RAID

User Guide

Product notice

This user guide describes features that are
common to most models. Some features
may not be available on your computer.

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1 Introduction

Until recently, there were limited options for most computer users who wanted to protect their data from loss in the event of a hard drive failure. These options were manually copying files to a backup drive or using cumbersome backup software. If users failed to perform one of these mundane tasks prior to a hard drive failure, they had to spend considerable time and money to recover even a portion of the data on the drive. Server and desktop computer users have long enjoyed the security and benefits of RAID (Redundant Array of Independent Disks) technology to recover data in the event of drive failure.

HP now offers a simple RAID solution for notebook computer users who need to protect data on a Serial ATA (SATA) disk drive in case of drive failure or virus attacks. HP's RAID solution also benefits computer users who frequently work with large files and want to improve the storage performance of their computer.

NOTE: The illustrations in this guide are provided in English only.

2 RAID technology overview

This chapter defines the terms used in this guide and describes the RAID technologies supported by select HP Business computers.

RAID terminology

Some of the terms in the following table have a broader meaning, but they are defined in relation to the RAID implementation described in this guide.

Term	Definition
Fault tolerance	The ability of the computer to continue to operate if one drive fails. Fault tolerance is often used interchangeably with reliability, but the two terms are different.
HDD	One physical hard disk drive in the RAID array.
Option ROM	A software module inside the system's BIOS that provides extended support for a particular piece of hardware. The RAID option ROM provides boot support for RAID volumes as well as a user interface for managing and configuring the system's RAID volumes.
Primary drive	The main internal hard drive in the computer.
RAID array	The physical drives that appear as one logical drive to the operating system.
RAID migration	The change of data from a non-RAID to RAID configuration. "RAID level migration," or the change of data from one RAID level to another, is not supported.
RAID volume	A fixed amount of space across a RAID array that appears as a single hard drive to the operating system.
Recovery drive	The hard drive that is the designated mirror (copy of the primary) drive in a RAID 1 and Recovery volume.
Reliability	The likelihood—over a period of time—that a hard drive can be expected to operate without failure, also known as mean time before failure (MTBF).
Stripe	The set of data on a single hard drive in a RAID volume.
Striping	The distribution of data over multiple disk drives to improve read/write performance.
SSD (solid-state drive)	A solid-state drive is a flash-based or DRAM-based hard drive with no rotating media.
SED (self-encrypting drive)	A self-encrypting drive is a hard drive that uses hardware encryption to protect the data on the drive.
mSATA module	An mSATA module is a flash-memory module with an mSATA connector.

RAID modes supported

The RAID modes supported by HP Business computers include RAID 0, RAID 1, RAID 5, and Flexible data protection (Recovery) as described below. RAID modes 0, 1, and Recovery require two SATA hard drives. RAID mode 5 requires three SATA hard drives. This can be accomplished by inserting a third SATA hard drive into the upgrade bay of specially-equipped computers. RAID 10 is not supported.

NOTE: When the SATA controller is in RAID mode, it will only support up to 4 SATA port devices. Enabling a fifth SATA port device causes the computer to freeze. Removing the fifth SATA port device restores normal operation.

RAID 0

RAID 0 stripes, or distributes, data across both drives. This allows data, especially large files, to be read faster because data is read simultaneously from both drives. However, RAID 0 offers no fault tolerance, which means that if one drive fails, the entire array fails.

RAID 1

RAID 1 copies, or mirrors, identical data on two hard drives. If one hard drive fails, RAID 1 allows data to be recovered from the other hard drive.
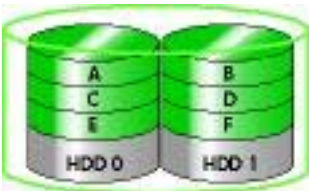
RAID 5

RAID 5 distributes data across three hard drives. If one hard drive fails, RAID 5 allows data to be recovered from the other two hard drives.
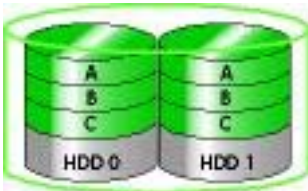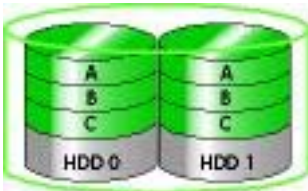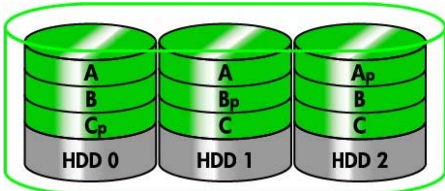
Flexible data protection (Recovery)

Flexible data protection (Recovery) is a feature of Intel® Rapid Storage Technology software. Recovery enhances RAID 1 functionality with several features that make it easier for users to mirror data to a designated recovery drive. For example, Recovery allows users to determine how the recovery volume is updated, either continuously (the default) or on request. Recovery also enables docking and undocking of the computer if the second drive is in the docking station's bay.

RAID mode summary

The following table describes the functions, applications, and advantages and disadvantages of the supported RAID modes.

RAID levels	Function/Applications	Advantages/Disadvantages
RAID 0 	**Function:** **Data is distributed across both disk drives.** Applications: ● Image editing ● Video production ● Pre-press applications	**Advantages:** **Read performance is higher than that of a non-RAID hard drive.** **Total storage capacity is doubled.** Disadvantages: The entire array fails if one drive fails; data cannot be recovered. Storage space may be wasted if the capacities of the primary and recovery hard drives are different (see HP SATA drive option kits on page 6).

RAID levels	Function/Applications	Advantages/Disadvantages
RAID 1 	**Function:** **Identical (mirrored) data is stored on two drives.** Applications: ● Accounting ● Payroll ● Financial	**Advantages:** **Provides high fault tolerance.** Disadvantages: Only half of the total drive capacity can be used for storage. Storage space may be wasted if the capacities of the primary and recovery hard drives are different (see HP SATA drive option kits on page 6).
RAID Recovery 	**Function:** **Identical (mirrored) data is stored on two drives.** **Boosts the functionality of RAID 1 with valuable features.** Applications: Any application that requires a simple data protection method.	**Advantages:** **Provides high fault tolerance.** **Users can choose to mirror data continuously or on request.** **Data recovery is quick and easy.** **Allows hot-plugging of mirrored drive (with eSATA or docking station hard drive).** **Enables easy migration to non-RAID.** Disadvantages: Only half of the total drive capacity can be used for storage. Storage space may be wasted if the capacities of the primary and recovery hard drives are different.
RAID 5 	**Function:** Distributes data across three hard drives. If one hard drive fails, RAID 5 allows data to be recovered from the other two hard drives. Applications: A good choice for large amounts of critical data.	**Advantages:** **Data redundancy** **Improved performance and capacity** **High fault-tolerance and read performance** Disadvantages: During a RAID rebuild after a hard drive fails, system performance can be decreased.

Fault tolerance

Fault tolerance is the ability of a RAID array to withstand and recover from a drive failure. Fault tolerance is provided by redundancy. Therefore, RAID 0 has no fault tolerance because it does not copy data to another hard drive. With RAID 1 and Recovery, one drive can fail without causing the array to fail. With Recovery, however, the restoration of a single file or an entire hard drive is much simpler than with RAID 1 alone. With RAID 5, one of the three hard drives can fail without causing the array to fail.

Performance

Performance is easy to understand, but it is difficult to measure because it involves several factors, some of which are beyond the scope of this document. Overall storage performance is determined by write performance and read performance, both of which vary based on the RAID technology selected.

- RAID 0 (striping) improves overall storage performance because data can be written and read simultaneously across two hard drives.

- Recovery and RAID 1 (mirroring) writes the same data to both hard drives; therefore, write performance may be slower. However, data can be read from both hard drives, so the read performance can be higher than that of a single non-RAID hard drive.

- RAID 5 performs at a level between RAID 0 and RAID 1.

3 Operating systems and devices supported

Operating systems supported

HP RAID supports the Windows 8 operating system.

Devices supported

This section describes the devices supported for RAID migration, including the SATA drives, computers, and docking station. Device support is summarized in the following table and then explained in more detail below the table. External USB SATA drives connected to the computer or docking station cannot be used for migrating to RAID.

|	Primary and Upgrade Bay SATA hard drives in the computer	Primary and secondary bay SATA hard drives in the computer	Docking station hard drive or eSATA hard drive attached to computer
RAID 0	Yes	Yes	No
RAID 1	Yes	Yes	No
Recovery	Yes	Yes	Yes
RAID 5	No	Yes	No

HP SATA drive option kits

HP offers SATA drive option kits for the computer Upgrade Bay and the docking station's SATA-swappable bay to support RAID migration. For optimal RAID performance, it is recommended that both drives have the same speed. However, supported HP Business computers allow drives with different speeds to be used in a RAID volume.

Drives of different capacities are also supported for RAID migration, as long as the capacity of the secondary (recovery) drive is equal to or greater than that of the primary drive. For example, if the primary drive is 200 GB, then at least a 200-GB drive is required in the Upgrade Bay to create a RAID volume. If the capacity of the secondary drive is larger than that of the primary drive, the excess capacity of the secondary (or third) drive will not be accessible. If, for example, the primary drive is 160 GB and the secondary drive is 250 GB, only 160 GB of the secondary drive will be usable in a RAID configuration. Therefore, for optimal use, it is recommended that both drives have the same capacity.

eSATA hard drives (select models only)

External SATA, or eSATA, is an external interface that allows a SATA drive to achieve data transfer speeds up to 6 times that of a SATA drive using a standard USB 2.0 interface. The following illustration shows a supported computer with a primary hard drive **(1)** and an eSATA drive **(2)** connected to the eSATA port (select models only) to allow Recovery. Regarding the capacity of the

eSATA drive, the same recommendations apply as stated for secondary drives in the computer Upgrade Bay.
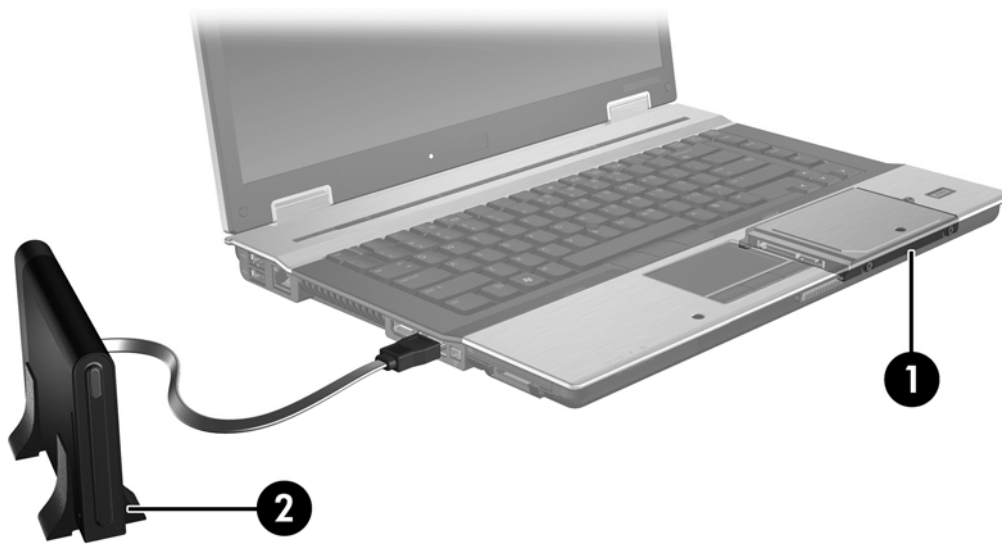
HP Business computers

Select HP Business computers support RAID using Intel® Rapid Storage Technology software (v10 and higher) and a second SATA drive in the Upgrade Bay.

The following illustration shows a supported computer with the primary hard drive **(1)** and a secondary hard drive in the Upgrade Bay **(2)** that allows RAID 0, RAID 1, and Recovery.
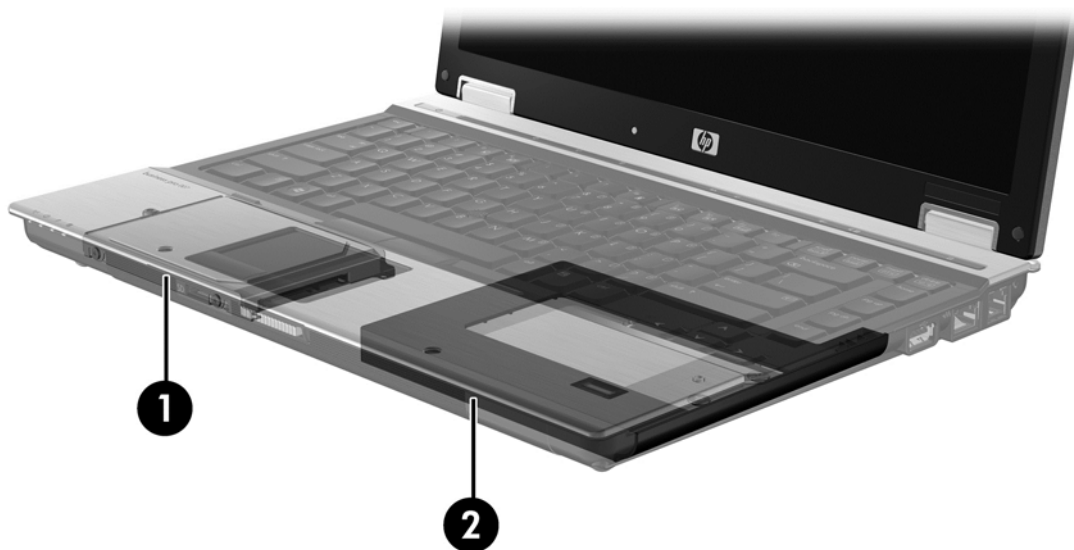
The following illustration shows a supported computer with the primary hard drive **(1)** and secondary hard drive **(2)**, with the third drive in the Upgrade Bay **(3)** that allows RAID 5.
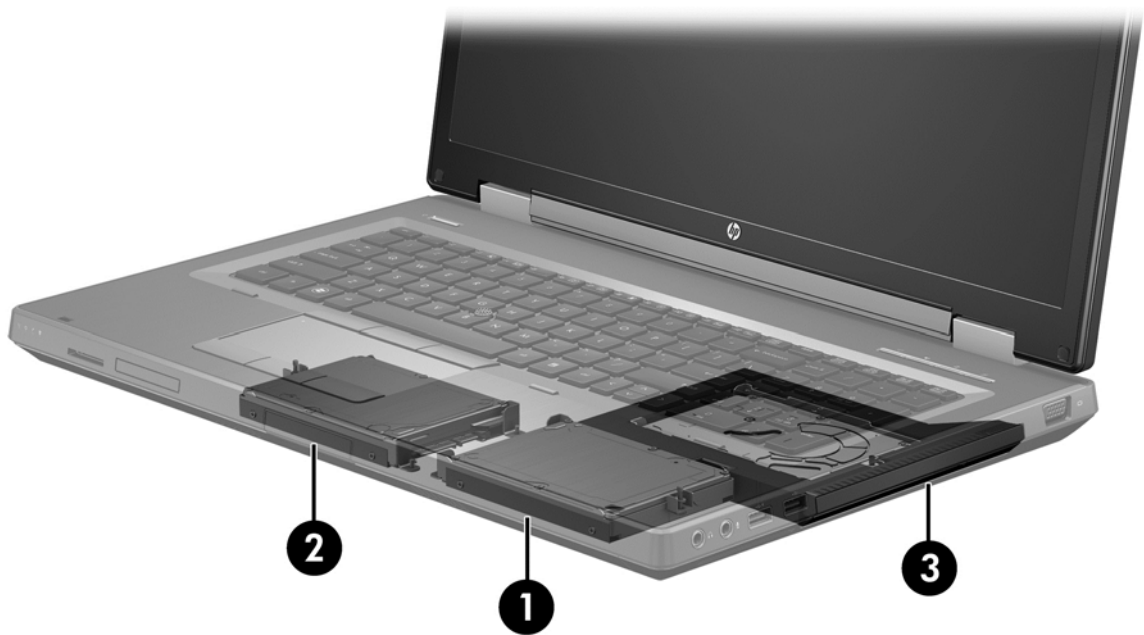
HP Advanced Docking Station

Recovery supports docking and undocking. It can be used to implement mirroring between the primary hard drive **(1)** and an optional hard drive in the SATA-swappable bay of the HP Advanced Docking station **(2)**.

The following illustration shows an HP Advanced Docking Station with the recovery hard drive in the SATA-swappable bay that allows Recovery.
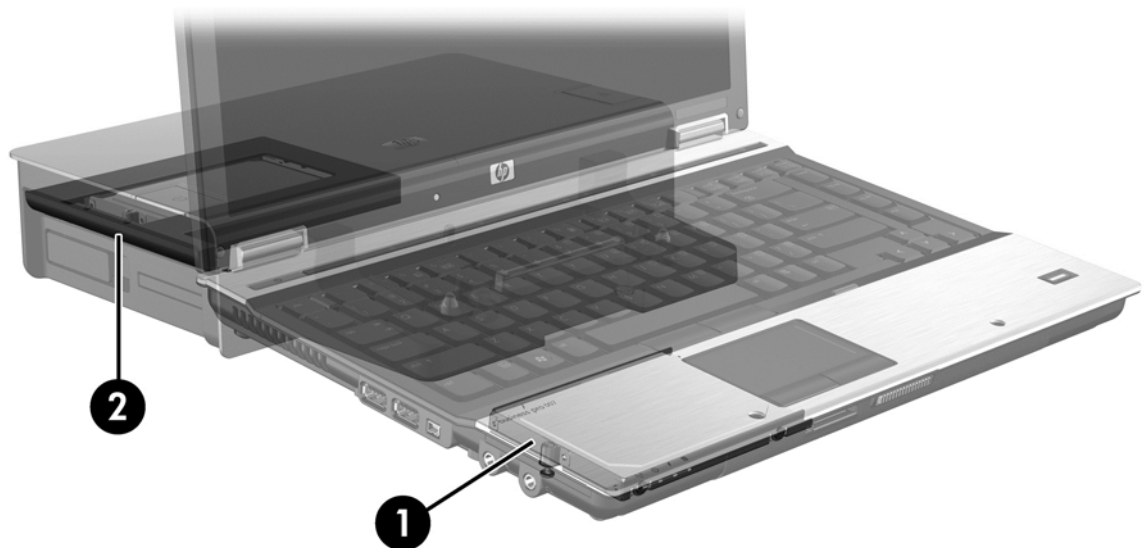
4 Intel Rapid Storage Technology

Intel® Rapid Storage Technology supports the following Recovery features.

Advanced Host Controller Interface

The Advanced Host Controller Interface (AHCI) is a specification that allows the storage driver to enable advanced SATA features such as Native Command Queuing and hot plug capability. AHCI must be enabled in the Computer Setup (BIOS) for these features to apply (see Enable RAID using the Computer Setup (BIOS) (f10) on page 12). AHCI is enabled by default on supported HP Business computers.

Native Command Queuing

A read/write drive head writes data to a hard drive platter in concentric circles (tracks) based on the order in which the write request was received. Because applications rarely request data in the same order that it was written to the platter, long delays (latency) would result if the drive head had to locate data in the exact order that the hard drive receives read requests. Native Command Queuing (NCQ) allows SATA hard drives to accept multiple commands and change their execution order to improve performance. This is analogous to the way an elevator reorders floor requests to minimize travel time and mechanical wear. Similarly, NCQ reduces the latency and unnecessary drive head movement required to execute multiple outstanding read/write requests, resulting in increased performance and reliability. NCQ requires support from the Computer Setup (BIOS), SATA controller, and controller driver.

Hot plug capability

Hot plug capability allows the SATA recovery hard drive to be removed or inserted while the computer is running. Hot plug capability is supported when the recovery hard drive is connected to the eSATA port or located in the docking station's SATA-swappable bay. For example, the recovery hard drive in the docking station's SATA-swappable bay can be removed while the computer is running if you need to temporarily insert an optical drive in the bay. Hot plug capability also allows you to dock and undock the computer at any time.

Intel Smart Response Technology (select models only)

NOTE: Intel® Smart Response Technology requires that the SATA controller be set to RAID mode in Computer Setup (BIOS). Typically, SRT is already enabled and in RAID mode from the factory, and no further user configuration is required.

Intel Smart Response Technology (SRT) is an Intel Rapid Storage Technology (RST) caching feature that significantly improves computer system performance. It allows a user to configure computer systems with an SSD mSATA module used as cache memory between the hard disk drive and system memory. This configuration provides the advantage of having a hard disk drive (or a RAID volume) for maximum storage capacity while simultaneously delivering an enhanced system performance experience.

NOTE: Intel Smart Response Technology caching is implemented as a single drive-letter solution. No additional drive letter is required for the SSD device used as a cache. Typically, SRT is enabled from the factory, and no further user configuration is required. SRT is not supported when used with SSD or SED drives.

NOTE: If you add a hard drive and intend to set a RAID volume, you must temporarily disable SRT. RAID volumes (i.e. – RAID 0, RAID 1, etc.) cannot be created if SRT is enabled. Disable SRT to create the desired RAID volume. After temporarily disabling SRT, you must reenable SRT. If you intend to reinstall the software image, SRT must first be disabled. You must select **Set to Available** before reinstalling the operating system and associated software.

To temporarily disable SRT:

1. From the Start screen, type `Intel`, and then select **Intel Rapid Storage Technology**.

2. Click the **Acceleration** link, and then click the **Disable Acceleration** link.

3. Select **Disable Acceleration**.

4. Click the **Reset to Available** link. Wait for the Acceleration Mode to complete.

IMPORTANT: You must temporarily disable SRT when changing RAID modes. Make the change and then re-enable SRT. Failure to temporarily disable this feature will prevent you from creating or changing RAID volumes.

NOTE: HP does not support SRT with self-encrypting drives (SEDs).

To enable SRT:

1. Select **Start > All Programs > Intel > Rapid Storage Technology**.

2. Click the **Accelerate** icon and then click **Select device**.

3. Select the SSD size to be allocated for the cache memory.

   NOTE: It is recommended to use the maximum size. Any remaining space on the SSD may be used for data storage using the simple data single disk.

4. Select the hard drive (or RAID volume) to be accelerated.

   NOTE: It is highly recommended to accelerate the system volume or system disk for maximum performance.

5. Select the acceleration mode, and then click **OK**. The recommended setting is **Maximized** mode, which is acceleration optimized for input/output performance.

   The page refreshes and reports the new acceleration configuration in the Acceleration View.

   NOTE: Before replacing or reimaging a hard drive, you must disable SRT.

   NOTE: When replacing or reimaging a hard drive, you must clear the cache to prevent a data conflict with information stored in cache memory. To clear the cache, from the Start screen, type `Intel`, and then select **Intel Rapid Storage Technology**. Next, click the Acceleration link, select **Disable Acceleration**, and then click the **Reset to Available** link to clear the cache.

To configure SATA mode in Computer Setup (BIOS):

1. Turn on or restart the computer, and then press esc while the "Press the ESC key for Startup Menu" message is displayed at the bottom of the screen.

2. Press f10 to enter Computer Setup (BIOS).

3. Use a pointing device or the arrow keys to select **System Configuration > Device Configurations**.

4. In **SATA Device Mode**, change the value to **RAID**.

5. Use the arrow keys to select **File > Save Changes and Exit**, and then press enter.

For more information on Intel Smart Response Technology, see http://www.intel.com/support/chipsets/sb/CS-032826.htm?wapkw=Smart%20Response%20Technology.

Intel Rapid Recover Technology

Intel Rapid Storage Technology supports the following recovery features.

Mirror update policies

With Recovery, you can determine how often the mirror hard drive is updated: continuously or on-request. When using the continuous update policy, data on the primary drive is simultaneously copied to the mirror drive as long as both drives are connected to the system. If you undock the computer while using the docking station's recovery drive, all new or revised data on the primary hard drive is automatically copied to the recovery hard drive when the notebook is redocked. This policy also allows for an unfinished mirroring operation to be completed if it was interrupted when you undocked the notebook.

When using the update on-request policy, data on the primary hard drive is copied to the mirror hard drive only when you request it by selecting **Update Recovery Volume** in Recovery. After the request, only the new or updated files on the primary drive are copied to the mirror hard drive. Prior to updating the mirror hard drive, the on-request policy allows a file to be recovered if the corresponding file on the primary hard drive is corrupted. The on-request policy can also protect data on the mirror hard drive if the primary hard drive is attacked by a virus, provided you do not update the mirror hard drive after the virus attack.

NOTE: You can change the mirror update policy at any time by right-clicking **Modify Volume Update Policy**.

Automatic hard drive switching and rapid recovery

If the primary hard drive fails, Recovery automatically switches to the mirrored drive without user intervention. Recovery displays a message to notify you of the primary hard drive failure. In the meantime, the computer can boot from the mirrored hard drive. When a new primary hard drive is installed and the computer is booted, Recovery's rapid recovery feature copies all mirrored data to the primary hard drive.

NOTE: If using the update on request policy and the primary hard drive fails or a file on the primary hard drive becomes corrupted, all unmirrored data is lost.

Simplified migration from RAID to non-RAID

Users can migrate from a RAID 1 or Recovery volume to two non-RAID hard drives, called "breaking the array," by following the instructions in Resetting RAID drives to non-RAID on page 25.

Migration from RAID 1 to Recovery is also supported. However, migration from RAID 0 to RAID 1 or from RAID 0 to a non-RAID primary hard drive is not supported.

5   RAID volume setup

The following instructions assume that a supported hard drive is installed in the computer Upgrade Bay, in the SATA-swappable bay of the docking station, or connected to the eSATA port of the computer (see).

The basic RAID migration steps are as follows:

- Enable RAID through the Computer Setup (BIOS).

- Initiate RAID migration using Intel® Rapid Storage Technology Console.

CAUTION: Make sure that the computer is connected to AC power before initiating the following procedures. The loss of power during RAID migration can result in the loss of data.

Enable RAID using the Computer Setup (BIOS) (f10)

NOTE: The following procedures assume that you are using the hard drive image that shipped with your computer. If a different image is installed on your computer, you must *first* enable RAID through the Computer Setup (BIOS) (f10), and then install the operating system and all required drivers, including the Intel Rapid Storage Technology driver. Next, follow the steps in . RAID volumes are created primarily between the primary hard drive and an internally-connected secondary hard drive. RAID volumes are not allowed to be created between a primary hard drive and an externally- connected hard drive. Creating a RAID volume between two externally-connected hard drives is possible, although there is little benefit in doing so.

1.   Turn on the computer, or restart it.

2.   Press f10 as soon as the computer boots.

> **NOTE:**   If you do not press f10 at the appropriate time, you must restart the computer, and then press f10 again to access the utility.

3.   In the Computer Setup (BIOS), select **System Configuration > Device Configurations**.
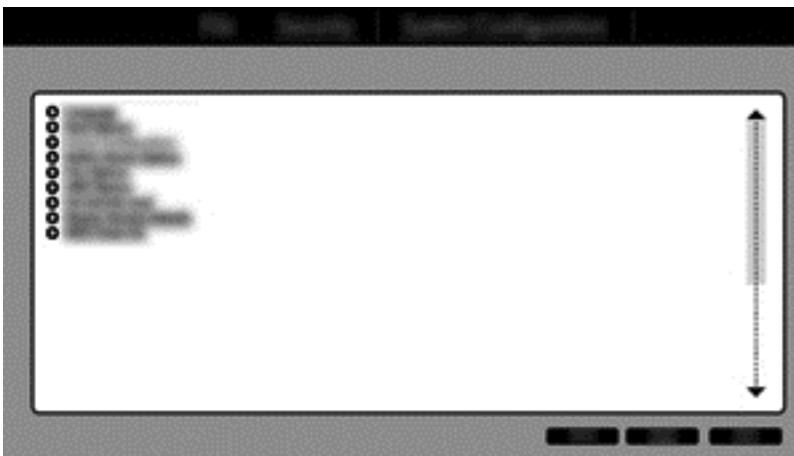
4. In the Device Configurations window, select **RAID** under **SATA Device Mode**. Click **Confirm**. The following message is displayed: "Changing this setting may require reinstallation of your operating system. Are you sure you want to proceed?"

NOTE: The hard drive image supplied with your computer contains drivers that allow you to switch between AHCI and RAID modes without reinstalling the operating system. If you use a different hard drive image, you may need to reinstall the operating system.

NOTE: Below SATA Device Mode, there is a check box for Ctrl I Prompt. If this is selected, the Intel option ROM screen is visible during the computer bootup time.
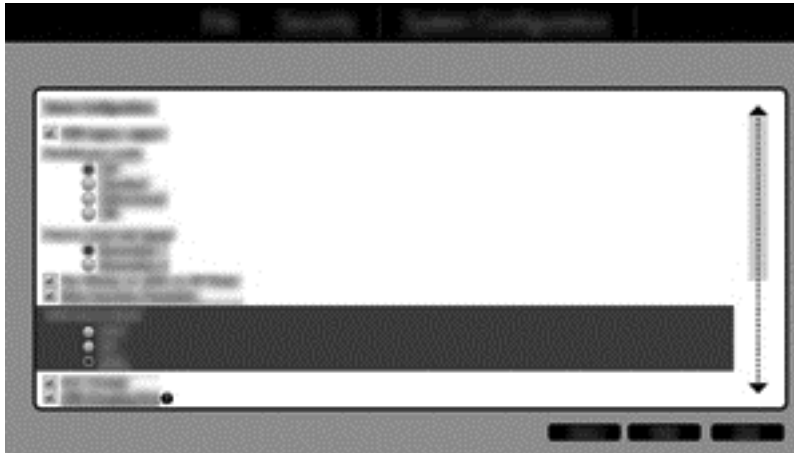
5. Select **File > Save Changes and Exit**. Then, click **Yes** to save the changes. If you do not want to apply your changes, select **Ignore Changes and Exit**.

CAUTION: Do NOT turn the computer power off while the ROM is saving the f10 Computer Setup changes, because the Complementary Metal Oxide Semiconductor (CMOS) could become corrupted. Turn the computer off only after exiting the f10 Setup screen.

6. After the operating system boots, you can begin the RAID migration procedure.

Initiate RAID migration

▲ Open the Intel Rapid Storage Technology Console. From the Start screen, type **Intel**, and then select Intel Rapid Storage Technology. Follow the on-screen instructions.
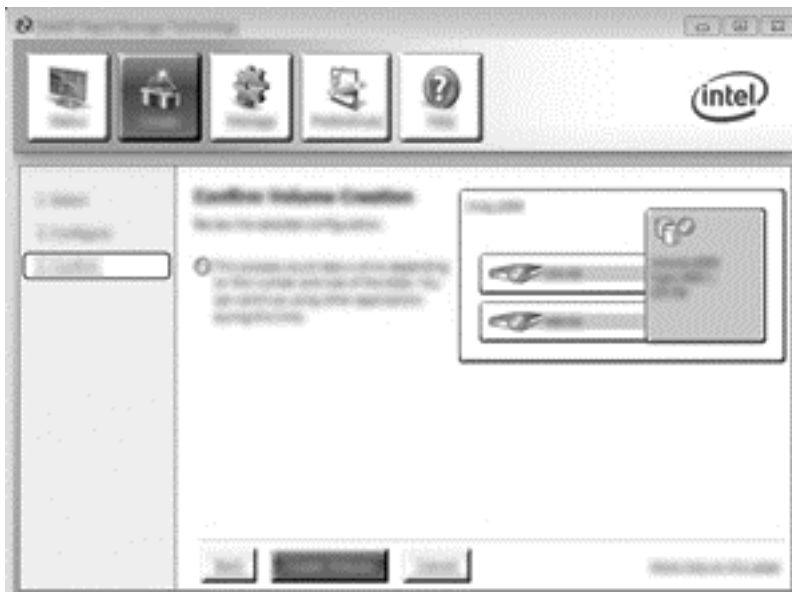

Migrating to RAID 1

1. Click **Create**, click **Real-time data protection (RAID 1)**, and then click **Next**.

2. Create a volume name (or use the suggested name), select the two hard drives to use for the RAID 1 array, and then click **Next**.

3. Click **Create Volume** to begin the migration process.

4. Once the **Create Volume** button is clicked, you are informed that the array has been created. Click the **OK** button. The array migration continues to run in the background. The computer can be used normally while the migration continues.
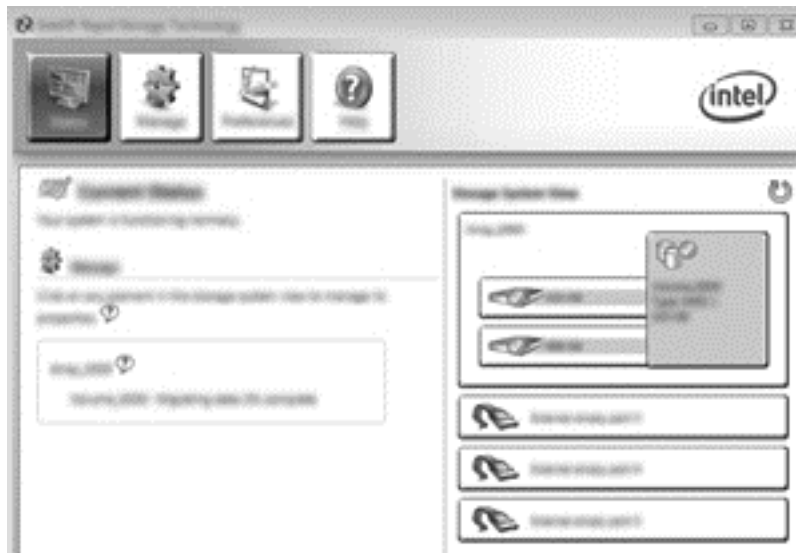
5. When you are notified that the array migration is complete, close all open programs, and then reboot the computer.

6. When the computer boots up, the operating system detects the newly-created array and requests a reboot. Reboot the computer when prompted. After the final reboot, the RAID migration is complete.

Migrating to Flexible data protection (Recovery)

Recovery offers more control over how data is copied from the primary drive to the recovery drive. When the secondary hard drive is in the SATA-swappable bay of the HP Advanced Docking Station or connected to the eSATA port of the computer (select models only), Recovery is the only RAID option available.

NOTE: Flexible data protection is not available using the eSATA port on the docking station on select models. On models unable to access flexible data protection on the eSATA port on the docking station, connect using the eSATA port on the notebook.
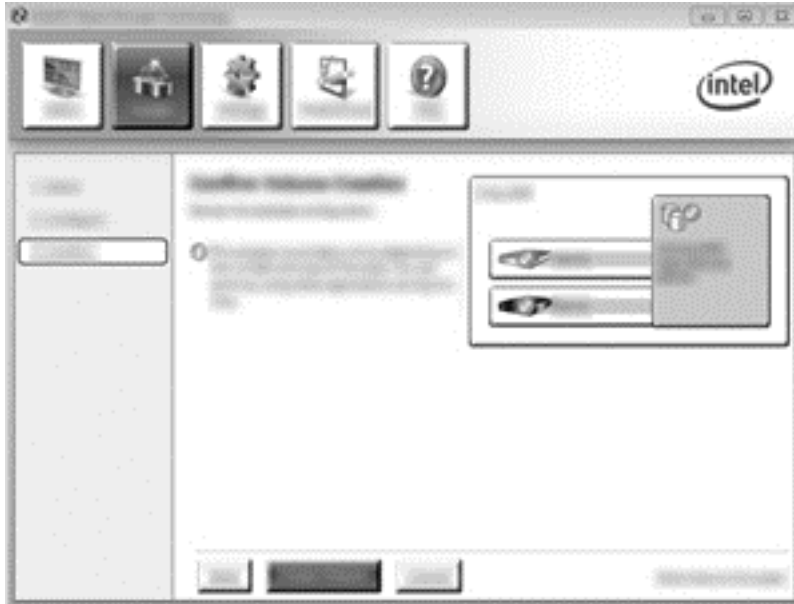
1. Click **Create**, click **Flexible data protection (Recovery)**, and then click **Next**.
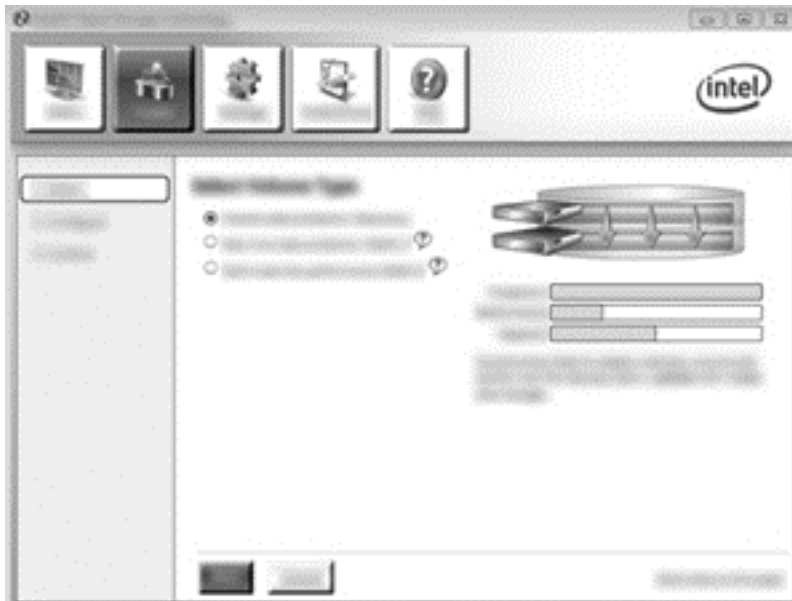
2. Create a volume name (or use the suggested name). The two hard drives to use for the Recovery array are already selected. Click **Next**.

3. Click **Create Volume** to begin the migration process.

4. Once the **Create Volume** button is clicked, you are informed that the array has been created. Click the **OK** button. The array migration continues to run in the background. The computer can be used normally while the migration continues.
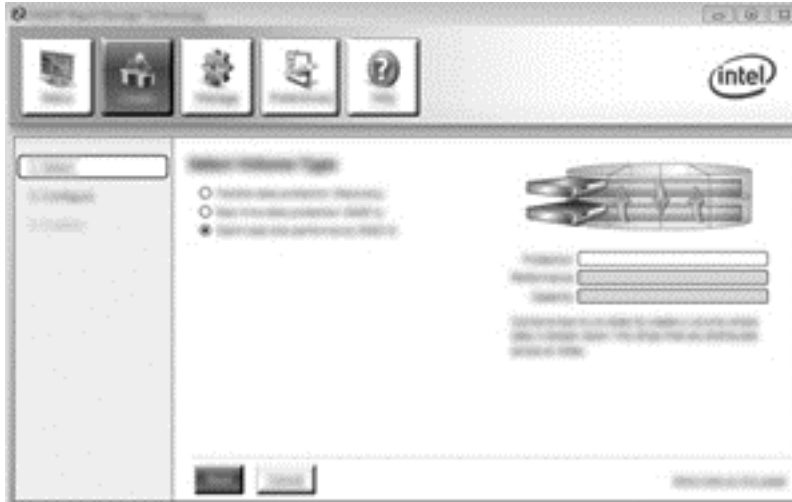

5. When you are notified that the array migration has completed, close all open programs, and then reboot the computer. When the computer reboots, the operating system detects the newly-created array and requests another reboot. Reboot the computer when prompted. After the final reboot, the RAID migration is complete.

    NOTE: It is possible that during a rebuild of the RAID volume, the Intel Rapid Storage Technology screen will display 0-GB to indicate the available storage space. However, the RAID volume storage space size will return to its original state after completion of the rebuild operation. The rebuild operation may take several hours depending on the size of the hard drives.

Migrating to RAID 0

NOTE: When using an HP-supplied image, migrating to RAID 0 requires you to perform additional advanced steps, including copying data to an additional external USB hard drive. Please read the entire RAID 0 migration procedure before you begin.

1. Click **Create**, click **Optimized disk performance**, and then click **Next**.

2. Create a volume name (or use the suggested name), select the two hard disk drives to use for the RAID 0 array, and then click **Next**.

3. Click **Create Volume** to begin the migration process.

4. A message displays, notifying you that the array has been created. Click the **OK** button.

> **NOTE:** The array migration continues to run in the background. The computer can be used normally while the migration continues.

5. When you are notified that the array migration has completed, close all open programs, and then restart the computer. When the computer is restarted, the operating system detects the newly-created array and prompts you to restart the computer a second time.

6. After you have restarted the computer a second time, the RAID migration is complete.

> **NOTE:** Although the total capacity of the RAID 0 volume appears in the Console, the extra capacity created with the addition of the secondary hard drive appears to the system as unallocated space. After the system reboots, you must allocate the unallocated space. Windows 8 contains additional capabilities that allow you to create a single RAID 0 volume.

Migrating to RAID 5 (select models only)

> **NOTE:** When using an HP-supplied image, migrating to RAID 5 requires you to perform additional steps, including copying data to an additional external USB hard drive. Please read the entire RAID 5 migration procedure before you begin.

> **NOTE:** RAID 5 requires 3 hard drives in the computer: the primary hard drive, the secondary hard drive, and the upgrade bay hard drive.

1. Click **Create**, select **Efficient data hosting and protection (RAID 5)**, and then click **Next**.

2. Create a volume name (or use the suggested name), select the three hard drives to use for the RAID 5 array, and then click **Next**.

3. Click **Create Volume** to begin the migration process.

4. Once **Create Volume** is selected, you are informed that the array has been created. Click the **OK** button. The array migration continues to run in the background. The computer can be used normally while the migration continues.

5. When you are notified that the array migration has completed, close all open programs, and then restart the computer. When the computer is restarted, the operating system detects the newly-created array and prompts you to restart the computer a second time.

6. After you have restarted the computer a second time, the RAID migration is complete.

NOTE: Although the total capacity of the RAID 5 volume appears in the Console, the extra capacity created with the addition of the three hard drives appears to the system as unallocated space. After the system reboots, you must allocate the unallocated space. For Windows XP, the only option through the operating system is to create and format a separate volume. Windows 8 contains additional capabilities that allow you to create a single RAID 5 volume.

NOTE: Due to the complexity of the RAID 5 volume, it will take longer for the computer to enter HIbernation than it does for other operations. After entering Hibernation, ensure that all computer activity has ceased and that all the lights are turned off before storing the computer in an enclosed space such as a computer carrying case.

Using Intel Rapid Storage Technology Recovery Console features

When using the Recovery Console, you can select how often the recovery hard drive is updated: continuously or on-request. Continuous Updates is the default update policy (see Mirror update policies on page 11). The steps to change the update policy to on-request are as follows:
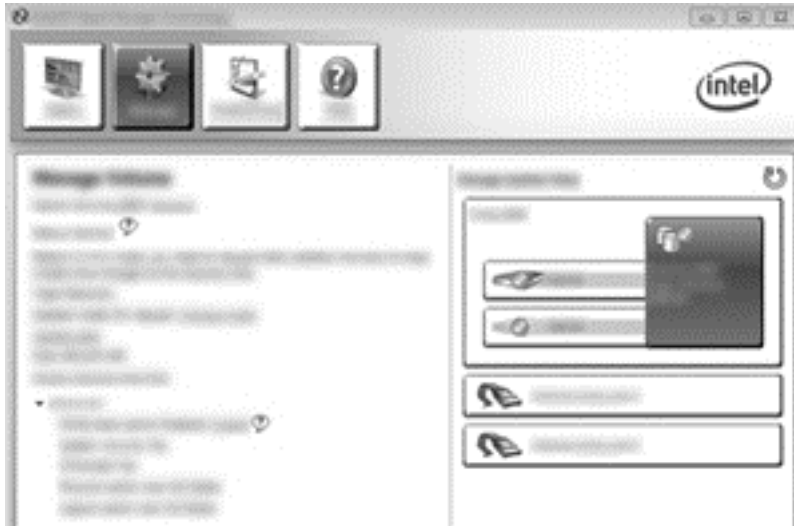
1. Click **Manage**, and then click the Recovery Volume to select it.

2. Click the **Advanced** link in the left pane.

3. Update mode displays the current setting. To change the current setting, click the **Change Mode** link, and then click **Yes**. When using the on-request update policy, you can manually update the recovery volume by selecting the **Update Data** link.

4. You can restore the continuous update policy at any time by selecting the **Change Mode** link, and then clicking **Yes**.

6 Resetting RAID drives to non-RAID

You can reset a RAID 1 or Recovery volume to two non-RAID drives using the following instructions to access the Intel Option ROM and reset both drives to non-RAID status. You must also reset both drives to non-RAID status if you need to move the RAID recovery drive from the computer's upgrade bay to the docking station's bay.

NOTE: A RAID 0 or RAID 5 volume cannot be migrated to a RAID 1 volume or to a non-RAID primary hard drive because the size of the RAID 0 or RAID 5 volume may be greater than the capacity of the primary hard drive. If you wish to return the primary hard drive in a RAID 0 or RAID 5 volume to non-RAID status, you must first back up all data to an external drive with sufficient capacity. Next, follow the steps below to reset the RAID 0 or RAID 5 drives to non-RAID status. After you complete the procedure, you must reinstall the operating system on the primary drive.

1. Power on or restart the computer. When the Option ROM window displays, press ctrl+I to enter the configuration utility.

   NOTE: The OPTION ROM (ctrl+I) feature must be enabled in the Computer Setup (BIOS) in computers with Windows 7 and Windows 8 operating systems. For computers with Windows 8 operating systems, you must also switch from UEFI Native mode to UEFI Hybrid mode in the system BIOS.

2. In the Main Menu, use the up or down arrow key to select **3. Reset Disks to Non-RAID**, and then press enter. The Reset RAID Data window is displayed.

3. Press the space bar to select the first drive, and then press the down arrow key and the space bar to select the second drive.

4. Press enter, and then press Y to confirm the selection.

> **NOTE:** The Option ROM menu automatically appears during bootup when an issue is detected within the RAID environment. After the issue has been resolved, the Option ROM menu only appears when it is selected from within the Computer Setup (BIOS) menu.

5. Use the down arrow key to select **Exit**, and then press enter and Y to boot the system.

7 Frequently asked questions

Can more than one RAID volume be installed on a computer?

No, there can only be one RAID volume on a computer.

Is RAID supported to allow both RAID 0 and RAID 1 on a single RAID volume?

No.

Can the computer be undocked if the recovery hard drive is in the docking station SATA-swappable bay?

Yes. If the "Continuous update" policy is selected, data is automatically copied to the docking station's recovery drive when the computer is re-docked. If the "Update on request" policy is selected, you must follow the normal procedure to copy data to the recovery hard drive when the computer is re-docked.

Can SRT be enabled in AHCI mode?

No. Smart Response Technology requires that the SATA mode is set to RAID mode to enhance the system's performance. You must first disable SRT, and then select **Set to Available** in order for the computer to boot in AHCI mode.

What is the maximum number of hard drives that can be connected to the system during boot when the storage controller is in RAID mode (f10 Computer Setup)?

This limitation does not apply when the storage controller is in AHCI mode. Once the storage controller is changed to RAID mode, only 3 hard drives can be connected to the unit during boot up. After the notebook is booted up, additional hard drives can be connected. This does not apply to attached USB hard drives.

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