

RAID 1(+0): breaking mirrors and rebuilding drives

How to, 5th edition

Introduction	2
Splitting a mirrored array using the Array Configuration Utility.....	2
Recombining a split mirrored array using ACU.....	3
Breaking a mirror and rebuilding the array using the manual method	4
Reverting to a previous copy of a mirrored set using the manual method	6
Increasing RAID 1(+0) capacity—array expansion versus breaking mirrors.....	7
For more information.....	9
Call to action	9



Introduction

This paper explains the two methods for safely breaking a RAID 1 or RAID 1(+0) mirror and rebuilding drives in RAID 1(+0) volumes using HP Smart Array controllers. The first method uses the HP Array Configuration Utility (ACU) split mirror feature. You can only use this method while a server is offline and it requires an HP Smart Array Advanced Pack (SAAP) license. You can also use a manual method with any Smart Array controller.

You may need to break a RAID 1(+0) mirror to create a backup of the RAID volume or to increase capacity.

Breaking the mirror lets you remove half of the mirrored drives and use them as a backup. You might want this backup to protect against failure or for troubleshooting software configurations. You can reestablish the mirror later by replacing the backup drives with new drives. The controller will automatically rebuild the new drives and restore fault tolerance.

Breaking the mirror lets you replace half of the drives in a RAID 1 or RAID 1(+0) array with larger capacity drives and rebuild the new drives. Afterwards, you can replace the remaining half of the original drives with another set of new drives and then rebuild again. Once this is complete, you can use the Array Configuration Utility (ACU) to increase the logical drive size or to configure additional volumes.

Splitting a mirrored array using the Array Configuration Utility

This function splits an array of RAID 1 or RAID 1(+0) logical drives into two identical new arrays consisting of RAID 0 logical drives. This is different from the manual method, in which the volumes keep their RAID 1 or RAID 1(+0) configuration after you split the mirror. Note that using the ACU does not require you to split all the arrays attached to the controller at the same time.

The ACU will show the Split Mirror task as an available option only under all of the following conditions:

- Both the ACU version and the selected controller support the action.
- The server is offline.
- You have installed the applicable Smart Array Advanced Pack keys.

Complete the following steps to split a mirrored array using the ACU:

1. After taking the server offline, insert the CD or bootable USB drive that contains the ACU (typically SmartStart) into an appropriate media drive.
2. Restart the system, booting to the CD or bootable USB drive.
3. From the Maintenance Operation menu, select the HP ACU.
4. In the selection panel, select Array Configuration and Diagnostics.
5. In the Configuration drop down menu, select the applicable controller.
6. Highlight or select the desired logical drive.
7. In the Available Tasks panel, click Split Mirrored Array.
8. Click OK.
9. You will see both logical drives in the Systems and Devices tree after ACU has finished splitting the array.

10. Power off the server.
11. Remove the physical drives that constitute one of the new arrays.

IMPORTANT

If you do not remove one of the arrays, the OS cannot distinguish between the two new arrays when the OS restarts because the arrays will be identical.

12. Restart the OS.

Recombining a split mirrored array using ACU

Complete the following steps to re-mirror an array using ACU:

1. Take the server offline and insert the CD or bootable USB drive that contains the ACU (typically SmartStart) into an appropriate media drive.
2. Restart the system, booting to the CD or bootable USB drive.
3. Select the HP ACU from the Maintenance Operation menu.
4. Select the controller that contains the array you want to re-mirror.
5. In the Configuration View panel, select the array to use as the source in the re-mirrored array.
6. In the Available Tasks panel, click Re-Mirror Array.
7. Select the array to be mirrored to the source. This is usually the array previously split out of the original mirrored array, but it can be another array of the correct size.

CAUTION

This process destroys all data on the second array.

8. Click OK.
9. Restart the OS after ACU finishes re-mirroring the array. The Smart Array controller will use the rebuild process to synchronize the mirrored drives. You can boot the OS during the rebuild process, but the logical drive will not be fault-tolerant until the rebuild finishes.

NOTE

The drive-online LED will blink during the rebuild synchronization process. The rebuild is complete when the LED stops blinking and turns solid green. A 300GB SAS (3.5" 15K) drive can take up to 2 hours to rebuild a mirrored array (depending on the number of IOPS the server is submitting to the controller).

Refer to the [HP website](#) to find more information or to download the Array Configuration Utility.

Breaking a mirror and rebuilding the array using the manual method

CAUTION

Use the following procedure for configurations with only one array on the controller. If you configure multiple arrays on a single controller, all arrays must be broken and restored together. Because of the added complexity for multiple arrays, we discourage this method of creating a backup of the logical driver.

You can break a RAID 1 or RAID 1(+0) mirror simply by removing a drive while the server is online. You must shut down the server first if you want to preserve the data on drives you are removing. If you want to use the removed drives to restore the server, or if you need the data on the drives for any other reason, follow these steps *exactly* to break a mirror:

1. Verify that the controller contains RAID 1 or RAID 1(+0) logical drives only.
 2. Shut down the OS to ensure a clean file system shutdown.
 3. Power off the server.
 4. Remove one-half of the drives created by the mirror (the backup). Label each removed drive with its respective drive bay number.
-

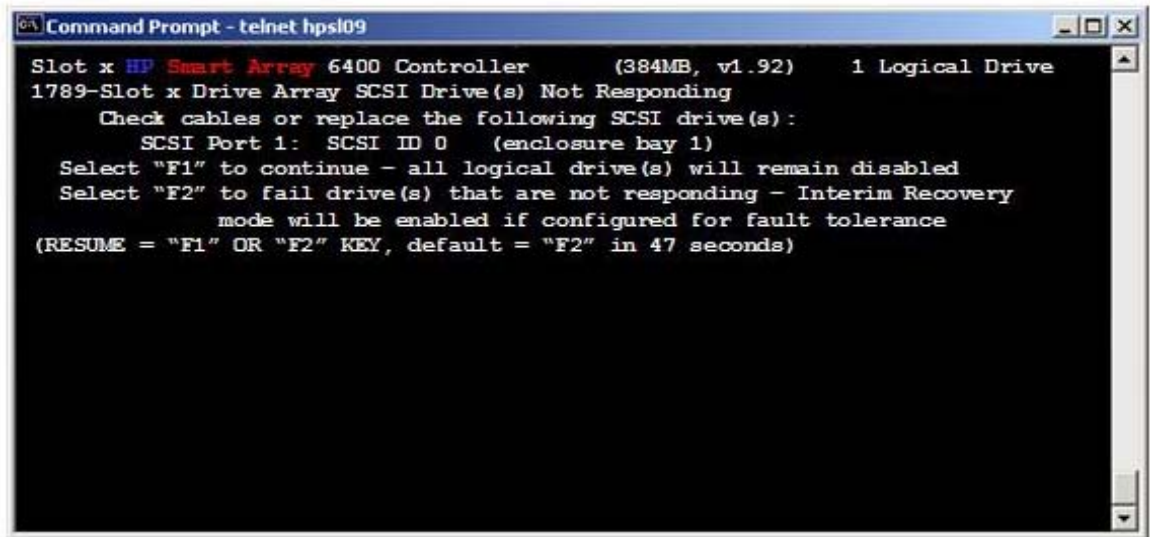
NOTE

For two-drive configurations, just remove one drive. For larger RAID 1+0 configurations, the first $n/2$ drives are always mirrored to the second $n/2$ drives (unless drives have been physically reordered using Offline Drive Movement). Always remove the set of drives that are one side of the mirrored array. Do not remove drives from opposite sides of the mirror.

5. Restart the OS with the remaining half of the drives that the mirror created.
6. You will get a message during boot-up indicating that the removed drives are not responding (Figure 1).
7. Press **F2** to fail the missing drive(s) and continue in recovery mode. All drives on the controller will remain disabled until you press **F2**. If you press **F1** by mistake, simply reboot again and press **F2** to fail the drives.

If you are breaking the mirror to test an OS patch, you should normally test the OS patch before making the array fault-tolerant again. Using this approach, you can verify the OS patch before beginning the rebuild in step 8 and replicating it across the mirror.

Figure 1. Boot-up message indicating that the logical drive is still available but missing physical drives



NOTE

If the logical drive fails and the server will not boot, you probably removed two drives that were mirrored to one another. Shut down the server if this occurs. Reinstall all drives and reboot. The drives mirrored to one another will be marked okay. All data should remain intact. Start again at step 1, being careful not to remove any drives mirrored to one another.

8. Insert the new drive(s) into the open drive bay. The array rebuild should start automatically. The replacement drives must be the same type (SATA or SAS) and the same or greater capacity as the original drives. If the rebuild does not start automatically, reboot and press **F1** to enable rebuild at the 1786 Recovery Needed POST message prompt.

NOTE

The drive-online LED will blink during the rebuild process. The rebuild is complete when the LED stops blinking and turns solid green. A 300-GB SAS (3.5" 15K) drive can take up to 2 hours to rebuild a mirrored array (depending on the number of IOPS the server is submitting to the controller).

9. Boot the OS after the rebuild completes.

Rebuilding the array re-mirrors it and brings it back into a fault-tolerant state.

Reverting to a previous copy of a mirrored set using the manual method

This method works only if you used the manual method to break the mirrored set.

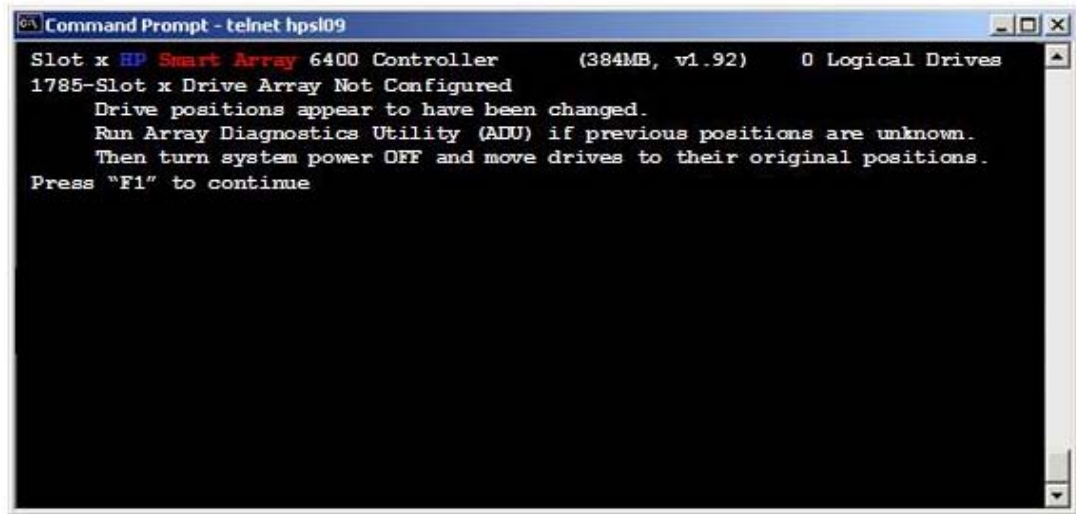
CAUTION

We strongly recommend that you verify that you have removed all drives from the current array before inserting the backup drives (step 1 below). Any drive that became part of the array during a rebuild process can **OVERWRITE** the **BACKUP** drive. Be especially careful in using hot spares, where the rebuild may have happened automatically and it is unclear whether another drive is now part of the array. To simplify this process, remove any spares before breaking the mirror and reinstall the spares only after the array rebuilds.

Complete the following steps to revert to a previous copy of a mirrored set:

1. Power off the server.
2. Remove all drives from the array and insert the drives containing the backup data (the original image on the array).
3. Install the backup drives in their original locations. If you are not sure where the backup drive came from, insert the drive into one of the drive bays where you created the array. You may need to move the drive if the controller does not detect a logical drive during boot-up.
4. Restart the server with only the backup drives installed.
5. If the controller finds no logical drives during boot up (Figure 2), you probably placed the drive in the wrong drive bay. Turn off the server, remove the drive, and place it into another available drive bay. Then power on the server.

Figure 2. Boot-up message indicating the controller found no logical drives.



6. During boot-up, the message will indicate that the drives are not responding (Figure 1).
7. Press **F2** to fail the missing drive and continue with one drive in recovery mode.
8. Insert the drive you want to rebuild into the open drive bay.
9. The array rebuild should start automatically. If the rebuild does not start, run ACU to initiate the rebuild.

CAUTION

You must hot insert the drives you want to rebuild. This ensures that the array controller recognizes the drives as replacements. Installing drives while the server is off may result in the controller disabling the volume.

NOTE

The drive-online LED will blink during the rebuild process. The rebuild is complete when the LED stops blinking and turns solid green. A 300-GB SAS (3.5" 15K) drive can take up to 2 hours to rebuild a mirrored (depending on the number of IOPS the server is submitting to the controller).

10. Boot the OS after the rebuild completes. This ensures fault-tolerance with the logical drive.

Increasing RAID 1(+0) capacity—array expansion versus breaking mirrors

You can also increase the capacity of a RAID 1(+0) array by using the Expand Array and Logical Drive Extension functions in ACU. This requires you to add pairs of physical drives to the existing

array. Once you have expanded the array, you can either add new logical drives or use the Logical Drive Extension function to grow the size of the existing logical drives. Using array expansion is the easiest way to grow capacity if you have additional drive slots available. If they are not available, then your only option is to break the RAID mirror and rebuild with larger capacity drives.

For more information

Resource description	Web address
Business Support Center for HP Array Configuration Utility	http://h20000.www2.hp.com/bizsupport/TechSupport/Home.jsp?lang=en&cc=us&prodTypeId=18964&prodSeriesId=468780
Configuring Arrays on HP Smart Array Controllers Reference Guide	http://h20000.www2.hp.com/bc/docs/support/SupportManual/c00729544/c00729544.pdf
Smart Array Advanced Pack (SAAP)	www.hp.com/go/saap

Call to action

Send comments about this paper to TechCom@HP.com.

