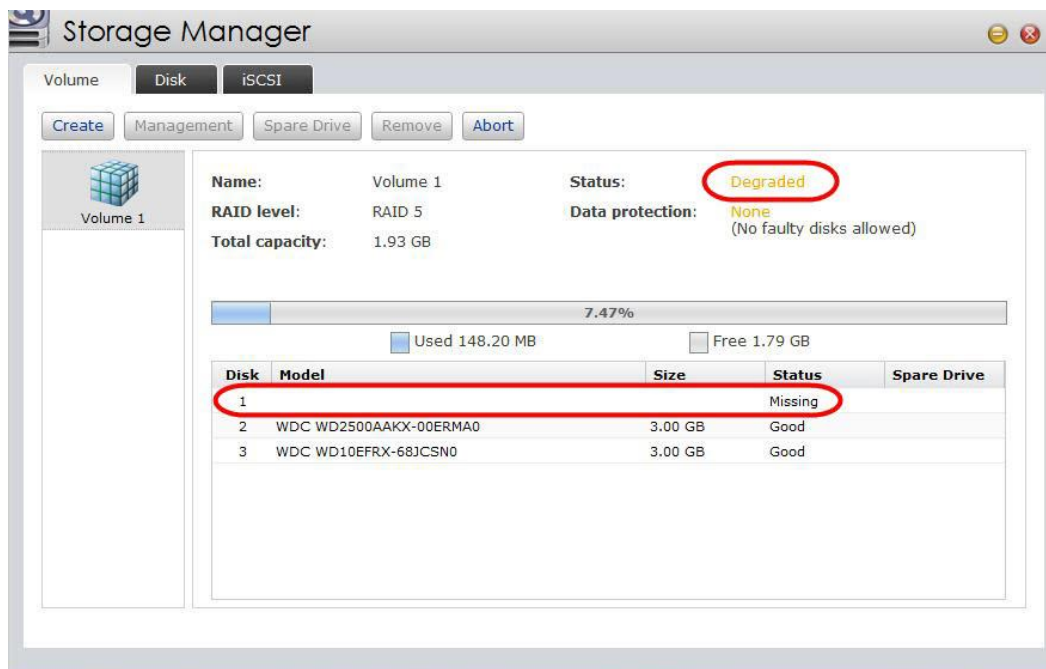
STEP 4

You will now be ready to replace your first disk. The **[Status:]** field will provide you with instructions to guide you through the disk replacement process. Eject the drive tray for the first disk and then replace the old disk with the new higher capacity disk.



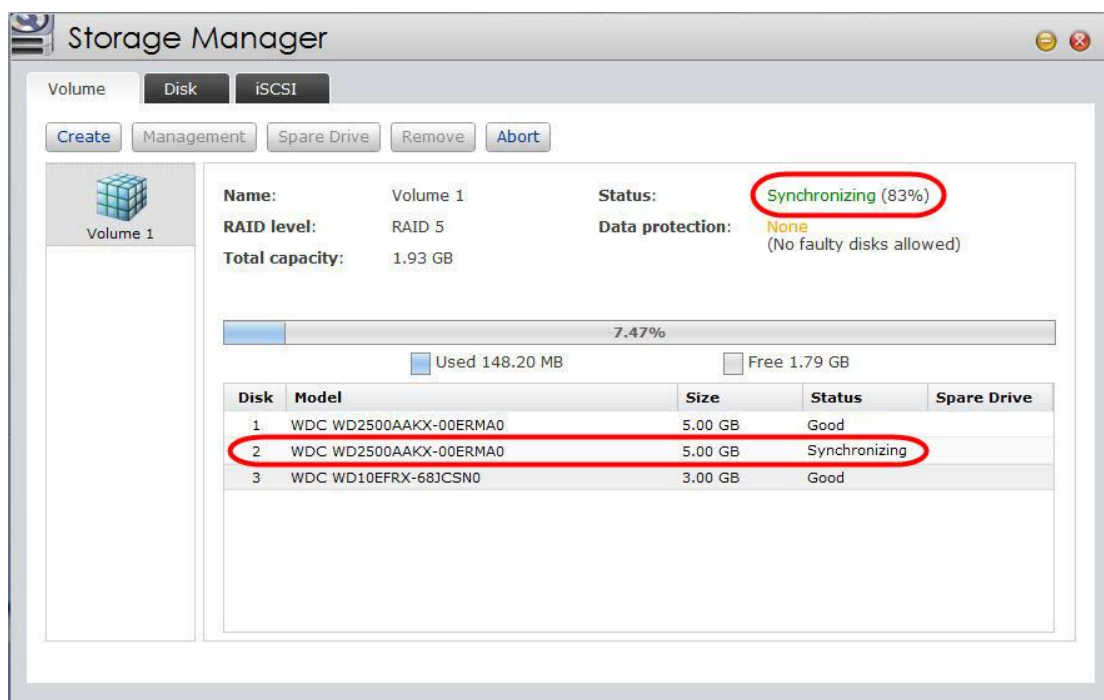
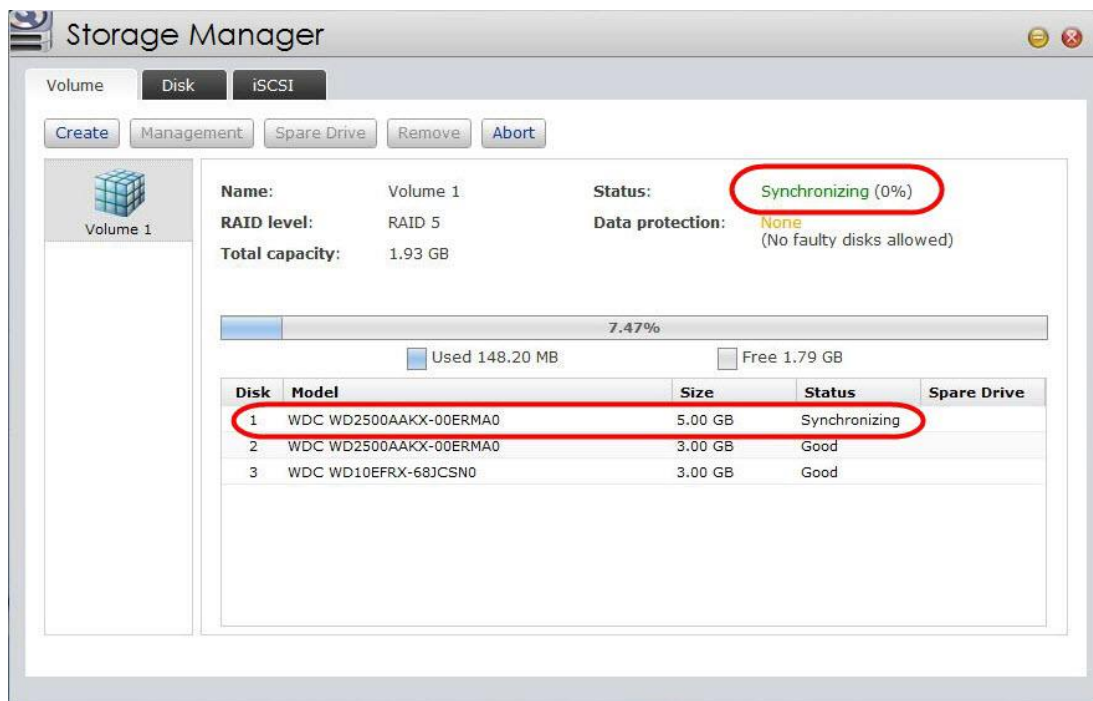
STEP 5

This is what the **[Status:]** field looks like once you eject the disk tray. At this time, you can proceed to replace the disk in the disk tray with a new disk.



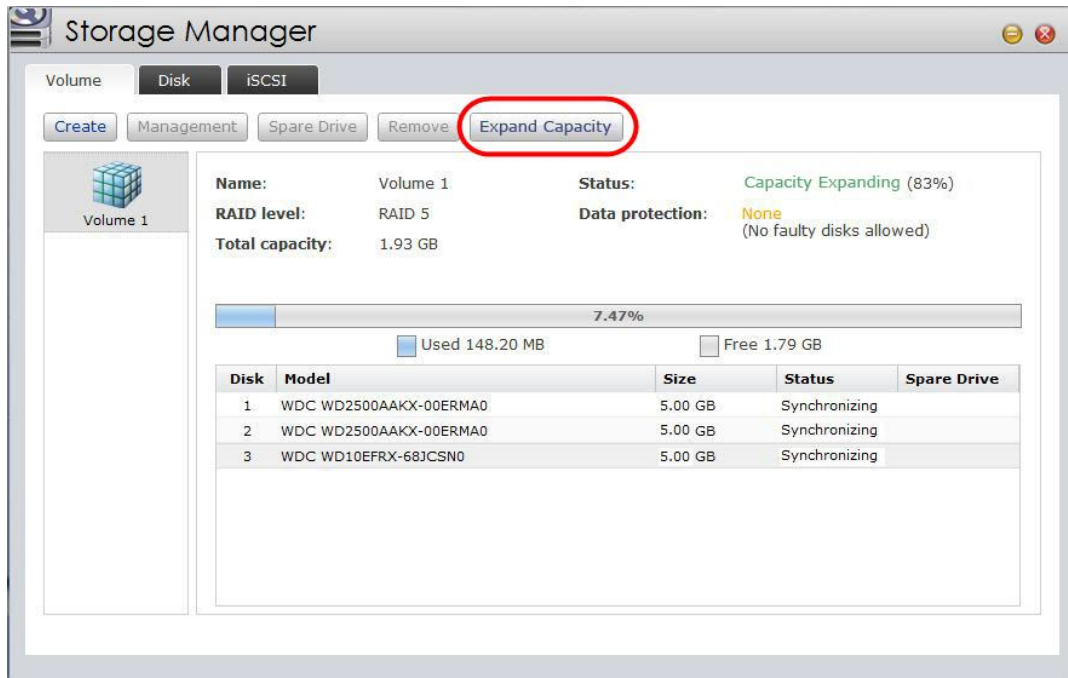
STEP 6

After you have finished replacing the disk, insert the disk tray back into the NAS. The disk will then begin to synchronize. The time required for synchronization will differ depending on the capacity of the hard disks and the amount data stored on them. Therefore, synchronization for a single disk may take a couple of hours to complete. After the disk has finished synchronizing, the **[Status:]** field will indicate to you that you may begin to replace the second disk. Follow the same procedures that you did for the first disk until all the disks in the volume are replaced.



STEP 7

After all the disks in the volume have been replaced, the **[Expand Capacity]** button will appear. Click on the **[Expand Capacity]** button to expand the capacity of the entire volume.



STEP 8

This is what the screen should look like once capacity has finished expanding.

