Intel[®] RAID Software User's Guide:

- Intel[®] Embedded Server RAID Technology 2 Intel IT/IR RAID

- Intel[®] Integrated Server RAID
 Intel[®] RAID Controllers using the Intel[®] RAID Software Stack 3

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Table of Contents

Chapter 1: Overview	1
Supported Hardware	
Software	
RAID Terminology	4
Fault Tolerance	
Enclosure Management	6
Performance	6
Chapter 2: RAID Levels	9
Summary of RAID Levels	
Selecting a RAID Level	
RAID 0 - Data Striping	
RAID 1 - Disk Mirroring/Disk Duplexing	
RAID 5 - Data Striping with Striped Parity	
RAID 6 - Distributed Parity and Disk Striping	
RAID IME	
RAID 10 - Combination of RAID 1 and RAID 0	
RAID 50 - Combination of RAID 5 and RAID 0	15
RAID 60 - Combination of RAID 0 and RAID 6	16
RAID Configuration Strategies	
Maximizing Fault Tolerance	
Maximizing Performance	
Maximizing Storage Capacity	
RAID Availability	
RAID Availability Concept	
Spare Drives	
Rebuilding	23
Drive in Foreign State	23
Copyback	24
Configuration Planning	24
Dimmer Switch Feature	25
Number of Physical Disks	25
MegaRAID Fast Path	25
4K Sector Drive Support	25
Larger than 2TB Drive Support	26
Power Save settings	26
Shield State	26
Array Purpose	27
Chapter 3: RAID Utilities	
Intel [®] Embedded Server RAID Technology 2 BIOS Configuration Utility	

LSI MPT* SAS BIOS Configuration Utility	29
Intel [®] RAID BIOS Console 2 Configuration Utility for Intelligent RAID	30
Intel [®] RAID Web Console 2 Configuration and Monitoring Utility	31
Drive Hierarchy within the RAID Firmware	32
Intel [®] Intelligent RAID Controller Features	32
Enterprise Features	32
Fault Tolerant Features	33
Cache Options and Settings	
Background Tasks	
Error Handling	
Audible Alarm	35
Chapter 4: Intel [®] RAID Drivers	37
RAID Driver Installation for Microsoft Windows*	
Installation in a New Microsoft Windows* Operating System	37
Installation in an Existing Microsoft Windows* Operating System	38
RAID Driver Installation for Red Hat* Enterprise Linux	38
RAID Driver Installation for SuSE* Linux	39
RAID Driver Installation for Novell NetWare*	
Installation in a New Novell Netware* System	39
Installation in an Existing Novell Netware* System	
RAID Driver Installation for Solaris* 10	40
Installation in a New Solaris* System	
Installation in an Existing Solaris* System	40
Chapter 5: Intel [®] Embedded Server RAID BIOS Configuration Utility	41
Creating, Adding or Modifying a Virtual Drive Configuration	
Setting the Write Cache and Read Ahead Policies	
Working with a Global Hot-spare Drive	44
Adding a Hot-spare Drive	45
Removing a Hot-spare Drive	45
Rebuilding a Drive	45
Auto Rebuild and Auto Resume	
Checking Data Consistency	
Viewing and Changing Device Properties	
Forcing a Drive Online or Offline	
Configuring a Bootable Virtual Drive	
Deleting (Clearing) a Storage Configuration	47
Chapter 6: Intel [®] IT/IR RAID Configuration	49
IM and IME Configuration Overview	49
Features	49
Creating IM and IME Volumes	50
Creating an IM Volume	51
Creating an IME Volume	52
Creating a Second IM or IME Volume	53

Managing Hot Spares	53
Other Configuration Tasks	55
Viewing Volume Properties	55
Synchronizing an Array	55
Activating an Array	55
Deleting an Array	56
Locating a Drive or Multiple Drives in a Volume	56
Selecting a Boot Disk	57
IS Configuration Overview	57
Creating IS Volumes	
Creating a Second IS Volume	59
Other Configuration Tasks	60
Viewing IS Volume Properties	60
Activating an Array	60
Deleting an Array	60
Locating a Disk Drive, or Multiple Disk Drives in a Volume	61
Selecting a Boot Disk	61
Chapter 7: Intel [®] RAID BIOS Console 2 Utility	63
Quick Configuration Steps	
Detailed Configuration Steps using the Intel [®] RAID BIOS Console 2	
Start the Intel [®] RAID BIOS Console 2 Utility	
Screen and Option Descriptions	
Setting Up a RAID Array Using the Configuration Wizard	
Creating RAID 0, 1, 5, or 6 using Intel [®] RAID BIOS Console 2 (detailed)	
Creating RAID 10, RAID 50, and RAID 60 using Intel® RAID BIOS Console 2	
Setting Drive Parameters	
Creating a Hot Spare	
Viewing Event Details	
Chapter 8: Intel [®] RAID Web Console 2	89
Configuration Functions	
Monitoring Functions	
Maintenance Functions	
Hardware and Software Requirements	
Installing the Intel [®] RAID Web Console 2 on a Microsoft Windows* Operating Syster	
Installing the Intel [®] RAID Web Console 2 on Linux or SuSE* Linux Enterprise Server	r92
Intel [®] RAID Web Console 2 Support and Installation on VMWare	
Installing Intel [®] RAID Web Console 2 for VMWare Classic	
Uninstalling Intel [®] RAID Web Console 2 for VMWare	
Installing Intel [®] RAID Web Console 2 Support on the VMWare ESX	
Starting the Intel [®] RAID Web Console 2	
Intel [®] RAID Web Console 2 Screens	
Physical/Virtual View Panel	
Properties/Operations/Graphical View Panel	

Event Log Panel	103
Menu Bar/Manage Menu	104
Menu Bar/Go To Menu	104
File Menu/Log Menu	104
File Menu/Tool Menu	104
File Menu/Help Menu	104
Drive Configuration Tasks	104
Create Virtual Drive	105
Creating a Virtual Drive Using Simple Configuration	105
Creating a Virtual Drive Using Advanced Configuration	
Creating a Spanned Disk Group	116
Creating Hot Spares	117
Setting Adjustable Task Rates	119
Adding a Drive to a Virtual Disk	120
Removing a Drive or Changing the RAID Level	
of a Virtual Disk	123
Changing Virtual Disk Properties	124
Deleting a Virtual Disk	125
Managing Configurations	126
Saving a Configuration to Disk	126
Clearing a Configuration from a Controller	128
Adding a Configuration from a File	129
Monitoring System Events and Devices	130
Monitoring System Events	130
Monitoring Controllers	131
Monitoring Disk Drives and Other Physical Devices	
Monitoring Virtual Disks	135
Monitoring Enclosures	135
Monitoring Battery Backup Units	
Battery Learn Cycle	137
Monitoring Rebuilds and Other Processes	139
Maintaining and Managing Storage Configurations	140
Initializing a Virtual Disk	140
Running a Consistency Check	141
Scanning for New Drives	
Rebuilding a Drive	
Removing a Drive	143
Flashing the Firmware	
Enabling RAID Premium Features	
Enabling Full Disk Encryption feature	
Enabling Snapshot feature	
Enabling Super Sized Cache	163
Appendix A: Creating a Virtual Drive Using Advanced Configuration	167

Appendix B: Events and Messages	
---------------------------------	--

List of Figures

Figure 1. RAID 0 - Data Striping	
Figure 2. RAID 1 - Disk Mirroring/Disk Duplexing	11
Figure 3. RAID 5 - Data Striping with Striped Parity	
Figure 4. Example of Distributed Parity across Two Blocks in a Stripe (RAID 6)	
Figure 5. Integrated Mirroring Enhanced with Three Disks	14
Figure 6. RAID 10 - Combination of RAID 1 and RAID 0	
Figure 7. RAID 50 - Combination of RAID 5 and RAID 0	
Figure 8. RAID 60 Level Virtual Drive	
Figure 9. Intel [®] Embedded Server RAID BIOS Configuration Utility Screen	
Figure 10. Adapter Properties Screen	
Figure 11. Create New Array Screen	
Figure 12. Manage Array Screen	
Figure 13. Adapter Properties Screen	58
Figure 14. Create New Array Screen	59
Figure 15. Intel [®] RAID BIOS Console 2 Menu	65
Figure 16. Intel [®] RAID BIOS Console 2 - Controller Selection	66
Figure 17. Controller Properties	66
Figure 18. Additional Controller Properties	67
Figure 19. Intel [®] RAID BIOS Console 2 - Configuration Types	70
Figure 20. Selecting Configuration	
Figure 21. Intel [®] RAID BIOS Console 2 - Configuration Methods	72
Figure 22. Intel [®] RAID BIOS Console 2 - Add Physical Drives to Array	
Figure 23. Intel [®] RAID BIOS Console 2 - Set Array Properties	
Figure 24. Intel [®] RAID BIOS Console 2 - Confirm Configuration	
Figure 25. Intel [®] RAID BIOS Console 2 - Initialization Speed Setting	
Figure 26. Intel [®] RAID BIOS Console 2 – Multiple Disk Groups for RAID 10, 50, or 60	
Figure 27. Intel [®] RAID BIOS Console 2 – Spanning Multiple Arrays	
Figure 28. Intel [®] RAID BIOS Console 2 – Viewing Completed Settings	
Figure 29. Intel [®] RAID BIOS Console 2 – Initialization Settings	
Figure 30. Intel [®] RAID BIOS Console 2 – RAID 10 Final Screen	
Figure 31. Intel [®] RAID BIOS Console 2 – RAID 10 Properties Screen	
Figure 32. Intel [®] RAID BIOS Console 2 – RAID 50 Properties Screen	
Figure 33. Intel [®] RAID BIOS Console 2 – Choosing a Hot Spare Drive	
Figure 34. Intel [®] RAID BIOS Console 2 – Setting a Hot Spare Drive	
Figure 35. Intel [®] RAID BIOS Console 2 – Viewing Hot Spare	
Figure 36. Intel [®] RAID BIOS Console 2 – Main Screen showing Hot Spare Drive	85
Figure 37. Intel [®] RAID BIOS Console 2 – Event Information Screen	
Figure 38. Intel [®] RAID BIOS Console 2 – Selecting Events to View	
Figure 39. Intel [®] RAID BIOS Console 2 – Viewing an Event	87
Figure 39. Intel [®] RAID Web Console 2 – Customer Information Screen	
Figure 40. Intel FAID web Console 2 – Customer mormation Screen	
Figure 41. Setup Type Screen Figure 42. Intel [®] RAID Web Console 2 – Select Server Screen	00 21
	30

Figure 43. Intel [®] RAID Web Console 2 – Login Screen
Figure 44. Intel [®] RAID Web console 2 dashboard 100
Figure 45. Intel [®] RAID Web Console 2 – Main Screen 101
Figure 46. Intel [®] RAID Web Console 2 – Operations Tab 102
Figure 47. Intel [®] RAID Web Console 2 – Graphical Tab (Optional feature) 103
Figure 48. Virtual Drive Creation Menu 106
Figure 49. Virtual Drive Creation Mode 106
Figure 50. Create Virtual Drive Screen
Figure 51. Create Virtual Drive - Summary Window 108
Figure 52. Option to Create Additional Virtual Drives
Figure 53. Option to Close the Configuration Wizard 109
Figure 54. Virtual Drive Creation Menu 110
Figure 55. Virtual Drive Creation Mode
Figure 56. Create Drive Group Settings Screen
Figure 57. Span 0 of Drive Group 0
Figure 58. Span 0 and Span 1 of Drive Group 0
Figure 59. Virtual Drive Settings Window
Figure 60. New Virtual Drive 0
Figure 61. Create Virtual Drive Summary Window
Figure 62. Option to Create Additional Virtual Drives
Figure 63. Option to Close the Configuration Wizard
Figure 64. Assign Global Hotspare
Figure 65. Assign Dedicated Hotspare
Figure 66. Select Hotspare Drive
Figure 67. Set Adjustable Task Rates 119
Figure 68. Starting Modify Drive Group 121
Figure 69. Select RAID level to migrate 121
Figure 70. Selecting Drives to Add 122
Figure 71. Changing RAID Level 122
Figure 72. Selecting Drives to Remove 123
Figure 73. Changing RAID Level 124
Figure 74. Set Virtual Disk Properties 125
Figure 75. Save Configuration to File 126
Figure 76. Save Configuration Dialog Box 127
Figure 77. Clear Configuration 128
Figure 78. Add Saved Configuration 129
Figure 79. Event Information Window 130
Figure 80. Controller Information 131
Figure 81. Physical Drive Information 132
Figure 82. Locating a Physical Drive 133
Figure 83. Patrol Read Configuration
Figure 84. Virtual Drive Properties
Figure 85. Enclosure Information
Figure 86. Battery Backup Unit Information
Figure 87. Battery Backup Unit Operations
Figure 88. Group Show Progress Window
Figure 89. Selecting Initialize

Figure 90. Group Consistency Check Window	
Figure 91. Scan for Foreign Configuration	142
Figure 92. Preparing Drive for Removal	143
Figure 93. Check Controller Security status	145
Figure 94. Check Drive Security status	
Figure 95. Enable Drive Security	146
Figure 96. Start Security Wizard	
Figure 97. Enter Security Key Identifier	147
Figure 98. Enter Security Key	
Figure 99. Enter Pass Phrase	149
Figure 100. Confirm Enable Drive Security	149
Figure 101. Check Drive Security Enabled status	150
Figure 102. Select Full Disk Encryption	
Figure 103. Create RAID Virtual Drive with FDE enabled	151
Figure 104. Instant Secure Erase	
Figure 105. Confirm Secure Erase	
Figure 106. Enable MegaRAID Recovery	
Figure 107. Enter the Capacity for Snapshot Respository	
Figure 108. Confirm Enable Snapshot	
Figure 109. Snapshot Base is shown	
Figure 110. Enter Snapshot Name	
Figure 111. Create Snapshot	
Figure 112. Create View	
Figure 113. Set MegaRAID Recovery Properties	
Figure 114. Disable MegaRAID Recovery	
Figure 115. Confirm Disable Snapshots	
Figure 116. Adapter Selection	
Figure 117. Selecting Snapshot Base	
Figure 118. Selecting Advanced Operations	
Figure 119. Selecting Rollback.	161
Figure 120. Selecting a snapshot	
Figure 121. Confirm Page	
Figure 122. Rollback operation is done	
Figure 123. Create SSC from Dashboard	
Figure 124. Create SSC Drive Group.	
Figure 125. Create SSCD name	
Figure 126. SSC Summary	
Figure 127. SSCD status shown	
Figure 128. Delete SSCD	
Figure 129. Virtual Drive Creation Menu	
Figure 130. Virtual Drive Creation Mode	
Figure 131. Create Drive Group Settings Screen	
Figure 132. Span 0 of Drive Group 0	
Figure 133. Span 0 and Span 1 of Drive Group 0	
Figure 134. Virtual Drive Settings Window.	
Figure 135. New Virtual Drive 0	
Figure 136. Create Virtual Drive Summary Window	173

Figure 137.	Option to Create Additional Virtual Drives	174
Figure 138.	Option to Close the Configuration Wizard	174

List of Tables

Table 1. RAID 0 Overview	10
Table 2. RAID 1 Overview	11
Table 3. RAID 5 Overview	12
Table 4. RAID 6 Overview	12
Table 5. RAID 1E Overview	14
Table 6. RAID 10 Overview	15
Table 7. RAID 50 Overview	16
Table 8. RAID 60 Overview	
Table 9. RAID Levels and Fault Tolerance	19
Table 10. RAID Levels and Performance	20
Table 11. RAID Levels and Capacity	22
Table 12. Factors to Consider for Array Configuration	
Table 13. Intel [®] RAID BIOS Console 2 Toolbar Icon Descriptions	
Table 14. MFI Messages	

The software described in this document is designed for use with Intel[®] RAID controllers, and with on-serverboard RAID solutions that use the Intel[®] RAID Software Stack 3 (driver package names begin with "ir3"), Embedded Server RAID Technology 2 (driver package names begin with ESRT2) or Intel[®] IT/IR RAID.

Supported Hardware

This manual covers the software stack that is shared by multiple Intel[®] server products:

- Intel[®] Embedded Server RAID Technology 2 (ESRT2) on the Intel[®] Enterprise South Bridge 2 (ESB2) in the chipset, the Intel[®] I/O Controller Hub 9R (ICH9R), the Intel[®] 3420 PCH chipset, Intel[®] C200 series chipset and Intel[®] C600 series chipset used in the following:
 - Intel[®] Server Board S1200BTL/S1200BTS
 - Intel® Server Boards based on the Intel® S5000 and S7000 chipsets
 - Intel[®] Server Boards based on the Intel[®] 5500/5520 chipset with the Intel[®] I/O Controller Hub 10R (ICH10R)
 - Intel[®] Server Boards that include the LSI* 1064e SAS (Serially attached SCSI) controller and some that include the LSI* 1068 SAS controller
 - Intel[®] Server Boards S3420GP
 - Intel[®] Server Boards S3200SH and X38ML
 - Intel[®] SAS Entry RAID Module AXX4SASMOD (when the module is in ESRTII mode)
 - Intel[®] RAID Controller SASMF8I

Intel[®] Embedded Server RAID Technology 2 provides driver based RAID modes 0,1, and 10 with an optional RAID 5 mode provided by Intel[®] RAID C600 Upgrade Key RKSATA4R5, RKSATA8R5, RKSAS4R5 or RKSAS8R5.

Intel[®] Embedded Server RAID Technology 2 provides driver-based RAID modes 0, 1, and 10 with an optional RAID 5 mode provided by the Intel[®] RAID Activation Key AXXRAKSW5 on the ESB2 and LSI* 1064e on some models of Intel[®] server boards. ESB2 supports SATA only.

LSI* SAS 1064e and 1068 provide SATA (Serial ATA) and SAS support. Not all 1068 SAS boards provide Intel[®] Embedded Server RAID Technology 2 modes.

Intel[®] Embedded Server RAID Technology 2 must be enabled in the server system BIOS before it is available. Intel[®] Embedded Server RAID Technology 2 is limited to a maximum of eight drives including hot spare(s). Expander devices are not yet supported by ESRT2.

- Intel[®] IT/IR RAID solutions with below Intel[®] IT/IR RAID controllers:
 - Intel[®] RAID Controller SASWT4I
- Intel[®] RAID Controller SASUC8I

- Intel[®] RAID SAS Riser Controller AFCSASRISER in Intel[®] Server System S7000FC4UR without Intel[®] SAS RAID Activation Key AXXRAKSAS2 installed.
- Intel[®] RAID SAS Riser Controller AFCSASRISER in Intel[®] Server System S7000FC4UR without Intel[®] SAS RAID Activation Key AXXRAKSAS2 installed
- Intel[®] SAS Entry RAID Module AXX4SASMOD
- Intel[®] 6G SAS PCIe Gen2 RAID Module RMS2LL080 and RMS2LL040
- Intel[®] Integrated RAID Technology on the Intel[®] ROMB solutions. Server boards and systems include:
 - Intel[®] Server Board S5000PSL (Product code: S5000PSLROMB)
 - Intel[®] Server System SR1550AL (Product code: SR1550ALSAS)
 - Intel[®] Server System SR2500 (Product code: SR2500LX)
 - Intel[®] Server System SR4850HW4s
 - Intel[®] Server System SR6850HW4s
 - Intel[®] Server System S7000FC4UR with a SAS riser card
 - Intel[®] Server Boards S3420GP, S5520HC/S5500HCV, S5520UR, S5520SC, and S5500WB12V/S5500WB with the Intel[®]Integrated RAID Controller SROMBSASMR

Systems using the Intel[®] RAID Controller SROMBSAS18E provide XOR RAID modes 0, 1, 5, 10, and 50 when the optional Intel[®] RAID Activation Key AXXRAK18E and a DDR2 400 MHz ECC DIMM are installed.

Systems using the Intel[®] RAID Controller SROMBSASFC or SROMBSASMP2 require the optional Intel[®] RAID Activation Key AXXRAKSAS2 and a DDR2 667 MHz ECC DIMM to provide RAID modes 0, 1, 5, 6, 10, 50, and 60.

The Intel[®] Integrated RAID Controller SROMBSASMR has a specially designed connector that only fits Intel[®] Server Boards S5520HC/S5500HCV, S5520UR, S5520SC, and S5500WB12V/S5500WB.

- *Note:* This manual does not include the software RAID modes provided by the SAS riser card on the Intel[®] Server System S7000FC4UR. This manual does not include the RAID modes provided by the FALSASMP2 without Intel[®] RAID Activation Key AXXRAKSAS2.
- Intel[®] Intelligent RAID used on the Intel[®] RAID controllers RMS25PB080, RMS25PB040, RMT3PB080, RMS25CB080, RMS25CB040, RMT3CB080, RS25AB080, RS25SB008, RS25DB080, RS25NB008, RS2VB080, RS2VB040, RT3WB080, RS2SG244, RS2WG160, RMS2MH080, RMS2AF080, RMS2AF040, RS2BL080, RS2BL040, RS2BL080DE, RS2BL080SNGL, RS2PI008, RS2PI008DE, RS2MB044, RS2WC080, RS2WC040, SROMBSASMR, SRCSATAWB, SRCSASRB, SRCSASJV, SRCSABB8I, SRCSASLS4I, SRCSASPH16I, SROMBSASFC, SROMBSASMP2, SROMBSAS18E, SRCSAS18E and SRCSAS144E.
 - The first generation SAS controllers (SRCSAS18E, SRCSAS144E, SROMBSAS18E) provide XOR RAID modes 0, 1, 5, 10, and 50
 - The second generation SAS controller (including SRCSATAWB, SRCSASRB, SRCSASJV, SRCSABB8I, SRCSASLS4I, SRCSASPH16I, SROMBSASFC, SROMBSASMP2, SROMBSASMR) provides XOR RAID modes 0, 1, 5, 6, 10, 50, and 60.
 - The Intel[®] 6G SAS PCIe Gen 2 RAID Controllers (including RMS25PB080, RMS25PB040, RMT3PB080, RMS25CB080, RMS25CB040, RMT3CB080,

RS25AB080, RS25SB008, RS25DB080, RS25NB008, RS2VB080, RS2VB040, RT3WB080, RS2SG244, RS2WG160, RS2BL080, RS2BL080SNGL, RS2BL080DE, RS2BL040, RS2PI008, RS2PI008DE, RS2MB044, RS2WC080, RS2WC040, RMS2MH080, RMS2AF080 and RMS2AF040) support SAS 2.0 new features with XOR RAID modes 0, 1, 5, 6, 10, 50, and 60. (RS2WC080 and RS2WC040 are entry level hardware RAID controllers and do not support RAID 6 and 60; RMS2AF080 and RMS2AF040 are entry level hardware RAID controllers and do not support RAID 10, 6 and 60.)

For more details, refer to the *Technical Product Specification (TPS)* or *Hardware User's Guide (HWUG)* for the RAID controllers.

Note: The Intel[®] RAID Controllers RMS2AF080, RMS2AF040, RS2WC080, and RS2WC040 only support strip sizes of 8KB, 16KB, 32KB, and 64KB. Also, their Cache Policy only supports Write Through, Direct I/O, and Normal RAID (No Read Ahead). For more details, refer to their Hardware User's Guide (HWUG).

This manual does not include information about native SATA or SAS-only modes of the RAID controllers.

Two versions of the Intel[®] RAID Controller RS2BL080 are available - RS2BL080, RS2BL080DE.

All features on RS2BL080 are supported on RS2BL080DE. In addition, RS2BL080DE provides one more feature of FDE (Full Disk Encryption) that RS2BL080 doesn't support.

Two versions of the Intel[®] RAID Controller RS2PI008 are available - RS2PI008, RS2PI008DE.

All features on RS2PI008 are supported on RS2PI008DE. In addition, RS2PI008DE provides one more feature of FDE (Full Disk Encryption) that RS2PI008 doesn't support.

Caution: Some levels of RAID are designed to increase the availability of data and some to provide data redundancy. However, installing a RAID controller is not a substitute for a reliable backup strategy. It is highly recommended you back up data regularly via a tape drive or other backup strategy to guard against data loss. It is especially important to back up all data before working on any system components and before installing or changing the RAID controller or configuration.

Software

Intel[®] Embedded Server RAID Technology 2, Intel[®] IT/IR RAID and Intel[®] Integrated Server RAID controllers include a set of software tools to configure and manage RAID systems. These include:

- Intel[®] RAID controller software and utilities: The firmware installed on the RAID controller provides pre-operating system configuration.
 - For Intel[®] Embedded Server RAID Technology 2, press <Ctrl> + <E> during the server boot to enter the BIOS configuration utility.
 - For Intel[®] IT/IR RAID, press <Ctrl> + <C> during the server boot to enter the LSI MPT* SAS BIOS Configuration Utility
 - For Intel[®] Integrated Server RAID, press <Ctrl> + <G> during the server boot to enter the RAID BIOS Console II.
- Intel[®] RAID Controller Drivers: Intel provides software drivers for the following operating systems.

- Microsoft Windows 2000*, Microsoft Windows XP*, and Microsoft Windows Server 2003* (32-bit and 64-bit editions)
- Red Hat* Enterprise Linux 3.0, 4.0, and 5.0 (with service packs; X86 and X86-64)
- SuSE* Linux Enterprise Server 9.0, SuSE* Linux Enterprise Server 10, and SuSE* Linux Enterprise Server 11(with service packs; X86 and X86-64)
- VMWare* ESX 4i
- *Note:* Only the combinations of controller, driver, and Intel[®] Server Board or System listed in the Tested Hardware and Operating System List (THOL) were tested. Check the supported operating system list for both your RAID controller and your server board to verify operating system support and compatibility.
- Intel[®] RAID Web Console 2: A full-featured graphical user interface (GUI) utility is provided to monitor, manage, and update the RAID configuration.

RAID Terminology

RAID is a group of physical disks put together to provide increased I/O (Input/Output) performance (by allowing multiple, simultaneous disk access), fault tolerance, and reliability (by reconstructing failed drives from remaining data). The physical drive group is called an array, and the partitioned sets are called virtual disks. A virtual disk can consist of a part of one or more physical arrays, and one or more entire arrays.

Using two or more configured RAID arrays in a larger virtual disk is called spanning. It is represented by a double digit in the RAID mode/type (10, 50, 60).

Running more than one array on a given physical drive or set of drives is called a sliced configuration.

The only drive that the operating system works with is the virtual disk, which is also called a virtual drive. The virtual drive is used by the operating system as a single drive (lettered storage device in Microsoft Windows*).

The RAID controller is the mastermind that must configure the physical array and the virtual disks, and initialize them for use, check them for data consistency, allocate the data between the physical drives, and rebuild a failed array to maintain data redundancy. The features available per controller are highlighted later in this document and in the hardware guide for the RAID controller.

The common terms used when describing RAID functions and features can be grouped into two areas: fault tolerance (data protection and redundancy) and performance.

Fault Tolerance

Fault tolerance describes a state in which even with a drive failure, the data on the virtual drive is still complete and the system is available after the failure and during repair of the array. Most RAID modes are able to endure a physical disk failure without compromising data integrity or processing capability of the virtual drive.

RAID mode 0 is not fault tolerant. With RAID 0, if a drive fails, then the data is no longer complete and no longer available. Backplane fault tolerance can be achieved by a spanned array where the arrays are on different backplanes.

True fault tolerance includes the automatic ability to restore the RAID array to redundancy so that another drive failure will not destroy its usability.

Hot Spare

True fault tolerance requires the availability of a spare disk that the controller can add to the array and use to rebuild the array with the data from the failed drive. This spare disk is called a hot spare. It must be a part of the array before a disk failure occurs. A hot-spare drive is a physical drive that is maintained by the RAID controller but not actually used for data storage in the array unless another drive fails. Upon failure of one of the array's physical drives, the hot-spare drive is used to hold the recreated data and restore data redundancy.

Hot-spare drives can be global (available to any array on a controller) or dedicated (only usable by one array). There can be more than one hot spare per array and the drive of the closest capacity is used. If both dedicated and global hot-spare drives are available, then the dedicated drive is used first. If the hot swap rebuild fails, then that hot spare is also marked failed. Since RAID 0 is not redundant, there is no hot spare value.

If a hot-spare drive is not an option, then it is possible to perform a hot or cold swap of the failed drive to provide the new drive for rebuild after the drive failure. A swap is the manual substitution of a replacement drive in a disk subsystem. If a swap is performed while the system is running, it is a hot swap. A hot swap can only be performed if the backplane and enclosure support it. If the system does not support hot-swap drives, then the system must be powered down before the drive swap occurs. This is a cold swap.

In all cases (hot spare, hot swap, or cold swap), the replacement drive must be at least as large as the drive it replaces. In all three cases, the failed drive is removed from the array. If using a hot spare, then the failed drive can remain in the system. When a hot spare is available and an automatic rebuild starts, the failed drive may be automatically removed from the array before the utilities detect the failure. Only the event logs show what happened.

If the system is shut down during the rebuild, all rebuilds should automatically restart on reboot.

Note: If running a sliced configuration (RAID 0, RAID 5, and RAID 6 on the same set of physical drives), then the rebuild of the spare will not occur until the RAID 0 array is deleted.

On Intel[®] RAID Controller RS2WC080 and RS2WC040, if Virtual Drive is in degrade mode due to failed physical drive, auto rebuild is not supported for hot-plugged drive until a manual selection is made by users. As part of JBOD implementation for Intel[®] RAID Controller RS2WC080 and RS2WC040, all new drives that are hot-plugged will automatically become JBOD. Users need to manually move the JBOD drive to Unconfigured Good and auto rebuild starts after that. For more details, refer to *Hardware User's Guide* (HWUG) for above controllers.

Data Redundancy

Data redundancy is provided by mirroring or by disk striping with parity stripes.

• Disk mirroring is found only in RAID 1 and 10. With mirroring, the same data simultaneously writes to two disks. If one disk fails, the contents of the other disk can be

used to run the system and reconstruct the failed array. This provides 100% data redundancy but uses the most drive capacity, since 50% of the total capacity is available. Until a failure occurs, both mirrored disks contain the same data at all times. Either drive can act as the operational drive.

• Parity is the ability to recreate data by using a mathematical calculation derived from multiple data sets. Parity is basically a checksum of all the data known as the "ABCsum". When drive A fails, the controller uses the ABCsum to calculates what remains on drives B+C. The remainder must be recreated onto new drive A.

Parity can be dedicated (all parity stripes are placed on the same drive) or distributed (parity stripes are spread across multiple drives). Calculating and writing parity slows the write process but provides redundancy in a much smaller space than mirroring. Parity checking is also used to detect errors in the data during consistency checks and patrol reads.

RAID 5 uses distributed parity and RAID 6 uses dual distributed parity (two different sets of parity are calculated and written to different drives each time.) RAID modes 1 and 5 can survive a single disk failure, although performance may be degraded, especially during the rebuild. RAID modes 10 and 50 can survive multiple disk failures across the spans, but only one failure per array. RAID mode 6 can survive up to two disk failures. RAID mode 60 can sustain up to two failures per array.

Data protection is also provided by running calculations on the drives to make sure data is consistent and that drives are good. The controller uses consistency checks, background initialization, and patrol reads. You should include these in regular maintenance schedules.

- The consistency check operation verifies that data in the array matches the redundancy data (parity or checksum). This is not provided in RAID 0 in which there is no fault tolerance.
- Background initialization is a consistency check that is forced five minutes after the creation of a virtual disk. Background initialization also checks for media errors on physical drives and ensures that striped data segments are the same on all physical drives in an array.
- Patrol read checks for physical disk errors that could lead to drive failure. These checks usually include an attempt at corrective action. Patrol read can be enabled or disabled with automatic or manual activation. This process starts only when the RAID controller is idle for a defined period of time and no other background tasks are active, although a patrol read check can continue to run during heavy I/O processes.

Enclosure Management

Enclosure management is the intelligent monitoring of the disk subsystem by software or hardware usually within a disk enclosure. It increases the ability for the user to respond to a drive or power supply failure by monitoring those sub systems.

Performance

Performance improvements come from multiple areas including disk striping and disk spanning, accessing multiple disks simultaneously, and setting the percentage of processing capability to use for a task.

Disk Striping

Disk striping writes data across all of the physical disks in the array into fixed size partitions or stripes. In most cases, the stripe size is user-defined. Stripes do not provide redundancy but improve performance since striping allows multiple physical drives to be accessed at the same time. These stripes are interleaved in a repeated sequential manner and the controller knows where data is stored. The same stripe size should be kept across RAID arrays.

Terms used with strip sizing are listed below.

- Strip size: One disk section
- Stripe size: Total of one set of strips across all data disks, not including parity stripes
- Stripe width: The number of disks involved

Disk Spanning

Disk spanning allows more than one array to be combined into a single virtual drive. The spanned arrays must have the same stripe size and must be contiguous. Spanning alone does not provide redundancy but RAID modes 10, 50, and 60 all have redundancy provided in their pre-spanned arrays through RAID 1, 5, or 6.

Note: Spanning two contiguous RAID 0 drives does not produce a new RAID level or add fault tolerance. It does increase the size of the virtual volume and improves performance by doubling the number of spindles. Spanning for RAID 10, RAID 50, and RAID 60 requires two to eight arrays of RAID 1, 5, or 6 with the same stripe size and that always uses the entire drive.

CPU Usage

Resource allocation provides the user with the option to set the amount of compute cycles to devote to various tasks, including the rate of rebuilds, initialization, consistency checks, and patrol read. Setting resource to 100% gives total priority to the rebuild. Setting it at 0% means the rebuild will only occur if the system is not doing anything else. The default rebuild rate is 30%.

The RAID controller supports RAID levels 0, 1E, 5, 6, 10, 50, and 60. The supported RAID levels are summarized below. In addition, it supports independent drives (configured as RAID 0). This chapter describes the RAID levels in detail.

Summary of RAID Levels

- RAID 0: Uses striping to provide high data throughput, especially for large files in an environment that does not require fault tolerance. In Intel[®] IT/IR RAID, RAID 0 is also called Integrated Striping (IS), which supports striped arrays with two to ten disks.
- RAID 1: Uses mirroring so that data written to one disk drive simultaneously writes to another disk drive. This is good for small databases or other applications that require small capacity but complete data redundancy. In Intel[®] IT/IR RAID, RAID 1 is also called Integrated Mirroring (IM) which supports two-disk mirrored arrays and hot-spare disks.
- RAID 5: Uses disk striping and parity data across all drives (distributed parity) to provide high data throughput, especially for small random access.
- RAID 6: Uses distributed parity, with two independent parity blocks per stripe, and disk striping. A RAID 6 virtual disk can survive the loss of two disks without losing data.
- RAID IME: Integrated Mirroring Enhanced (IME) which supports mirrored arrays with three to ten disks, plus hot-spare disks. This is implemented in Intel[®] IT/IR RAID.
- RAID 10: A combination of RAID 0 and RAID 1, consists of striped data across mirrored spans. It provides high data throughput and complete data redundancy but uses a larger number of spans.
- RAID 50: A combination of RAID 0 and RAID 5, uses distributed parity and disk striping and works best with data that requires high reliability, high request rates, high data transfers, and medium-to-large capacity.
- *Note:* It is not recommended to have a RAID 0, RAID 5, and RAID 6 virtual disk in the same physical array. If a drive in the physical array has to be rebuilt, the RAID 0 virtual disk will cause a failure during the rebuild.
- RAID 60: A combination of RAID 0 and RAID 6, uses distributed parity, with two independent parity blocks per stripe in each RAID set, and disk striping. A RAID 60 virtual disk can survive the loss of two disks in each of the RAID 6 sets without losing data. It works best with data that requires high reliability, high request rates, high data transfers, and medium-to-large capacity.

Selecting a RAID Level

To ensure the best performance, select the optimal RAID level when the system drive is created. The optimal RAID level for a disk array depends on a number of factors:

- The number of physical drives in the disk array
- The capacity of the physical drives in the array
- The need for data redundancy
- The disk performance requirements

RAID 0 - Data Striping

RAID 0 provides disk striping across all drives in the RAID array. RAID 0 does not provide any data redundancy, but does offer the best performance of any RAID level. RAID 0 breaks up data into smaller segments, and then stripes the data segments across each drive in the array. The size of each data segment is determined by the stripe size. RAID 0 offers high bandwidth.

Note: RAID level 0 *is not fault tolerant. If a drive in a RAID* 0 *array fails, the whole virtual disk (all physical drives associated with the virtual disk) will fail.*

By breaking up a large file into smaller segments, the RAID controller can use both SAS drive and SATA drives to read or write the file faster. RAID 0 involves no parity calculations to complicate the write operation. This makes RAID 0 ideal for applications that require high bandwidth but do not require fault tolerance.

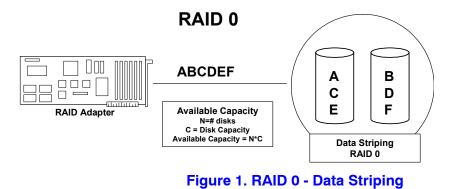


Table 1. RAID 0 Overview

Uses	Provides high data throughput, especially for large files. Any environment that does not require fault tolerance.
Strong Points	Provides increased data throughput for large files. No capacity loss penalty for parity.
Weak Points	Does not provide fault tolerance or high bandwidth. If any drive fails, all data is lost.
Drives	1 to 32

RAID 1 - Disk Mirroring/Disk Duplexing

In RAID 1, the RAID controller duplicates all data from one drive to a second drive. RAID 1 provides complete data redundancy, but at the cost of doubling the required data storage capacity. Table 2 provides an overview of RAID 1.

Uses	Use RAID 1 for small databases or any other environment that requires fault tolerance but small capacity.
Strong Points	Provides complete data redundancy. RAID 1 is ideal for any application that requires fault tolerance and minimal capacity.
Weak Points Requires twice as many disk drives. Performance is impaired dur rebuilds.	
Drives	2 to 32 (must be an even number of drives)

Table 2. RAID 1 Overview

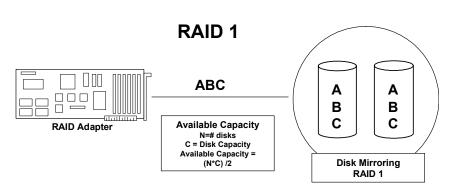


Figure 2. RAID 1 - Disk Mirroring/Disk Duplexing

RAID 5 - Data Striping with Striped Parity

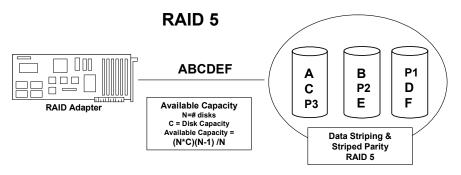
RAID 5 includes disk striping at the block level and parity. Parity is the data's property of being odd or even, and parity checking detects errors in the data. In RAID 5, the parity information is written to all drives. RAID 5 is best suited for networks that perform a lot of small I/O transactions simultaneously.

RAID 5 addresses the bottleneck issue for random I/O operations. Because each drive contains both data and parity, numerous writes can take place concurrently.

Table 3 provides an overview of RAID 5.

Table 3. RAID 5 Overview

Uses	Provides high data throughput, especially for large files. Use RAID 5 for transaction processing applications because each drive can read and write independently. If a drive fails, the RAID controller uses the parity drive to recreate all missing information. Use also for office automation and online customer service that requires fault tolerance. Use for any application that has high read request rates but low write request rates.
Strong Points	Provides data redundancy, high read rates, and good performance in most environments. Provides redundancy with lowest loss of capacity.
Weak Points	Not well suited to tasks requiring lot of writes. Suffers more impact if no cache is used (clustering). If a drive is being rebuilt, disk drive performance is reduced. Environments with few processes do not perform as well because the RAID overhead is not offset by the performance gains in handling simultaneous processes.
Drives	3 to 32





RAID 6 - Distributed Parity and Disk Striping

RAID 6 is similar to RAID 5 (disk striping and parity), but instead of one parity block per stripe, there are two. With two independent parity blocks, RAID 6 can survive the loss of two disks in a virtual disk without losing data.

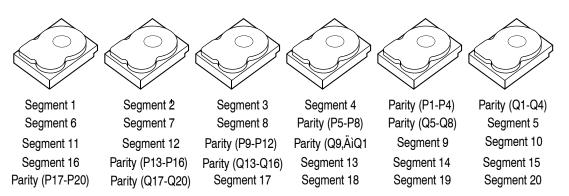
Table 4 provides an overview of RAID 6.

Table 4. RAID 6 Overview

Uses	Provides a high level of data protection through the use of a second parity block in each stripe. Use RAID 6 for data that requires a high level of protection from loss. In the case of a failure of one drive or two drives in a virtual disk, the RAID controller uses the parity blocks to recreate the missing information. If two drives in a RAID 6 virtual disk fail, two drive rebuilds are required, one for each drive. These rebuilds do not occur at the same time. The controller rebuilds one failed drive at a time.
	Use for office automation and online customer service that requires fault tolerance. Use for any application that has high read request rates but low write request rates.

Strong Points	Provides data redundancy, high read rates, and good performance in most environments. Can survive the loss of two drives or the loss of a drive while another drive is being rebuilt. Provides the highest level of protection against drive failures of all of the RAID levels. Read performance is similar to that of RAID 5.	
Weak Points	Not well suited to tasks requiring lot of writes. A RAID 6 virtual disk has to generate two sets of parity data for each write operation, which results in a significant decrease in performance during writes. Disk drive performance is reduced during a drive rebuild. Environments with few processes do not perform as well because the RAID overhead is not offset by the performance gains in handling simultaneous processes. RAID 6 costs more because of the extra capacity required by using two parity blocks per stripe.	
Drives	3 to 32	

The following figure shows a RAID 6 data layout. The second set of parity drives are denoted by Q. The P drives follow the RAID 5 parity scheme.



Parity is distributed across all drives in the array. When only three hard drives are available for RAID 6, the situation has to be that P equals Q equals original data, which means that the original data has three copies across the three hard drives.

Figure 4. Example of Distributed Parity across Two Blocks in a Stripe (RAID 6)

RAID IME

An IME volume can be configured with up to ten mirrored disks (one or two global hot spares can also be added). Figure 5 shows the logical view and physical view of an Integrated Mirroring Enhanced (IME) volume with three mirrored disks. Each mirrored stripe is written to a disk and mirrored to an adjacent disk. This type of configuration is also called RAID 1E.

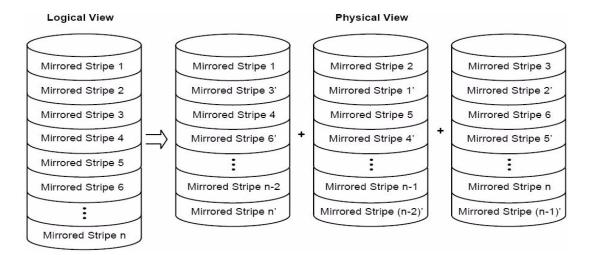


Figure 5. Integrated Mirroring Enhanced with Three Disks

Table 5. RAID 1E Overview

Uses	Use RAID 1E for small databases or any other environment that requires fault tolerance but small capacity.
Strong Points	Provides complete data redundancy. RAID 1E is ideal for any application that requires fault tolerance and minimal capacity.
Weak Points	Requires twice as many disk drives. Performance is impaired during drive rebuilds.
Drives	3 to 10

RAID 10 - Combination of RAID 1 and RAID 0

RAID 10 is a combination of RAID 0 and RAID 1. RAID 10 consists of stripes across mirrored drives. RAID 10 breaks up data into smaller blocks and then mirrors the blocks of data to each RAID 1 RAID set. Each RAID 1 RAID set then duplicates its data to its other drive. The size of each block is determined by the stripe size parameter, which is set during the creation of the RAID set. RAID 10 supports up to eight spans.

Table 6 provides an overview of RAID 10.

Table 6. RAID 10 Overview

Uses	Appropriate when used with data storage that requires 100 percent redundancy of mirrored arrays and that needs the enhanced I/O performance of RAID 0 (striped arrays). RAID 10 works well for medium- sized databases or any environment that requires a higher degree of fault tolerance and moderate to medium capacity.
Strong Points	Provides both high data transfer rates and complete data redundancy.
Weak Points	Requires twice as many drives as all other RAID levels except RAID 1.
Drives	4 - 240

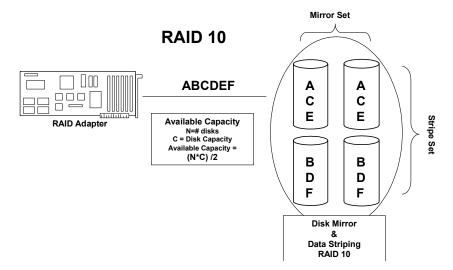


Figure 6. RAID 10 - Combination of RAID 1 and RAID 0

RAID 50 - Combination of RAID 5 and RAID 0

RAID 50 provides the features of both RAID 0 and RAID 5. RAID 50 includes both parity and disk striping across multiple arrays. RAID 50 is best implemented on two RAID 5 disk arrays with data striped across both disk groups.

RAID 50 breaks up data into smaller blocks and then stripes the blocks of data to each RAID 5 disk set. RAID 5 breaks up data into smaller blocks, calculates parity by performing an exclusive-or on the blocks and then writes the blocks of data and parity to each drive in the array. The size of each block is determined by the stripe size parameter, which is set during the creation of the RAID set.

RAID level 50 supports up to eight spans and tolerates up to eight drive failures, though less than total disk drive capacity is available. Though multiple drive failures can be tolerated, only one drive failure can be tolerated in each RAID 1 level array.

Table 7 provides an overview of RAID 50.

Table 7. RAID 50 Overview

Uses	Appropriate when used with data that requires high reliability, high request rates, high data transfer, and medium to large capacity.
Strong Points	Provides high data throughput, data redundancy, and very good performance.
Weak Points	Requires 2 to 8 times as many parity drives as RAID 5.
Drives	6 to 32

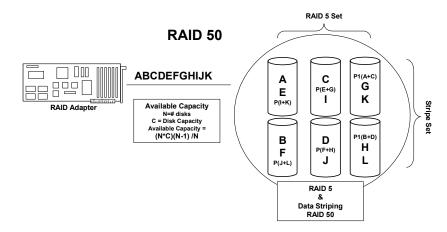


Figure 7. RAID 50 - Combination of RAID 5 and RAID 0

RAID 60 - Combination of RAID 0 and RAID 6

RAID 60 provides the features of both RAID 0 and RAID 6, and includes both parity and disk striping across multiple arrays. RAID 6 supports two independent parity blocks per stripe.

A RAID 60 virtual disk can survive the loss of two disks in each of the RAID 6 sets without losing data. RAID 60 is best implemented on two RAID 6 disk groups with data striped across both disk groups.

RAID 60 breaks up data into smaller blocks, and then stripes the blocks of data to each RAID 6 disk set. RAID 6 breaks up data into smaller blocks, calculates parity by performing an exclusive-or on the blocks and then writes the blocks of data and parity to each drive in the array. The size of each block is determined by the stripe size parameter, which is set during the creation of the RAID set.

RAID 60 supports up to 8 spans and tolerates up to 16 drive failures, though less than total disk drive capacity is available. Each RAID 6 level can tolerate two drive failures.

Table 8 provides an overview of RAID 60.

Table 8. RAID 60 Overview

	Provides a high level of data protection through the use of a second parity block in each stripe. Use RAID 60 for data that requires a very high level of protection from loss.
Uses	In the case of a failure of one drive or two drives in a RAID set in a virtual disk, the RAID controller uses the parity blocks to recreate all the missing information. If two drives in a RAID 6 set in a RAID 60 virtual disk fail, two drive rebuilds are required, one for each drive. These rebuilds do not occur at the same time. The controller rebuilds one failed drive, and then the other failed drive.
	Use for office automation, online customer service that requires fault tolerance or for any application that has high read request rates but low write request rates.
Strong Points	Provides data redundancy, high read rates, and good performance in most environments. Each RAID 6 set can survive the loss of two drives or the loss of a drive while another drive is being rebuilt. Provides the highest level of protection against drive failures of all of the RAID levels. Read performance is similar to that of RAID 50, though random reads in RAID 60 might be slightly faster because data is spread across at least one more disk in each RAID 6 set.
Weak Points	Not well suited to tasks requiring a lot of writes. A RAID 60 virtual disk has to generate two sets of parity data for each write operation, which results in a significant decrease in performance during writes. Disk drive performance is reduced during a drive rebuild. Environments with few processes do not perform as well because the RAID overhead is not offset by the performance gains in handling simultaneous processes. RAID 6 costs more because of the extra capacity required by using two parity blocks per stripe.
Drives	A minimum of 6.

The following figure shows a RAID 6 data layout. The second set of parity drives are denoted by Q. The P drives follow the RAID 5 parity scheme.

Note: When only three hard drives are available for RAID 6, the situation has to be that P equals Q equals original data, which means that the three hard drives have the same original data, which can afford two disk failures.

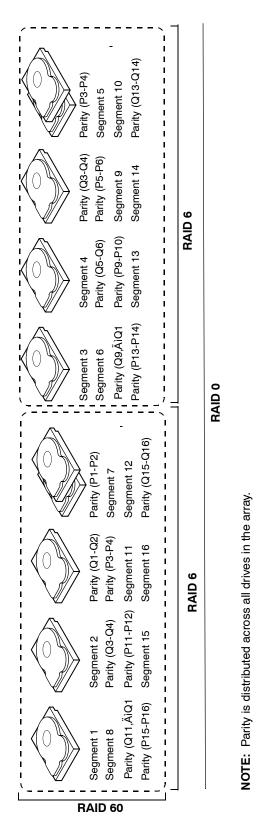


Figure 8. RAID 60 Level Virtual Drive

RAID Configuration Strategies

The most important factors in RAID array configuration are:

- Virtual disk availability (fault tolerance)
- Virtual disk performance
- Virtual disk capacity

You cannot configure a virtual disk that optimizes all three factors, but it is easy to choose a virtual disk configuration that maximizes one factor at the expense of another factor. For example, RAID 1 (mirroring) provides excellent fault tolerance, but requires a redundant drive. The following subsections describe how to use the RAID levels to maximize virtual disk availability (fault tolerance), virtual disk performance, and virtual disk capacity.

Maximizing Fault Tolerance

Fault tolerance is achieved through the ability to perform automatic and transparent rebuilds using hot-spare drives and hot swaps. A hot-spare drive is an unused online available drive that the RAID controller instantly plugs into the system when an active drive fails. After the hot spare is automatically moved into the RAID array, the failed drive is automatically rebuilt on the spare drive. The RAID array continues to handle requests while the rebuild occurs.

A hot swap is the manual substitution of a replacement unit in a disk subsystem for a defective one, where the substitution can be performed while the subsystem is running hot-swap drives. Auto-Rebuild in the WebBIOS Configuration Utility allows a failed drive to be replaced and automatically rebuilt by "hot swapping" the drive in the same drive bay. The RAID array continues to handle requests while the rebuild occurs, providing a high degree of fault tolerance and zero downtime.

RAID Level	Fault Tolerance
0	Does not provide fault tolerance. All data is lost if any drive fails. Disk striping writes data across multiple disk drives instead of just one disk drive. It involves partitioning each drive storage space into stripes that can vary in size. RAID 0 is ideal for applications that require high bandwidth but do not require fault tolerance.
1 or IME	Provides complete data redundancy. If one drive fails, the contents of the other drive can be used to run the system and reconstruct the failed drive. The primary advantage of disk mirroring is that it provides 100 percent data redundancy. Since the contents of the drive are completely written to a second drive, no data is lost if one of the drives fails. Both drives contain the same data at all times. RAID 1 or IME is ideal for any application that requires fault tolerance and minimal capacity.
5	Combines distributed parity with disk striping. Parity provides redundancy for one drive failure without duplicating the contents of entire disk drives. If a drive fails, the RAID controller uses the parity data to reconstruct all missing information. In RAID 5, this method is applied to the entire drive or stripes across all disk drives in an array. Using distributed parity, RAID 5 offers fault tolerance with limited overhead.

Table 9. RAID Levels and Fault Tolerance

RAID Level	Fault Tolerance
6	Combines distributed parity with disk striping. RAID 6 can sustain two drive failures and still maintain data integrity. Parity provides redundancy for two drive failures without duplicating the contents of entire disk drives. If a drive fails, the RAID controller uses the parity data to reconstruct all missing information. In RAID 6, this method is applied to entire drives or stripes across all drives in an array. Using distributed parity, RAID 6 offers fault tolerance with limited overhead.
10	Provides complete data redundancy using striping across spanned RAID 1 arrays. RAID 10 works well for any environment that requires the 100 percent redundancy offered by mirrored arrays. RAID 10 can sustain a drive failure in each mirrored array and maintain drive integrity.
50	Provides data redundancy using distributed parity across spanned RAID 5 arrays. RAID 50 includes both parity and disk striping across multiple drives. If a drive fails, the RAID controller uses the parity data to recreate all missing information. RAID 50 can sustain one drive failure per RAID 5 array and still maintain data integrity.
60	Provides data redundancy using distributed parity across spanned RAID 6 arrays. RAID 60 can sustain two drive failures per RAID 6 array and still maintain data integrity. It provides the highest level of protection against drive failures of all of the RAID levels. RAID 60 includes both parity and disk striping across multiple drives. If a drive fails, the RAID controller uses the parity data to recreate all missing information.

Maximizing Performance

A RAID disk subsystem improves I/O performance. The RAID array appears to the host computer as a single storage unit or as multiple virtual units. I/O is faster because drives can be accessed simultaneously. Table 10 describes the performance for each RAID level.

Table 10. RAID Levels and Performance

RAID Level	Performance
0	RAID 0 (striping) offers the best performance of any RAID level. RAID 0 breaks up data into smaller blocks, then writes a block to each drive in the array. Disk striping writes data across multiple drives instead of just one drive. It involves partitioning each drive storage space into stripes that can vary in size from 8 KB to 128 KB. These stripes are interleaved in a repeated sequential manner. Disk striping enhances performance because multiple drives are accessed simultaneously.
1 or IME	With RAID 1 or IME (mirroring), each drive in the system must be duplicated, which requires more time and resources than striping. Performance is impaired during drive rebuilds.

RAID Level	Performance
5	RAID 5 provides high data throughput, especially for large files. Use this RAID level for any application that requires high read request rates, but low write request rates, such as transaction processing applications, because each drive can read and write independently. Since each drive contains both data and parity, numerous writes can take place concurrently. In addition, robust caching algorithms and hardware based exclusive-or assist make RAID 5 performance exceptional in many different environments.
	Parity generation can slow the write process, making write performance significantly lower for RAID 5 than for RAID 0 or RAID 1. Disk drive performance is reduced when a drive is being rebuilt. Clustering can also reduce drive performance. Environments with few processes do not perform as well because the RAID overhead is not offset by the performance gains in handling simultaneous processes.
6	RAID 6 works best when used with data that requires high reliability, high request rates, and high data transfer. It provides high data throughput, data redundancy, and very good performance. However, RAID 6 is not well suited to tasks requiring a lot of writes. A RAID 6 virtual disk has to generate two sets of parity data for each write operation, which results in a significant decrease in performance during writes. Disk drive performance is reduced during a drive rebuild. Environments with few processes do not perform as well because the RAID overhead is not offset by the performance gains in handling simultaneous processes.
10	RAID 10 works best for data storage that need the enhanced I/O performance of RAID 0 (striped arrays), which provides high data transfer rates. Spanning increases the size of the virtual volume and improves performance by doubling the number of spindles. The system performance improves as the number of spans increases (the maximum number of spans is eight). As the storage space in the spans is filled, the system stripes data over fewer and fewer spans and RAID performance degrades to that of a RAID 1 or RAID 5 array.
50	RAID 50 works best when used with data that requires high reliability, high request rates, and high data transfer. It provides high data throughput, data redundancy, and very good performance. Spanning increases the size of the virtual volume and improves performance by doubling the number of spindles. The system performance improves as the number of spans increases (the maximum number of spans is eight). As the storage space in the spans is filled, the system stripes data over fewer and fewer spans and RAID performance degrades to that of a RAID 1 or RAID 5 array.
60	RAID 60 works best when used with data that requires high reliability, high request rates, and high data transfer. It provides high data throughput, data redundancy, and very good performance. Spanning increases the size of the virtual volume and improves performance by doubling the number of spindles. The system performance improves as the number of spans increases (the maximum number of spans is eight). As the storage space in the spans is filled, the system stripes data over fewer and fewer spans and RAID performance degrades to that of a RAID 1 or RAID 6 array.
	RAID 60 is not well suited to tasks requiring a lot of writes. A RAID 60 virtual disk has to generate two sets of parity data for each write operation, which results in a significant decrease in performance during writes. Disk drive performance is reduced during a drive rebuild. Environments with few processes do not perform as well because the RAID overhead is not offset by the performance gains in handling simultaneous processes.

Maximizing Storage Capacity

Storage capacity is an important factor when selecting a RAID level. There are several variables to consider. Striping alone (RAID 0) requires less storage space than mirrored data (RAID 1 or IME) or distributed parity (RAID 5 or RAID 6). RAID 5, which provides redundancy for one drive failure without duplicating the contents of entire disk drives, requires less space then RAID 1. Table 11 explains the effects of the RAID levels on storage capacity.

Table 11. RAID Levels and Capacity

RAID Level	Capacity
0	RAID 0 (disk striping) involves partitioning each drive storage space into stripes that can vary in size. The combined storage space is composed of stripes from each drive. RAID 0 provides maximum storage capacity for a given set of physical disks.
1 or IME	With RAID 1 (mirroring), data written to one disk drive is simultaneously written to another disk drive, which doubles the required data storage capacity. This is expensive because each drive in the system must be duplicated.
5	RAID 5 provides redundancy for one drive failure without duplicating the contents of entire disk drives. RAID 5 breaks up data into smaller blocks, calculates parity by performing an exclusive-or on the blocks, then writes the blocks of data and parity to each drive in the array. The size of each block is determined by the stripe size parameter, which is set during the creation of the RAID set.
6	RAID 6 provides redundancy for two drive failures without duplicating the contents of entire disk drives. However, it requires extra capacity because it uses two parity blocks per stripe. This makes RAID 60 more expensive to implement.
10	RAID 10 requires twice as many drives as all other RAID levels except RAID 1. RAID 10 works well for medium-sized databases or any environment that requires a higher degree of fault tolerance and moderate to medium capacity. Disk spanning allows multiple disk drives to function like one big drive. Spanning overcomes lack of disk space and simplifies storage management by combining existing resources or adding relatively inexpensive resources.
50	RAID 50 requires two to four times as many parity drives as RAID 5. This RAID level works best when used with data that requires medium to large capacity.
60	RAID 60 provides redundancy for two drive failures in each RAID set without duplicating the contents of entire disk drives. However, it requires extra capacity because a RAID 60 virtual disk has to generate two sets of parity data for each write operation. This makes RAID 60 more expensive to implement.

RAID Availability

RAID Availability Concept

Data availability without downtime is essential for many types of data processing and storage systems. Businesses want to avoid the financial costs and customer frustration associated with failed servers. RAID helps you maintain data availability and avoid downtime for the servers that provide that data. RAID offers several features, such as spare drives and rebuilds, that you can use to fix any physical disk problems, while keeping the servers running and data available. The following subsections describe these features.

Spare Drives

You can use spare drives to replace failed or defective drives in an array. A replacement drive must be at least as large as the drive it replaces. Spare drives include hot swaps, hot spares, and cold swaps.

A hot swap is the manual substitution of a replacement unit in a disk subsystem for a defective one, where the substitution can be performed while the subsystem is running (performing its normal functions). In order for the functionality to work, the backplane and enclosure must support hot swap.

Hot-spare drives are physical drives that power up along with the RAID drives and operate in a standby state. If a physical disk used in a RAID virtual disk fails, a hot spare automatically takes its place and the data on the failed drive is rebuilt on the hot spare. Hot spares can be used for RAID levels 1, IME, 5, 6, 10, 50, and 60.

Note: If a rebuild to a hot spare fails for any reason, the hot-spare drive will be marked as "failed". If the source drive fails, both the source drive and the hot-spare drive will be marked as "failed".

Before you replace a defective physical disk in a disk subsystem, a cold swap requires that you power down the system.

Rebuilding

If a physical disk fails in an array that is configured as a RAID 1, IME, 5, 6, 10, 50, or 60 virtual disk, you can recover the lost data by rebuilding the drive. If you have configured hot spares, the RAID controller automatically tries to use them to rebuild failed arrays. A manual rebuild is necessary if there are no hot spares available with enough capacity to rebuild the failed array. Before rebuilding the failed array, you must install a drive with enough storage into the subsystem.

Drive in Foreign State

When newly inserted drives are detected by the RAID controller, and are displayed in either RAID BIOS Console 2 or RAID Web Console 2, their state may show as (Foreign) Unconfigured Good, or (Foreign) Unconfigured Bad. The Foreign state indicates that the RAID controller finds existing RAID configuration on the new drives. Since these drives cannot be configured directly, avoid deleting data on the existing RAID by mistake. Use "Scan for Foreign Configuration" option in RAID Web Console 2, or use "Scan Devices" option in RAID BIOS Console 2, in order to preview, import or clear the existing RAID configurations on the drives. If existing RAID configurations are cleared, their state changes to Unconfigured Good or Unconfigured Bad.

Copyback

The copyback feature allows you to copy data from a source drive of a virtual drive to a destination drive that is not a part of the virtual drive. Copyback is often used to create or restore a specific physical configuration for a drive group (for example, a specific arrangement of drive group members on the device I/O buses). Copyback can be run automatically or manually.

Typically, when a drive fails or is expected to fail, the data is rebuilt on a hot spare. The failed drive is replaced with a new disk. Then the data is copied from the hot spare to the new drive, and the hot spare reverts from a rebuild drive to its original hot spare status. The copyback operation runs as a background activity, and the virtual drive is still available online to the host.

Copyback is also initiated when the first Self-Monitoring Analysis and Reporting Technology (SMART) error occurs on a drive that is part of a virtual drive. The destination drive is a hot spare that qualifies as a rebuild drive. The drive with the SMART error is marked as "failed" only after the successful completion of the copyback. This avoids putting the drive group in degraded status.

Note: During a copyback operation, if the drive group involved in the copyback is deleted because of a virtual drive deletion, the destination drive reverts to an Unconfigured Good state or hot spare state.

Order of Precedence

In the following scenarios, rebuild takes precedence over the copyback operation:

- 1. If a copyback operation is already taking place to a hot spare drive, and any virtual drive on the controller degrades, the copyback operation aborts, and a rebuild starts. The rebuild changes the virtual drive to the optimal state.
- 2. The rebuild operation takes precedence over the copyback operation when the conditions exist to start both operations. For example:
 - Where the hot spare is not configured (or unavailable) in the system.
 - There are two drives (both members of virtual drives), with one drive exceeding the SMART error threshold, and the other failed.
 - If you add a hot spare (assume a global hot spare) during a copyback operation, the copyback is aborted, and the rebuild operation starts on the hot spare.

Configuration Planning

Factors to consider when planning a configuration are the number of physical disks the RAID controller can support, the purpose of the array, and the availability of spare drives.

Each type of data stored in the disk subsystem has a different frequency of read and write activity. If you know the data access requirements, you can more successfully determine a strategy for optimizing the disk subsystem capacity, availability, and performance.

Servers that support video-on-demand typically read the data often, but write data infrequently. Both the read and write operations tend to be long. Data stored on a general-purpose file server involves relatively short read and write operations with relatively small files.

Dimmer Switch Feature

Powering and cooling drives represents a major cost for data centers. The new MegaRAID DimmerTM Switch reduces the power consumption of the devices connected to a MegaRAID controller. This helps to share resources more efficiently and lower costs.

With Dimmer Switch, any unconfigured drive connected to a MegaRAID controller is spun down after 30 minutes of inactivity, reducing its power usage. Spun down drives are spun up automatically when you create a configuration using those drives.

Number of Physical Disks

Your configuration planning for the SAS RAID controller depends in part on the number of physical disks that you want to use in a RAID array. The number of drives in an array determines the RAID levels that can be supported. Only one RAID level can be assigned to each virtual disk.

MegaRAID Fast Path

The MegaRAID Fast Path Premium Feature is a high performance IO Accelerator technology for Solid State Drive RAID Arrays connected to a MegaRAID adapter. There are two "Levels" to this feature. Level 1 Fast Path enabled by default without PFK. The "Standard" or Level 1 Fast Path pertains to general IO Path improvements to Write Through data transfers. Additionally, controller cache tuning has resulted in improvements to configurations leveraging write back mode.

Level 2 Fast Path enabled automatically with Intel[®] RAID Premium Feature Key AXXRPFKSSD or AXXRPFKSSD2 installed. Level 2 Fast Path is SSD-centric. This is where the Premium Feature kicks in by supporting full optimization of SSD Virtual Disk groups. With this premium feature enabled, Solid State Drive configurations tuned for small, random block-size IO activity -- typical of transactional database applications -- can sustain higher numbers of IO READs Per Second, compared with Level 1 Fast Path. The performance levels reached with this solution are equivalent to those of much costlier Flash-based adapter card solutions.

Refer to Intel[®] RAID Premium Feature Key AXXRPFKSSD, AXXRPFKDE, and AXXRPFKSNSH Installation Guide (E88588-00x) or Intel[®] RAID Premium Feature Keys AXXRPFKSSD2, AXXRPFKDE2, and AXXRPFKSNSH2 Installation Guide (G29824-00x) for description of the Premium Feature Key (PFK).

4K Sector Drive Support

The disk drive industry is in transition to support disk drives with native formatting of 4K sectors. 4K formatted drives provide an opportunity to improve capacity and error correction efficiencies as capacities grow, and as improvements in error correction are implemented. Drives supporting 4K sectors will also support a 512 byte emulation mode which will allow

the drive to be operated with legacy OS and hardware products that do not support 4K byte sectors. Intel[®] plans to implement 4K sector support on all new products, beginning with those designed to utilize the LSI 2208 and LSI2308 SAS products. Currently shipping Intel[®] RAID and SAS products will support 4K sector drives running in legacy 512b sector mode.

Larger than 2TB Drive Support

The disk drive industry is in transition to support disk drives with volume size larger than 2 Terabytes. The Intel[®] 6G SAS PCIe Gen2 RAID Controllers can fully recognize and configure the volume of these disk drives. For the other RAID types listed in "Supported Hardware" section, there is no problem for the first 2TB space of the disk drive to be recognized and configured.

Power Save settings

The controller conserves energy by placing certain unused drives into powersave mode. The controller will automatically spin up drives from powersave mode whenever necessary. Drives that can be set to power save mode are: Unconfigured Drives, Hot Spare Drives, Configured Drives. The setting can be made in either RAID BIOS Console 2, or RAID Web Console 2. There is also a way to disable this setting from CmdTool2, by typing: CmdTool2 -LDSetPowerPolicy -None -Lall -a0

This command only has effect when one or more logical drives are created. The Power Save mode currently is only supported by Intel[®] Intelligent RAID products.

Shield State

Physical devices in RAID firmware transit between different states. If the firmware detects a problem or a communication loss for a physical drive, the firmware transitions the drive to a bad (FAILED or UNCONF BAD) state. To avoid transient failures, an interim state called the Shield State is introduced before marking the drive as being in a bad state.

The Shield State is an interim state of a physical drive for diagnostic operations. The results of the diagnostic tests determine if the physical drive is good or bad. If any of the diagnostic tests fail, the physical drive transitions to a bad state (FAILED or UNCONF BAD).

The three possible Shield States are:

- Unconfigured Shielded
- Configured Shielded
- Hotspare Shielded

Physical View and Logical View in either RAID BIOS Console 2 or RAID Web Console 2 can reflect drive Shield State. Other drive states include:

- Unconfigured Good
- Online
- Hotspare
- Failed
- Rebuilding

- Unconfigured Bad
- Missing
- Offline
- None

Array Purpose

Important factors to consider when creating RAID arrays include availability, performance, and capacity. Define the major purpose of the disk array by answering questions related to these factors, such as the following, which are followed by suggested RAID levels for each situation:

- Will this disk array increase the system storage capacity for general-purpose file and print servers? Use RAID 5, 6, 10, 50, or 60.
- Does this disk array support any software system that must be available 24 hours per day? Use RAID 1, IME, 5, 6, 10, 50, or 60.
- Will the information stored in this disk array contain large audio or video files that must be available on demand? Use RAID 0.
- Will this disk array contain data from an imaging system? Use RAID 0 or 10.

Fill out Table 12 to help you plan the array configuration. Rank the requirements for your array, such as storage space and data redundancy, in order of importance, and then review the suggested RAID levels.

Requirement	Suggested RAID Level(s)
Storage space	RAID 0, RAID 5
Data redundancy	RAID 5, RAID 6, RAID 10, RAID 50, RAID 60
Physical disk performance and throughput	RAID 0, RAID 10
Hot spares (extra physical disks required)	RAID 1, RAID IME, RAID 5, RAID 6, RAID 10, RAID 50, RAID 60

Table 12. Factors to Consider for Array Configuration

Intel[®] Embedded Server RAID Technology 2 BIOS Configuration Utility

With support for up to six SATA drives or eight SAS/SATA drives, depending on the server board or system, the embedded RAID BIOS has the following features:

- Support for interrupt 13 and Int19h.
- Support for SATA CD-ROM/DVD-ROM devices, including support for booting from a CD-ROM drive.
- POST (Power On Self Test) and run-time BIOS support for device insertion and removal.
- Support for a migration path from Intel[®] Embedded Server RAID Technology 2 to Intel Integrated Server RAID hardware.
- Automatic resume of rebuilding, check consistency, and initialization.
- Global hot spare support based on the virtual drive size.
- Support for RAID levels 0, 1, 5, and 10.
- Support for auto rebuild.
- Support for different capacity disks in the same array.
- Support for up to eight physical drives and eight virtual drives.
- Stripe size of 64 KB only.
- Support for disk coercion with options of None, 128 MB, or 1 GB.
- Ability to select a virtual drive as boot device. By default, virtual drive 0 is bootable.

LSI MPT* SAS BIOS Configuration Utility

You can use the LSI MPT* SAS BIOS Configuration Utility to create one or two IM/IME volumes on each Intel[®] IT/IR RAID Controller, with one or two optional global hot-spare disks. All disks in an IM/IME volume must be connected to the same Intel[®] IT/IR RAID Controller.

Although you can use disks of different size in IM and IME volumes, the smallest disk in the volume will determine the logical size of all disks in the volume. In other words, the excess space of the larger member disk(s) will not be used. For example, if you create an IME volume with two 100 GB disks and two 120 GB disks, only 100 GB of the larger disks will be used for the volume.

Integrated Mirroring and Integrated Mirroring Enhanced support the following features:

• Configurations of one or two IM or IME volumes on the same Intel[®] IT/IR RAID Controller. IM volumes have two mirrored disks; IME volumes have three to ten mirrored disks. Two volumes can have up to a total of 12 disks.

Note: This feature requires IR RAID firmware v1.20.00 or above to be installed.

• One or two global hot-spare disks per controller, to automatically replace failed disks in IM/IME volumes. The hot-spare drives are in addition to the 12-disk maximum for two volumes per Intel[®] IT/IR RAID Controller.

Note: Support for two hot-spare disks requires IR RAID firmware v1.20.00 or above.

- Mirrored volumes run in optimal mode or in degraded mode (if one mirrored disk fails).
- Hot-swap capability.
- Presents a single virtual drive to the OS for each IM/IME volume.
- Supports both SAS and SATA disks. The two types of disks cannot be combined in the same volume. However, a Intel[®] IT/IR RAID Controller can support one volume with SATA disks and a second volume with SAS disks.
- Fusion-MPT* architecture.
- Easy-to-use BIOS-based configuration utility.
- Error notification: The drivers update an OS-specific event log.
- LED status support.
- Write journaling, which allows automatic synchronization of potentially inconsistent data after unexpected power-down situations.
- Metadata used to store volume configuration on mirrored disks.
- Automatic background resynchronization while the host continues to process inputs/outputs (I/Os).
- Background media verification ensures that data on IM/IME volumes is always accessible.

Intel[®] RAID BIOS Console 2 Configuration Utility for Intelligent RAID

The Intel[®] RAID BIOS Console 2 configuration utility provides full-featured, GUI-based configuration and management of RAID arrays. The Intel[®] RAID BIOS Console 2 utility resides in the controller firmware and is independent of the operating system. The Intel[®] RAID BIOS Console 2 configuration utility lets you:

- Select an Intel[®] RAID controller
- Choose a configuration method for physical arrays, disk groups, and virtual drives
- Create drive arrays
- Define virtual drives
- Initialize virtual drives
- Access controllers, virtual drives, and physical arrays to display their properties

- Create hot-spare drives
- Rebuild failed drives
- Verify data redundancy in RAID 1, 5, 6, 10, 50, or 60 virtual drives

Intel[®] RAID Web Console 2 Configuration and Monitoring Utility

The Intel[®] RAID Web Console 2 is an operating system-based, object-oriented GUI utility that configures and monitors RAID systems locally or over a network. The Intel[®] RAID Web Console 2 runs on each of the supported Microsoft Windows* and Linux operating systems.

With the Intel[®] RAID Web Console 2, you can perform the same tasks as you can with the Intel[®] RAID BIOS Console 2 or with the Intel[®] Embedded Server RAID BIOS Configuration utility. In addition, the Intel[®] RAID Web Console 2 provides on-the-fly RAID migration, creating almost limitless adaptability and expansion of any virtual drive while the system remains operational.

The Intel[®] RAID Web Console 2 allows you to:

- Create and manage virtual drives
- Add a drive to a RAID virtual drive

The following situations assume RAID 0 has one drive and RAID 1 has two drives:

- convert from RAID 0 to RAID 1 by adding one additional drive.
- convert from RAID 0 to RAID 5 by adding two additional drives.
- convert from RAID 0 to RAID 6 by adding three additional drives.
- convert from RAID 1 to RAID 0.
- convert from RAID 1 to RAID 5 by adding one additional drive.
- convert from RAID 1 to RAID 6 by adding two additional drives.
- convert from RAID 5 to RAID 0.
- convert from RAID 5 to RAID 6 by adding one additional drive.
- convert from RAID 6 to RAID 0.
- convert from RAID 6 to RAID 5.
- convert a degraded RAID into RAID 0.
- remove physical drives from a virtual drive.
- *Note:* While you can apply RAID-level migration at any time, Intel[®] recommends that you do so when there are no reboots. Many operating systems issues I/O operations serially (one at a time) during boot. With a RAID-level migration running, a boot can often take more than 15 minutes.

Drive Hierarchy within the RAID Firmware

The Intel[®] Integrated RAID firmware is based on three fundamental levels. Virtual drives are created from drive arrays that are created from physical drives.

- Level 1 consists of the physical drives (hard drives and removable hard disks). The firmware identifies each drive by its physical ID and maps it to a virtual address. A virtual drive can be constructed of more than one physical drive.
- Level 2 consists of the array(s) formed by firmware made of one or more disks and can be made into RAID 0, 1, 5, 6, 10, 50, or 60.
- Level 3 consists of the virtual drives. These are the only drives that can be accessed by the operating system. These are the drives given drive letters (C, D, and so forth) under the Microsoft Windows* operating system. The firmware automatically transforms each newly installed drive array into a virtual drive. RAID 0, 1, 5, or 6 use a single array and RAID 10, 50, 60 use multiple arrays.

Intel[®] Intelligent RAID Controller Features

Enterprise Features

- Online capacity expansion (OCE). Add capacity to the virtual drive. The added capacity can be presented to the operating system as additional space for the operating system to partition it as an additional drive, or it may be added to an operating system drive, depending upon the capability of the operating system.
- Online RAID level migration allows for upgrading a RAID level. Options are to go from RAID 1 to RAID 0, RAID 5 to RAID 0, RAID 6 to RAID 0, RAID 6 to RAID 5. With OCE, options are to go from RAID 0 to RAID 1, RAID 0 to RAID 5, RAID 0 to RAID 6, RAID 1 to RAID 5, RAID 1 to RAID 6, RAID 5 to RAID 6.
 - You cannot migrate or perform OCE on a spanned RAID array or disk group (RAID 10, RAID 50, or RAID 60).
 - You cannot migrate to a smaller capacity configuration.
 - You cannot perform OCE when there is more than one virtual drive on a virtual array or disk group.
- Each controller allows 128 virtual drives.
- When five or more disks are used, Smart Initialization automatically checks consistency of virtual drives for RAID 5. This allows performance optimization by enabling read-modify-write mode of operation with five or more disks in a RAID 5 array or disk group. Peer read mode of operation is used when the RAID 5 array or disk group contains three or four physical drives.
- If the system shuts down, the initialization or rebuild process automatically resumes on the next boot. Auto resume must be enabled prior to virtual drive creation.
- Stripe size is user definable on a per drive basis and can be 8, 16, 32, 64, or 128 KB in size. The default is 256 KB, which is optimal for many data access types.

- Hot spares can be set as global or dedicated. A global hot spare automatically comes online to replace the first drive to fail on any array or disk group on the controller. A dedicated hot spare is assigned to a specific array or disk group and only comes online to rebuild this specific failed array or disk group. A hot spare only comes online if it is the same size or larger than the failing drive (see drive coercion below), and if a drive has been marked as failed. If a drive is removed (and marked as failed) within a virtual drive, the hot spare automatically comes online. However, there must be disk activity (I/O to the drive) in order for a missing drive to be marked as failed.
- Drive coercion refers to the ability of the controller to recognize the size of the physical drives connected and then force the larger drives to use only the amount of space available on the smallest drive. Drive coercion allows an option to map out a reserved space to compensate for slightly smaller drive sizes that may be added later. The default is set to 1 GB. The coercion algorithm options are:
 - None: No coercion of size.
 - 128 MB: The software rounds the drive capacity down to the next 128 MB boundary and then up to the nearest 10 MB until the coerced capacity is larger than the actual drive size. It is then reduced by 10 MB.
 - 1 GB: The software rounds the drive capacity down to the nearest 1 GB boundary and then down by 1 MB. This corresponds to the terms most drive manufacturers use.

Fault Tolerant Features

- Configuration on Disk (COD) and NVRAM (Non-volatile Random Access Memory) storage of array and disk group configuration information. Array and disk group configuration information is stored both on the hard drive (COD) and in NVRAM. This helps protect against loss of the configuration due to adapter and/or drive failure.
- Failed drives are automatically detected and a transparent rebuild of the failed array automatically occurs using a hot-spare drive.
- Support for SAF-TE (SCSI Accessed Fault-Tolerant Enclosure) enabled enclosures allows enhanced drive failure and rebuild reporting via enclosure LEDs (Light-Emitting Diodes); support also includes hot swapping of hard drives.
- A battery backup for cache memory is available as an option. RAID controller firmware automatically checks for the presence of the battery module, and if found, allows the write back cache option. The adapter continuously tracks the battery voltage and reports if the battery is low. If low, the battery is first given a fast charge to replenish the charge and is then given a trickle charge to keep it at an optimal power level. Adapters that support the battery module include a "dirty cache" LED; when power is lost to the system and data remains in the cache memory that has not been written to disk, the LED signals that this operation needs to be completed. Upon reboot, the data in memory can then write to the hard disk drive.
- Although I/O performance may be lower, hard disk drive write-back cache is disabled by default because data can potentially be lost if a power outage occurs. Enabling the HDD write-back cache may improve performance, but when enabled, you should use a UPS (Uninterruptible Power Supply) device to prevent data loss during power outages.
- Battery life is about three years. You should monitor the battery health and replace when needed.

• SMART (Self-Monitoring Analysis and Reporting Technology) technology is supported. This provides a higher level of predictive failure analysis of the hard disk drives by the RAID controller.

Cache Options and Settings

Cache options and settings can be unique for each virtual drive.

- Cache Write Policy
 - Write Through: I/O completion is signaled only after the data is written to hard disk.
 - Write Back with BBU: I/O completion is signaled when data is transferred to cache.
 - Always Write Back- Write back is enabled even if BBU is bad or missing
- Cache Policy
 - Direct I/O: When possible, no cache is involved for both reads and writes. The data transfers are directly from host system to the disk and from the disk to the host system.
 - Cached I/O: All reads first look at cache. If a cache hit occurs, the data is read from cache; if not, the data is read from disk and the read data is buffered into cache. All writes to drive are also written to cache.
- Read Policy
 - No Read Ahead: Provides no read ahead for the virtual drive.
 - Read Ahead: Reads and buffers additional consecutive stripes/lines into cache.
 - Adaptive: The read ahead automatically turns on and off depending upon whether the disk is accessed for sequential reads or random reads.

Background Tasks

- Rebuilding a failed drive is performed in the background. The rebuild rate is tunable from 0-100%.
 - The rebuild rate controls the amount of system resources allocated to the rebuild.
 - *Caution:* It is not recommended to increase the rebuild rate to over 50%. A higher rebuild rate can result in operating system requests not being serviced in a timely fashion and causing an operating system error.
- A consistency check scans the consistency of data on a fault-tolerant disk to determine if data has been corrupted.
- Background initialization is a background check of consistency. It has the same functionality as the check consistency option but is automatic and can be canceled only temporarily. If it is canceled, it starts again in a few minutes. Background initialization is only performed on redundant volumes.
- RAID level migration and online capacity expansion are completed in the background.
- Patrol Read is a user definable option available in the Intel[®] RAID Web Console 2 that performs drive reads in the background and maps out any bad areas of the drive.

Error Handling

- Most commands are retried four or more times. The firmware is programmed to provide the best effort to recognize an error and recover from it if possible.
- Failures are logged and stored in NVRAM. Operating system-based errors are viewable from the event viewer in the Web Console 2.
- RAID-related errors can be reported by the hard drive firmware, SAF-TE controller, or the RAID controller firmware. These errors may be reported to the operating system through RAID management software, through SMART monitoring, or through CIM management. Some errors may also be reported by the SAF-TE controller and logged in the system event log (SEL) for the Intel[®] server board. In addition, the operating system may report access errors. Depending on the RAID controller and drive enclosure, the error may be evident by the color of LEDs, the flashing of LEDs, or audible alarms.

Audible Alarm

The following list of beep tones is used on $Intel^{\mathbb{R}}$ Intelligent RAID Controllers. These beeps usually indicate that a drive has failed.

- Degraded Array or Disk Group: Short tone, 1 second on, 1 second off
- Failed Array or Disk Group: Long tone, 3 seconds on, 1 second off
- Hot Spare Commissioned Short tone, 1 second on, 3 seconds off

During a rebuild, the tone alarm stays on. After the rebuild completes, an alarm with a different tone will sound.

The disable alarm option in either the Intel[®] RAID BIOS Console 2 or Intel[®] Web Console 2 management utilities holds the alarm disabled after a power cycle. You must use the enable alarm option to re-enable the alarm.

The silence alarm option in either the $Intel^{\mathbb{R}}$ RAID BIOS Console 2 or the $Intel^{\mathbb{R}}$ Web Console 2 management utilities will silence the alarm until a power cycle or another event occurs.

The drivers that Intel provides for Intel[®] RAID Controllers are not compatible with SCSI or SATA-only RAID controllers. The RAID driver files are available on the *Resource CD* that accompanies the RAID controllers. The driver files are also available at http://downloadcenter.intel.com. If you need to transfer the driver files to another system, you can copy them to a floppy disk or a USB key.

Note: Intel updates software frequently and updated drivers may provide additional features. Check for new software at the Intel Web site: http://www.intel.com/support/motherboards/server/. See the Readme file that accompanies the download for updated information. For operating systems that are not listed here, but are listed at the above Intel Web site see Readme file that accompanies the download for installation steps.

RAID Driver Installation for Microsoft Windows*

Installation in a New Microsoft Windows* Operating System

This procedure installs the RAID device driver system during the Microsoft Windows 2003*, Microsoft Windows 2000*, or Microsoft Windows XP* operating system installation. The system must contain an Intel[®] RAID controller. Microsoft Windows 2003* automatically adds the driver to the registry and copies the driver to the appropriate directory.

- Start the Microsoft Windows* installation by booting from the Microsoft Windows* CD-ROM disk. The system BIOS must support booting from a CD-ROM drive. You may need to change BIOS settings to allow CD-ROM booting. See your system documentation for instructions.
- 2. Press <F6> to install when the screen displays: Press F6 if you need to install...

Note: You must press <*F*6> for the system to recognize the new driver.

- Choose <S> to specify an additional device when the screen displays: setup could not determine the type...
 - *Note:* If this screen is not displayed as the first user input, then the setup program did not register that the $\langle F6 \rangle$ key was pressed. Reboot the system and return to step 2.
- 4. When the system asks for the manufacturer-supplied hardware support disk, insert the Microsoft Windows* driver disk and press <Enter>.
- 5. Select the appropriate Microsoft Windows* driver from the menu by highlighting it. Press <Enter> to proceed. The driver is added to the registry and copied to the appropriate directory.
- 6. Continue with the Microsoft Windows* operating system installation procedure.

Installation in an Existing Microsoft Windows* Operating System

This procedure installs or upgrades the RAID device driver on an existing Microsoft Windows 2003*, Microsoft Windows 2000*, or Microsoft Windows XP* operating system. The system must contain an Intel[®] RAID controller.

- 1. Boot to the Microsoft Windows* operating system. The Found New Hardware Wizard is displayed. The program identifies the SAS controller and requests the driver disk.
- 2. Insert the Microsoft Windows* driver disk into the floppy drive.
- 3. For Microsoft Windows 2003* or Microsoft Windows XP*, choose Install Software Automatically. In Microsoft Windows 2000*, choose Search for a Suitable Driver.
- 4. Microsoft Windows 2000* only: Click the Specify location box and make sure the search location is the floppy drive.
- 5. Click Next.
- 6. A message that this driver is not digitally signed may display. This message informs you that a nonsigned driver is being installed. If you see this message, click Continue Anyway.
- 7. The system loads the driver from the Microsoft Windows* driver disk and copies the driver to the system disk. The Found New Hardware Wizard screen displays the message:

The wizard has finished...

8. Click Finish to complete the driver upgrade.

RAID Driver Installation for Red Hat* Enterprise Linux

This section describes the installation of the device driver on new Red Hat* Enterprise Linux 3, 4, or 5 systems. The following are general installation guidelines. Refer to the release notes that accompanied the driver for information on updating the driver on an existing Red Hat* Linux system.

- 1. Boot to the CD-ROM with Disk 1. Command: linux dd
- 2. Press <Enter> at the boot prompt on the Welcome screen.
- 3. Copy the Linux driver image from the *Resource CD* to a disk or USB key.
- 4. Insert the disk with driver image.
- 5. Select Yes.
- 6. Scroll down to select Intel[®] RAID adapter driver. The utility locates and loads the driver for your device.
- 7. Follow the Red Hat* Linux installation procedure to complete the installation.

RAID Driver Installation for SuSE* Linux

SuSE* Linux uses a program called YaST2 (Yet another System Tool) to configure the operating system during installation. For complex installations, you can select "Install Manually" at the first install screen and a different program, linuxrc, is used. This section assumes a straightforward installation using YaST2.

- 1. Insert CD-ROM disk 1 into the CD-ROM drive and the RAID controller driver diskette in the floppy drive.
- 1. Boot to the CD-ROM.
- 2. The operating system loads a minimal operating system from the CD-ROM onto a RAM disk. The operating system also loads any driver module found in the floppy drive.
- 3. At the Welcome to YaST2 screen, select your language and click Accept.
- 4. At the Installation Settings screen, set up the disk partitioning.
- 5. Continue with the SuSE* Linux installation procedure.

RAID Driver Installation for Novell NetWare*

Installation in a New Novell Netware* System

Follow the instructions in the *Novell Netware** *Installation Guide* to install Novell Netware in the server. Perform the following steps to install Novell NetWare using your Intel[®] RAID controller as a primary adapter.

Note: Drivers for Novell Netware* are not available on the CD-ROM. The latest drivers are available at http://www.intel.com/support/motherboards/server/ or from your CDI account.

- 1. Boot from Novell NetWare*
- 2. Follow the instructions on the screen until you reach the Device Driver screen, which is used to modify drivers.
- 3. Select Modify and press <Enter>.
- 4. On the Storage Driver Support screen select Storage Adapters and press < Enter>.
- 5. Delete any existing Intel[®] RAID adapter listings.
- 6. Press <Insert> to add unlisted drivers.
- 7. Press <Insert> again.

A path is displayed.

- 8. Press <F3>.
- Insert the driver disk into the floppy drive, and press <Enter>.
 The system will locate the .HAM driver.
- 10. Press the *<*Tab*>* key.
- 11. Select the Driver Summary screen, and press < Enter>.

12. Continue the Novell NetWare installation procedure.

Installation in an Existing Novell Netware* System

Perform the following steps to add the Novell NetWare* driver to an existing Installation.

- *Note:* Drivers for Novell Netware* are not available on the CD-ROM. The latest drivers are available at http://www.intel.com/support/motherboards/server/ or from your CDI account.
 - 1. Type nwconfig at the root prompt and press <Enter>. The Configuration Options screen loads.
 - 2. Select Drive Options and press <Enter>.
 - 3. Select Configure Disk and Storage Device Options, and press < Enter>.
 - 4. Select one of the following options displayed in the window:
 - a. Discover and Load an Additional Driver If you select this option, the system discovers the extra unit and prompts you to select a driver from the list. Press <Insert> to insert the driver. This completes the procedure.
 - b. Select an Additional Driver If you select this option the Select a Driver screen displays. Press <Insert>. Follow the instructions that display. Insert a disk into the floppy drive, and press <Enter>. The system will find and install the driver. This completes the procedure.

RAID Driver Installation for Solaris* 10

Installation in a New Solaris* System

This updated driver can be applied using the normal operating system installation options.

Note: Drivers for Solaris* 10 are not available on the CD-ROM. The latest drivers are available at http://www.intel.com/support/motherboards/server/ or from your CDI account.

Boot the target system from the Solaris* 10 OS DVD (starting with DVD #1).

- 1. Select Solaris from the GRUB menu.
- 2. After the initial kernel loads, select option 5 Apply driver updated.
- 3. Insert driver floppy or CD into USB floppy or DVD-ROM drive, respectively, on the target system.

Installation in an Existing Solaris* System

- 1. Create a temporary directory "/tmp" under current working directory. Command: *mkdir tmp*.
- 2. Depending on your platform, untar i386.tar or x86_64.tar. Command: *tar -xf i386.tar* or *tar -xf x86_64.tar*.
- 3. Depending on your platform, run install.sh or install32.sh. Command: *sh install* or *sh install32*.

5 Intel[®] Embedded Server RAID BIOS Configuration Utility

If the SATA RAID or SAS RAID options are enabled in the server BIOS, an option to enter the Intel[®] Embedded Server RAID BIOS Configuration utility displays during the server boot process. To enter the utility, press <Ctrl> + <E> when prompted.

The Intel[®] Embedded Server RAID BIOS Configuration utility allows a user to:

- Create, add, modify, and clear virtual drive configurations
- Initialize or rebuild the configured drives
- Set the boot drive
- Create a global hot-spare drive
- View physical and virtual drive parameters
- View and set adapter properties, including consistency check and auto-resume

SATA and SAS systems use different versions of the Intel[®] Embedded Server RAID BIOS Configuration utility, but both versions use the same keystrokes and contain identical menus. The utility menus show limited help at the bottom of the screen and selections are chosen with the arrow keys and the space bar. If no virtual drive is available to configure, a warning is displayed. Only the number of potential physical drives differs for the SAS and SATA versions of the utility.

The following menu and sub-menu options are available:

Management Menu- Configure Initialize Objects Rebuild	Configuration Utility —Configuration Menu Easy Configuration New Configuration View/Add Configuration Clear Configuration Select Boot Drive
Objects Adapter Virtual Drive Physical Drive	AdapterRebuild Rate= 50Chk Const Rate= 50FGI Rate= 50BGI Rate= 50Disk WC= 0nRead Ahead= 0nBios State= EnableCont On Error= YesFast Init= EnableAuto Rebuild= 0nAuto Resume= EnableDisk Coercion= 1GBFactory Default

Figure 9. Intel[®] Embedded Server RAID BIOS Configuration Utility Screen

Creating, Adding or Modifying a Virtual Drive Configuration

To create, add, or modify a virtual drive configuration, follow these steps:

- 1. Boot the system.
- 2. Press <Ctrl> + <E> when prompted to start the Intel[®] Embedded Server RAID BIOS Configuration utility.
- 3. Select Configure from the Main Menu.
- 4. Select a configuration method:
 - Easy Configuration does not change existing configurations but allows new configurations.
 - New Configuration deletes any existing arrays and virtual drives and creates only new configurations.
 - View/Add Configuration lets you view or modify an existing configuration.

For each configuration method, a list of available physical drives is displayed. These drives are in the READY state. If you select a physical drive in the list, information about each drive is displayed.

5. Use the arrow keys to move to a drive and press the space bar to add it to the array.

Note: The utility limits each drive to the size of the smallest drive.

The status for each selected drive that is added to an array changes status from READY to ONLIN A[array#]-[drive#]. For example, ONLIN A00-01 means array 0, disk drive 1.

- 6. (Optional) Create a global hot-spare drive by highlighting a drive that is marked READY and press the <F4> key. Then select **Yes** from the pop-up menu.
- 7. Repeat step 5 and step 6 to create a second array if needed. When you have selected drives for all desired arrays, press the <F10> key.
- 8. Select an array by highlighting it. Press the <Enter> key to set the properties.
- 9. The virtual drive configuration screen is displayed, This screen shows the following:
 - Virtual drive number
 - RAID level
- Virtual drive size
- Number of stripes in the physical array
- Stripe size
- State of the virtual drive
- Access Policy

To set these options, highlight a property and press the <Enter> key. The available parameters for that property are displayed for the selection.

- 10. Select a RAID level: Select 0, 1, or 10 depending upon number of drives and the purpose.
- 11. Consider whether you need to override the default virtual drive size. By default, all available space in the array is assigned to the current virtual drive. For RAID 10 arrays, only one virtual drive can be defined for the entire array.
- *Note:* If you create an SSD virtual drive and set the access policy to 'Read-only', it is strongly recommended that you reboot the system for the changes to take effect, or else, you will still have access to create files, and delete them.
- 12. (Optional) Change the default Write Cache and Read Ahead policies. See Setting the Write Cache and Read Ahead Policies.
- 13. When you have finished defining the current virtual drive, select **Accept** and press the <Enter> key.
- 14. Repeat step 8 through step 13 for all virtual drives.
- 15. Save the configuration when prompted, and press any key to return to the Main Menu.
- 16. Select Initialize and use the space bar to highlight the virtual drive to initialize.

Caution: All data on the virtual drive is erased during an initialization.

- 17. Press the <F10> key. Select **Yes** at the prompt and press the <Enter> key to begin the initialization. A graph shows the progress of the initialization.
- 18. After the initialization is complete, press the <Esc> key to return to the previous menu. Pressing the <Esc> key closes the current menu. If a process is running when you press the <Esc> key, you are given the following options:

- Abort: When Abort is selected, the task is stopped and will not resume. If an initialization has started, Abort does not restore data.
- **Stop:** When Stop is selected, the current task stops. Stop is available only if auto resume is enabled on the adapter. See AutoResume/AutoRestore for information.
- Continue: The task continues normally. Continue cancels the press of the <Esc> key. If AutoResume is enabled, the task resumes from the point at which it was stopped.

Setting the Write Cache and Read Ahead Policies

Read and write cache settings apply to all virtual drives in an array. They may show as on/off; enable/disable; or as initials of the desired state, such as WB for Write Back. They are in menus as Write Policy and Read Policy or as Write Cache (WC) and Read Ahead (RA). You can view these policies from the Adapter Properties or from the Virtual Drive's View/Update Parameters.

The following are the cache policies:

• If WC is on, the write cache of the physical drives, which makes the virtual drive turn on. In this mode, when the physical drive cache receives all the data, the I/O request is signaled as completed.

Caution: If power fails before the cached data is written to the drive, the data is lost.

- If WC is off, only if the data is written to the media of the drive, the I/O request is signaled as completed.
- RA = ON allows the read ahead mode of the physical drives, which makes the virtual drive turn on. In this mode, the physical drive will read additional data and store that data into its cache. This improves performance on sequential reads.

To change cache policies, follow these steps:

- 1. Select Objects | Virtual Drive | Virtual Drive n | View/Update Parameters.
- 2. Use the arrow key to select the option to change. Press the <Enter> key.
- 3. Use the arrow key to select **Off** or **On**.
- 4. If asked to confirm the change, use the arrow key to select **Yes**. Press the <Enter> key to change the cache setting.

Working with a Global Hot-spare Drive

A global, but not dedicated, hot-spare drive can be created to automatically replace a failed drive in a RAID 1 or RAID 10 array. For new arrays, you should create the global hot-spare during the configuration process. See "Creating, Adding or Modifying a Virtual Drive Configuration" on page 42.

Adding a Hot-spare Drive

To add a hot-spare drive to an existing configuration, follow these steps:

- 1. Select **Objects** from the Main Menu.
- 2. Select **Physical Drive**. A list of physical drives is displayed.
- 3. Select an unused drive from the list, and select **Make Hot Spare**. The screen changes to indicate HOTSP.

Removing a Hot-spare Drive

To remove a hot-spare drive, follow these steps:

- 1. Select **Objects** from the Main Menu.
- 2. Select **Physical Drive**. A list of physical drives is displayed.
- 3. Select the disk that displays **HOTSP**, press the <Enter> key.
- Select Force Offline and press the <Enter> key. The status of the drive changes to READY. The drive can be used in another array.

Rebuilding a Drive

The Intel[®] Embedded Server RAID BIOS Configuration utility includes a manual rebuild option that rebuilds a failed array due to an individual failed drive in a RAID 1 or 10 array. RAID 0 drives are not redundant and cannot be rebuilt. You can also rebuild a good drive (not physically failed) using the existing configuration data.

To rebuild a drive:

- 1. Select **Rebuild** from the Main Menu. The failed drives show the status FAIL.
- 2. Press the arrow keys to highlight the physical drive that you want to rebuild. Press the space bar to select the drive.
- 3. Press the <F10> key and select Y to confirm. As the rebuild process begins, the drive indicator shows REBLD.
- 4. When the rebuild is complete, press any key to continue.

Auto Rebuild and Auto Resume

To ensure data protection, enable Auto Rebuild and Auto Resume so that drives are automatically re-created to maintain redundancy.

- In a pre-boot environment, auto rebuild starts only when you enter the BIOS utility.
 - *Note:* Hot-plug support is not available in the pre-boot environment. For the system BIOS or the Intel[®] Embedded Server RAID BIOS Configuration utility to detect the physical drive, insert the drive when the system is off.
- When the operating system is running, the auto rebuild starts if the system has a hotspare drive or if you replace the failed drive with a new drive.

The Auto Rebuild and Auto Resume options are available in the $Intel^{\mathbb{R}}$ Embedded Server RAID BIOS Configuration utility from the menu that is displayed after you select **Objects** | Adapter.

Checking Data Consistency

The Check Consistency feature can be used on RAID 1 or RAID 10 drives to verify the data consistency between the mirrored drives. It can be set to only report or to both report and automatically fix the data.

1. From the Main Menu, select Check Consistency and press the <Enter> key.

A list of configured virtual drives is displayed.

- 2. Use the arrow keys to choose the desired drive. Press the space bar to select the virtual drive to check for consistency. (RAID 1 or 10 only)
- 3. Press the $\langle F10 \rangle$ key.
- 4. At the prompt, select **Yes** and then press the <Enter> key.

If the Report and Fix/Report options are not shown, select Main Menu | Objects | Adapter | ChkCons and set Report only or Fix\Report.

Viewing and Changing Device Properties

You can view adapter, virtual drive, and physical drive properties. You can also change some adapter properties and the Write Cache and Read Ahead for Virtual Drives.

- 1. From the Main Menu select Objects.
- 2. Choose Adapter, Virtual Drive, or Physical Drive.
- 3. Select the device from the list and view the properties.
 - For virtual drives, choose View | Update Parameters.
 - For physical drives, choose Drive Properties.

The numeric values of the rates settings are the percentage of system resources. FGI and BGI are abbreviations for foreground and background initialization rates.

4. To change a value, highlight the property and press the <Enter> key.

Note: Some values cannot be changed.

- 5. Select or type a different value for the property and press the <Enter> key.
- 6. When you are finished, press the <Esc> key until you return to the Main Menu.

Forcing Drives Online or Offline

A drive can be forced offline so that a hot-spare drive will replace it. Power failures may cause a drive to go offline and you must force it back online.

Forcing a Drive Online or Offline

You can force a drive offline so that a hot-spare replaces it. Power failures may cause a drive to go offline and you must force it back online. To force a drive online or offline, follow these steps:

- 1. On the Main Menu, select **Objects** and then **Physical Drive**.
- 2. Highlight a physical drive that is a member of an array and press the <Enter> key.
- 3. From the menu, choose one of the following:
 - Force Offline to take the drive off line. If the drive was online, its status changes to FAIL.
 - Force Online to bring the drive on line. If the drive was offline, its status changes to ONLINE.

Configuring a Bootable Virtual Drive

Follow these steps to configure a bootable virtual drive:

- 1. From the Main Menu, select **Configure** | Select Boot Drive.
- 2. Select a virtual drive from the list to make it the designated boot drive.
- *Note:* You should also check the system BIOS Setup utility for the boot order setting. To access the BIOS Setup utility, press the $\langle F2 \rangle$ key when prompted during POST.

Deleting (Clearing) a Storage Configuration

Caution: Before you clear a storage configuration, back up all the data you want to keep.

To clear a storage configuration, follow these steps:

- 1. On the Main Menu, select Configure | Clear Configuration.
- 2. When the message appears, select **Yes** to confirm. All virtual drives are deleted from the configuration.

6 Intel[®] IT/IR RAID Configuration

This chapter explains how to create Integrated Mirroring (IM), Integrated Mirroring Enhanced (IME), and Integrated Striping (IS) volumes using the LSI MPT* SAS BIOS Configuration Utility.

IM and IME Configuration Overview

You can use the LSI MPT* SAS BIOS Configuration Utility to create one or two IM/IME volumes on each Intel[®] IT/IR RAID Controller, with one or two optional global hot-spare disks. All disks in an IM/IME volume must be connected to the same Intel[®] IT/IR RAID Controller.

Although you can use disks of different size in IM and IME volumes, the smallest disk in the volume will determine the logical size of all disks in the volume. In other words, the excess space of the larger member disk(s) will not be used. For example, if you create an IME volume with two 100 GB disks and two 120 GB disks, only 100 GB of the larger disks will be used for the volume.

Features

Integrated Mirroring and Integrated Mirroring Enhanced support the following featurs:

- Configurations of one or two IM or IME volumes on the same Intel[®] IT/IR RAID Controller. IM volumes have two mirrored disks; IME volumes have three to ten mirrored disks. Two volumes can have up to a total of 12 disks.
- Note: This feature requires IR RAID firmware v1.20.00 or above to be installed.
 - One or two global hot-spare disks per controller, to automatically replace failed disks in IM/IME volumes. The hot-spare drivess are in addition to the 12-disk maximum for two volumes per Intel[®] IT/IR RAID Controller.

Note: Support for two hot-spare disks requires IR RAID firmware v1.20.00 or above.

- Mirrored volumes run in optimal mode or in degraded mode (if one mirrored disk fails).
- Hot-swap capability.
- Presents a single virtual drive to the OS for each IM/IME volume.
- Supports both SAS and SATA disks. The two types of disks cannot be combined in the same volume. However, a Intel[®] IT/IR RAID Controller can support one volume with SATA disks and a second volume with SAS disks.
- Fusion-MPT* architecture.

- Easy-to-use BIOS-based configuration utility.
- Error notification: The drivers update an OS-specific event log.
- LED status support.
- Write journaling, which allows automatic synchronization of potentially inconsistent data after unexpected power-down situations.
- Metadata used to store volume configuration on mirrored disks.
- Automatic background resynchronization while the host continues to process inputs/outputs (I/Os).

Background media verification ensures that data on IM/IME volumes is always accessible.

Creating IM and IME Volumes

The LSI MPT* SAS BIOS Configuration Utility is part of the Fusion-MPT* BIOS. When the BIOS loads during boot and you see the message about the LSI MPT* SAS BIOS Configuration Utility, press $\langle Ctrl \rangle + \langle C \rangle$ to start the utility. The message then changes to:

Please wait, invoking LSI SAS Configuration Utility...

After a brief pause, the main menu appears. On some systems, however, the following message appears:

Configuration Utility will load following initialization!

In this case, the LSI MPT* SAS BIOS Configuration Utility loads after the system has completed a power-on self test. You can configure one or two IM or IME volumes per Fusion-MPT* controller. You can also configure one IM/IME and one Integrated Striping (IS) volume on the same controller, up to a maximum of 12 physical disk drives for the two volumes. In addition, you can create one or two hot spares for the IM/IME array(s).

The following guidelines also apply when creating an IM or IME volume:

- All physical disks in a volume must be either SATA (with extended command set support) or SAS (with SMART support). SAS and SATA disks cannot be combined in the same volume. However, you can create one volume with SAS disks and a second volume with SATA disks on the same controller.
- Disks must have 512 byte blocks and must not have removable media.
- An IM volume must have two drives. An IME volume can have three to ten drives. In addition, one or two hot spares can be created for the IM/IME volume(s).

Note: If a disk in an IM/IME volume fails, it is rebuilt on the global hot spare if one is available. Intel recommends that you always use hot spares with IM/IME volumes.

Creating an IM Volume

To create an IM volume with the LSI MPT* SAS BIOS Configuration Utility, follow these steps:

- 1. On the Adapter List screen, use the arrow keys to select an adapter.
- 2. Press <Enter> to go to the Adapter Properties screen, shown in Figure 10.

LSI Corp Config Utility v6.24.00.00 Adapter Properties SAS1064E	9 (2008.07.01)
Adapter PCI Slot PCI Address(Bus/Dev) MPT Firmware Revision SAS Address NVDATA Version Status Boot Order Boot Order Boot Support RAID Properties SAS Topology Advanced Adapter Properties	SASWT41 06 0A:00 1.26.00.00-IR 500605B0:000C9B64 2D.00 Enabled 0 LEnabled BIOS & OS]
Esc = Exit Menu F1/Shift+1 = Help Enter = Select Item -/+/Enter = Change	? Item

Figure 10. Adapter Properties Screen

- 3. On the Adapter Properties screen, use the arrow keys to select **RAID Properties** on the screen and press <Enter>.
- 4. When prompted to select a volume type, select Create IM Volume.

The Create New Array screen shows a list of disks available to be added to a volume.

5. Move the cursor to the RAID Disk column and select a disk. To add the disk to the volume, change the No to Yes by pressing the <+> or <-> keys, or the space bar.

When the first disk is added, the utility prompts you to either keep existing data or overwrite existing data.

6. Press $\leq M \geq$ to keep the existing data on the first disk or press $\leq D \geq$ to overwrite it.

If you keep the existing data, this is called a data migration. The first disk will be mirrored onto the second disk, so any data you want to keep must be on the first disk selected for the volume. Data on the second disk is overwritten. The first disk must have 512 KB available for metadata after the last partition.

As disks are added, the Array Size field changes to reflect the size of the new volume.

7. [Optional] Add one or two global hot spares by moving the cursor to the hot spare column and pressing the <+> or <-> keys, or the space bar.

Figure 11 shows an IM volume configured with one global hot-spare disk.

Creat	e New Ar	fig Utility rray SAS1064E			2008.07	.01)			
	ay Type ay Size(IM 75340					
Slot Num O 1	ATA ATA	Identifier ST3808110AS ST3808110AS	D D	[Yes]	Spr ENo]	Drive Status Primary Secondary	Fail 	(MB) 76319 76319	ł
2 3	ATA ATA	ST3808110AS ST3808110AS	D D	[No] [No]	[Yes] [No]	Hot Spare Max Dsks		76319 76319	
									ļ
		enu F1/Shi Select disk for			pare	C = Create	array		

Figure 11. Create New Array Screen

8. When the volume has been fully configured, press <C> and select **Save Changes**. Then exit this menu to commit the changes.

The LSI MPT SAS BIOS Configuration Utility* pauses while the array is created.

Creating an IME Volume

To create an IME volume with the LSI MPT* SAS BIOS Configuration Utility, follow these steps:

- 1. On the Adapter List screen, use the arrow keys to select an Intel[®] IT/IR RAID Controller.
- 2. Press <Enter> to load the Adapter Properties screen, shown in Figure 10.
- 3. On the Adapter Properties screen, use the arrow keys to select **RAID Properties** on the screen and press <Enter>.
- 4. When prompted to select a volume type, choose Create IME Volume.

The Create New Array screen shows a list of disks that can be added to a volume.

- 5. Move the cursor to the RAID Disk column and select a disk. To add the disk to the volume, change the No to Yes by pressing the <+> or <-> keys, or the space bar.
- 6. Repeat this step to select a total of three to ten disks for the volume.

All existing data on all the disks you select will be overwritten. As you add disks, the Array Size field changes to reflect the size of the new volume.

- 7. [Optional] Add one or two global hot spares to the volume by moving the cursor to the hot spare column and pressing the <+> or <-> keys, or the space bar.
- 8. When the volume has been fully configured, press <C> and then select **Save changes**. Exit the menu to commit the changes.

The utility pauses while the array is created.

Creating a Second IM or IME Volume

Intel[®] IT/IR RAID Controllers allow you to configure two IM or IME volumes per controller. If one volume is already configured, and if there are available disk drives, there are two ways to add a second volume.

Option 1:

- 1. In the configuration utility, select an adapter from the Adapter List.
- 2. Select the **RAID Properties** option to display the current volume.
- 3. Press <C> to create a new volume.
- 4. Continue with either step 4 in "Creating an IM Volume" on page 51 or step 4 in "Creating an IME Volume" on page 52 to create a second volume.

Option 2:

- 1. On the Adapter List screen, use the arrow keys to select an Intel[®] IT/IR RAID Controller.
- 2. Press <Enter> to go to the Adapter Properties screen, shown in Figure 10.
- 3. On the Adapter Properties screen, use the arrow keys to select **RAID Properties** and press <Enter>.
- 4. Continue with either step 4 in "Creating an IM Volume" on page 51 or step 4 in "Creating an IME Volume" on page 52to create a second volume.

Managing Hot Spares

You can create one or two global hot-spare disks to protect the IM or IME volumes on an Intel[®] IT/IR RAID controller. Usually, you create global hot spares at the same time you create the IM/IME volume.

To add global hot-spare disks after an IM/IME volume has been created, follow these steps:

- 1. On the View Array screen, select Manage Array.
- 2. In the Manage Array screen select Manage Hot Spares, as shown in Figure 12.

LSI Corp Config Utility Manage Array SAS1064E	v6.24.00.00 (2008.07.01)
Identifier Type Scan Order Size(MB) Status	Intel IM O 75340 Optimal
Manage Hot Spares Synchronize Array Activate Array	
Delete Array	
Esc = Exit Menu F1/Shi Enter = Select Item	ft*1 = Help

Figure 12. Manage Array Screen

- 3. Select a disk from the list by pressing the <+> or <-> key, or the space bar.
- 4. After you select the global hot-spare disk, press <C>.

An error message appears if the selected disk is not at least as large as the smallest disk used in the IM/IME volume(s). The global hot-spare disk must have 512 byte blocks, it cannot have removable media, and the disk type must be either SATA with extended command set support or SAS with SMART support.

If SATA disks are used for the IM/IME volume(s), the hot-spare disk must also be a SATA disk. If SAS disks are used, the hot-spare disk must also be a SAS disk. An error message appears if the selected disk is not the same type as the disks used in the IM/IME volumes.

- 5. [Optional] Select a second hot-spare disk.
- 6. Select **Save changes** then exit this menu to commit the changes.

The configuration utility pauses while the global hot spares are added.

To delete a global hot spare, follow these steps:

- 1. Select Manage Hot Spare on the Manage Array screen.
- 2. Select **Delete Hot Spare** and then press <C>.

If there are two hot spares, select one to delete.

3. Select **Save changes** then exit this menu to commit the changes.

The configuration utility pauses while the global hot spare is removed.

Other Configuration Tasks

This section explains how to perform other configuration and maintenance tasks for IM and IME volumes.

Viewing Volume Properties

To view the properties of volumes, follow these steps:

- 1. In theLSI MPT* SAS BIOS Configuration Utility, select an adapter from the Adapter List.
- 2. Select the **RAID Properties** option.

The properties of the current volume are displayed. If global hot spares are defined, they are also listed.

- *Note:* If you create one volume using SAS disks, another volume using SATA disks, and another using global hot-spare disks, the hot-spare disks will only appear when you view the volume that has the same type of disks as the hot-spare disks.
- 3. If two volumes are configured, press <Alt> + <N> to view the other array.
- 4. To manage the current array, select Manage Array and press < Enter>.

Synchronizing an Array

The Synchronize Array command forces the firmware to resynchronize the data on the mirrored disks in the array. It is seldom necessary to use this command, because the firmware automatically keeps the mirrored data synchronized during normal operation. When you use this command, one disk of the array is placed in a degraded state until the data on the mirrored disks has been resynchronized.

To force the synchronization of a selected array, follow these steps:

- 1. Select Synchronize Array on the Manage Array screen.
- 2. Press <Y> to start the synchronization, or <N> to cancel it.

Activating an Array

An array can become inactive if it is removed from one controller or computer and moved to another one. The Activate Array option allows you to reactivate an inactive array that has been added to a system. This option is only available when the selected array is currently inactive.

To activate a selected array, follow these steps:

1. Select Activate Array on the Manage Array screen.

2. Press $\langle Y \rangle$ to proceed with the activation, or press $\langle N \rangle$ to abandon it.

After a pause, the array will be active.

Note: If there is a global hot-spare disk on the controller to which you have moved the array, the BIOS checks when you activate the array to determine if the hot spare is compatible with the new array. An error message appears if the disks in the activated array are larger than the hot-spare disk or if the disks in the activated array are not the same type as the hot-spare disk (SATA versus SAS).

Deleting an Array

Caution: If a volume has been deleted, it cannot be recovered. Before deleting an array, be sure to back up all data on the array that you want to keep.

To delete a selected array, follow these steps:

- 1. Select **Delete Array** on the Manage Array screen.
- 2. Press $\langle Y \rangle$ to delete the array.

After a pause, the array is deleted. If there is a remaining array and one or two hotspare disks, the BIOS checks the hot-spare disks to determine if they are compatible with the remaining array. If they are not compatible (i.e., they are too small or the wrong disk type), the firmware deletes them as well.

Note: When an IM volume is deleted, the data is preserved on the primary disk. When an IME volume is deleted, the master boot records of all disks are deleted.

Locating a Drive or Multiple Drives in a Volume

You can use the LSI MPT* SAS BIOS Configuration Utility to locate and identify a specific physical disk drive by flashing the drive's LED. You can also use the utility to flash the LEDs of all the disk drives in a RAID volume. There are several ways to do this:

- When you are creating an IM or IME volume, and a disk drive is set to Yes as part of the volume, the LED on the disk drive is flashing. The LED is turned off when you have finished creating the volume.
- You can locate individual disk drives from the SAS Topology screen. To do this, move the cursor to the name of the disk in the Device Identifier column and press <Enter>. The LED on the disk flashes until the next key is pressed.
- You can locate all the disk drives in a volume by selecting the volume on the SAS Topology screen. The LEDs flash on all disk drives in the volume.

Note: The LEDs on the disk drives will flash as described above if the firmware is correctly configured and the drives or the disk enclosure supports disk location.

Selecting a Boot Disk

You can select a boot disk in the SAS Topology screen. The selected disk is moved to scan ID 0 on the next boot, and remains at this position. This makes it easier to set the BIOS boot device options and to keep the boot device constant during device additions and removals. There can only be one boot disk.

To select a boot disk, follow these steps:

- 1. In the LSI MPT* SAS BIOS Configuration Utility, select an adapter from the Adapter List.
- 2. Select the SAS Topology option.

The current topology is displayed. If the selection of a boot device is supported, the bottom of the screen lists the $\langle Alt \rangle + \langle B \rangle$ option. This is the key for toggling the boot device. If a device is currently configured as the boot device, the Device Info column on the Topology screen will show the word "Boot."

- 3. To select a boot disk, move the cursor to the disk and press $\langle Alt \rangle + \langle B \rangle$.
- 4. To remove the boot designator, move the cursor down to the current boot disk and press <Alt> + .

This controller will no longer have a disk designated as boot.

5. To change the boot disk, move the cursor to the new boot disk and press <Alt> + .

The boot designator will move to this disk.

Note: The firmware must be configured correctly in order for the $\langle Alt \rangle + \langle B \rangle$ feature to work.

IS Configuration Overview

You can use the LSI MPT* SAS BIOS Configuration Utility to create one or two IS volumes, with up to a total of 12 drives, on an Intel[®] IT/IR RAID Controller. Each volume can have from two to ten drives. Disks in an IS volume must be connected to the same Intel[®] IT/IR RAID Controller, and the controller must be in the BIOS boot order.

Although you can use disks of different size in IS volumes, the smallest disk determines the "logical" size of each disk in the volume. In other words, the excess space of the larger member disk(s) is not used. Usable disk space for each disk in an IS volume is adjusted down to a lower value in order to leave room for metadata. Usable disk space may be further reduced to maximize the ability to interchange disks in the same size classification. The supported stripe size is 64 kbytes.

For more information about Integrated Striping volumes, see "Features" on page 49.

Creating IS Volumes

The LSI MPT* SAS BIOS Configuration Utility is part of the Fusion-MPT* BIOS. When the BIOS loads during boot and you see the message about the utility, press $\langle Ctrl \rangle + \langle C \rangle$ to start it. After you do this, the message changes to:

Please wait, Invoking Configuration Utility...

After a brief pause, the main menu of the LSI MPT* SAS BIOS Configuration Utility appears. On some systems, however, the following message appears next: Configuration Utility will load following initialization!

In this case, the utility will load after the system has completed its power-on self test.

Follow the steps below to configure an Integrated Striping (IS) volume with the LSI MPT* SAS BIOS Configuration Utility. The procedure assumes that the required controller(s) and disks are already installed in the computer system. You can configure an IM/IME volume and an IS volume on the same Intel[®] IT/IR RAID Controller.

1. On the Adapter List screen of the LSI MPT* SAS BIOS Configuration Utility, use the arrow keys to select a RAID adapter.

|--|--|

2. Press <Enter> to go to the Adapter Properties screen, as shown in Figure 13.

Figure 13. Adapter Properties Screen

- 3. On the Adapter Properties screen, use the arrow keys to select **RAID Properties** and press <Enter>.
- 4. When you are prompted to select a volume type, select Create IS Volume.

The Create New Array screen shows a list of disks that can be added to a volume.

5. Move the cursor to the RAID Disk column. To add a disk to the volume, change the No to Yes by pressing the <+> or <-> key, or the space bar. As disks are added, the Array Size field changes to reflect the size of the new volume.

There are several limitations when creating an IS (RAID 0) volume:

- All disks must be either SATA (with extended command set support) or SAS (with SMART support).
- Disks must have 512 byte blocks and must not have removable media.
- There must be at least two and no more than ten drives in a valid IS volume. Hot-spare drives are not allowed.

Arr	ay Type ay Size			IS 150680				
Slot Num 0 1 2 3	Device ATA ATA ATA ATA	ST3808110AS ST3808110AS	D D D		Spr [No] [No] [No]	Drive Status 		
		lenu F1/Sh Select disk for			pare	C = Create	array	

Figure 14. Create New Array Screen

6. When you have added the desired number of disks to the array, press <C> and then select **Save changes**. Then exit the menu to commit the changes. The configuration utility pauses while the array is created.

Creating a Second IS Volume

The Intel[®] IT/IR RAID Controllers allow you to configure two IS volumes, or an IS volume and an IM/IME volume. If one volume is already configured, and if there are available disk drives, there are two ways to add a second volume.

Option 1: Perform the following steps:

1. In the LSI MPT* SAS BIOS Configuration Utility select an adapter from the Adapter List. Select the **RAID Properties** option.

The current volume will be displayed.

- 2. Press <C> to create a new volume.
- 3. Continue with Step 4 of "Creating IS Volumes," to create a second IS volume.

Option 2: Perform the following steps:

- 1. On the Adapter List screen, use the arrow keys to select an Intel[®] IT/IR RAID Controller.
- 2. Press <Enter> to go to the Adapter Properties screen, shown in Figure 13.

- 3. On the Adapter Properties screen, use the arrow keys to select **RAID Properties** and press <Enter>.
- 4. Continue with step 4 in "Creating IS Volumes" on page 58 to create a second IS volume.

Other Configuration Tasks

This section explains how to perform other configuration and maintenance tasks for IS volumes.

Viewing IS Volume Properties

To view the properties of IS volumes, follow these steps:

- 1. In the configuration utility, select an adapter from the Adapter List.
- 2. Select the **RAID Properties** option.

The properties of the current volume are displayed.

- 3. If more than one volume is configured, press <Alt> + <N> to view the next array.
- 4. To manage the current array, press <Enter> when the Manage Array item is selected.

Activating an Array

An array can become inactive if, for example, it is removed from one controller or computer and moved to another one. The "Activate Array" option allows you to reactivate an inactive array that has been added to a system. This option is only available when the selected array is currently inactive.

To activate an array once it has been selected, follow these steps:

- 1. Choose Activate Array on the Manage Array screen.
- 2. Press <Y> to proceed with the activation, or press <N> to abandon it. After a pause, the array will be active.

Deleting an Array

Caution: Once a volume has been deleted, it cannot be recovered. Before deleting an array, be sure to back up all data on the array that you want to keep.

To delete a selected array, follow these steps:

1. Select Delete Array on the Manage Array screen.

2. Press <Y> to delete the array, or press <N> to abandon the deletion. After a pause, the firmware deletes the array.

Note: The master boot records of all disks are deleted and data cannot be recovered.

Locating a Disk Drive, or Multiple Disk Drives in a Volume

You can use the LSI MPT* SAS BIOS Configuration Utility to locate and identify a specific physical disk drive by flashing the drive's LED. You can also use the utility to flash the LEDs of all the disk drives in a RAID volume. There are several ways to do this:

- When you are creating an IS volume, and a disk drive is set to Yes as part of the volume, the LED on the disk drive is flashing. The LED is turned off when you are finished creating the volume.
- You can locate individual disk drives from the SAS Topology screen. To do this, move the cursor to the name of the disk in the Device Identifier column and press <Enter>. The LED on the disk flashes until the next key is pressed.
- You can locate all the disk drives in a volume by selecting the volume on the SAS Topology screen. The LEDs flash on all disk drives in the volume.
- *Note:* The LEDs on the disk drives will flash as described above if the firmware is correctly configured and the drives or the disk enclosure supports disk location.

Selecting a Boot Disk

You can select a boot disk in the SAS Topology screen. This disk is then moved to scan ID 0 on the next boot, and remains at this position. This makes it easier to set BIOS boot device options and to keep the boot device constant during device additions and removals. There can be only one boot disk.

To select a boot disk, follow these steps:

- 1. In the LSI MPT* SAS BIOS Configuration Utility, select an adapter from the Adapter List.
- 2. Select the SAS Topology option.

The current topology is displayed. If the selection of a boot device is supported, the bottom of the screen lists the $\langle Alt \rangle + \langle B \rangle$ option. This is the key for toggling the boot device. If a device is currently configured as the boot device, the Device Info column on the SAS Topology screen will show the word "Boot."

- 3. To select a boot disk, move the cursor to the disk and press $\langle Alt \rangle + \langle B \rangle$.
- 4. To remove the boot designator, move the cursor down to the current boot disk and press <<u>Alt</u>> + <<u>B</u>>.

This controller will no longer have a disk designated as boot.

5. To change the boot disk, move the cursor to the new boot disk and press <Alt> + .

The boot designator will move to this disk.

Note: The firmware must be configured correctly for the <*Alt*> + <*B*> feature to work.

The Intel[®] RAID BIOS Console 2 utility provides a GUI utility to configure and manage RAID volumes. The utility configures disk groups and virtual drives. Because the utility resides in the RAID controller firmware, it is independent of the operating system.

The Intel[®] RAID BIOS Console 2 utility:

- Selects controller
- Displays controller properties
- Scans devices
- Displays the physical properties of devices
- Configures physical drives
- Defines virtual drives
- · Displays virtual drive properties
- · Initializes virtual drives
- Checks data for consistency

The Intel[®] RAID BIOS Console 2 utility provides a Configuration Wizard to guide you through the configuration of virtual drives and physical arrays.

Quick Configuration Steps

This section provides the steps to configure arrays and disk groups, and virtual drives using the Intel[®] RAID BIOS Console 2 utility. The following sections describe how to perform each action using the Intel[®] RAID BIOS Console 2 utility. The steps are as follows:

- 1. Power on the system.
- 2. Press <Ctrl>+<G> to start the Intel[®] RAID BIOS Console 2 utility.
 - *Note:* Some server boards have a BIOS SETUP option called "Port 60/64 Emulation" (or with other similar name). Please ensure this option is enabled in order to use Intel[®] RAID BIOS Console 2 successfully.
- 3. Start the Configuration Wizard.
- 4. Choose a configuration method.
- 5. Using the available physical drives, create arrays and disk groups.
- 6. Using the space in the arrays and disk groups, define the virtual drive(s).
- 7. Initialize the new virtual drives.

Detailed Configuration Steps using the Intel[®] RAID BIOS Console 2

Start the Intel[®] RAID BIOS Console 2 Utility

- When the system boots, hold down the <Ctrl> key and press the <G> key when the following is displayed:
 Press <Ctrl><G> to enter the RAID BIOS Console
 After you press <Ctrl>+<G>, the Controller Selection screen appears.
- 2. Select a controller and click **Start** to begin the configuration.

Note: If there is a configuration mismatch between the disks and the NVRAM, the utility automatically displays the Select Configuration screen. Choose whether the configuration should be read from the RAID array or from NVRAM. For more information, see "Configuration Mismatch Screen" on page 70.

Screen and Option Descriptions

This section describes the Intel[®] RAID BIOS Console 2 screens and options.

Toolbar Options

Table 13 describes the Intel[®] RAID BIOS Console 2 toolbar icons.

Table 13. Intel[®] RAID BIOS Console 2 Toolbar Icon Descriptions

lcon	Description
1	Return to the main screen.
4 00	Return to the page you accessed immediately before the current page.
	Exit the Intel [®] RAID BIOS Console 2 utility.
	Silence the alarm.

Main Screen

From the main screen, you can scan the devices connected to the controller, select an Intel[®] RAID controller, and switch between the Physical Drives view and Virtual Drives view. The main screen also provides access to the following screens and tools:

- Controller Selection
- Controller Properties
- Scan Devices
- Virtual Drives
- Drives
- Configuration Wizard
- Physical View
- Events
- Exit

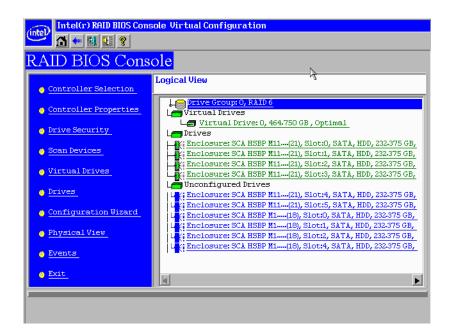


Figure 15. Intel[•] RAID BIOS Console 2 Menu

Controller Selection

This option allows you to choose an Intel[®] RAID controller installed in the system.

Adapter No.	Bus No.	Device No.	Type 👌	Firmware Version
0. 💿	11	0	Intel Server RAID Controller RS2BL080	2.0.03-0638
			Start	

Figure 16. Intel[®] RAID BIOS Console 2 - Controller Selection

Controller Properties Screen

When you select the Controller Selection option on the main screen, the Intel[®] RAID BIOS Console 2 utility displays a list of the Intel RAID controllers in the system.

The Controller Properties screen allows you to view and configure the software and hardware of the selected controller.

(inter) RAID BIO	JS Console Controlle ?	er Information	
RAID BIOS C	Console		
	Intel Server RAID	Controller RS2BL080	
Serial Number	SR91700301	FRU	None
SubVendorID	0x8086	Drive Security Capable	Yes
SubDeviceID	0x9261	Drive Security Enabled	No
PortCount	8	Drive Security Method	FDE Only
HostInterface	PCIE	NVRAMSize	32 KB
Firmware Version	2.0.03-0638	Memory Size	512 MB
FW Package Version	12.0.1-0035	Min Stripe Size	8 KB
Firmware Time	Jun 22009;00:23:04	Max Stripe Size	1 MB
WebBIOS Version	3.0-17-Rel	Virtual Drive Count	1
Drive Count	10		
		Next	
1 Home			┥ Back

Figure 17. Controller Properties

- Firmware Version: The firmware version.
- Host Interface: The host interface for the installed RAID controller.
- NVRAM Size: The NVRAM size on the RAID controller.
- Firmware Time: The firmware release date/time.
- Min Stripe Size: The minimum stripe size used to read and write data.
- WebBIOS Version: The BIOS version for the Intel[®] RAID BIOS Console 2.
- Sub Device ID: The sub-device ID (identification) for the RAID controller.
- Sub Vendor ID: The sub-vendor ID (identification) for the RAID controller.
- Port Count: Number of ports available.

- **Memory Size:** The memory size of the installed DIMM (Dual In-Line Memory Module).
- Max Stripe Size: The maximum stripe size.
- Physical Disk Count: The number of physical disks connected to the RAID controller.

Additional Controller Properties

To access the screen that displays the additional controller properties, click **Next** on the Controller Properties screen. To change one of the properties displayed in the screen below, select the new value and click **Submit**.

intel(r) RAID BIO	<mark>S Console Controller Pr</mark> 	roperties		
RAID BIOS C				
Properties				
Battery Backup	Present	Coercion Mode	None 🔻	
Set Factory Defaults	No 🔻	S.M.A.R.T Polling	300 y seconds	
Cluster Mode	Disabled 🔻	Alarm Control	Enabled	
Rebuild Rate	30	Patrol Read Rate	30	
BGI Rate	30	Cache Flush Interval	4	
CC Rate	30	Spinup Drive Count	2	
Reconstruction Rate	30	Spinup Delay	6	
Controller BIOS	Enabled 🔻	StopOnError	Enabled 🔻	
NCQ	Enabled 🔻	Drive Powersave	Enabled 👿	
	👃 Submit 🛛 🖕	Reset 🕪 Next		
🚹 Home 🛶 Back				
			,	

Figure 18. Additional Controller Properties

- Battery Backup: Indicates if a battery backup unit is installed.
- Set Factory Defaults: Change this field to Yes to reset the RAID controller settings to the factory defaults.
- Cluster Mode: Enable this field if the RAID controller is used in a cluster.
- **Rebuild Rate:** Enter a number between 0 and 100 to control the rate at which a future rebuild will be performed on a disk group.
- **Patrol Read Rate:** A patrol read is a preventive procedure that monitors physical disks to locate and resolve potential problems that could lead to disk failure. Enter a number between 0 and 100 to control the rate at which patrol reads are performed.
- **BGI Rate (Background Initialization Rate):** Background initialization makes the virtual drive immediately available for use, even while initialization is occurring. Enter a number between 0 and 100 to control the rate at which virtual drives are initialized in the background.
- CC Rate (Check Consistency Rate): A consistency check scans the consistency of data on a fault-tolerant disk to determine if the data is corrupted. Enter a number between 0 and 100 to control the rate at which a consistency check is done.
- **Reconstruction Rate:** Enter a number between 0 and 100 to control the rate at which the reconstruction of a virtual drive occurs.

- Adapter BIOS: Determines whether the Option ROM is loaded.
- Coercion Mode:
 - None: No coercion of size.
 - 128M: The software rounds the drive capacity down to the next 128 MB boundary and then up to the nearest 10 MB until the coerced capacity is larger than the actual drive size. It is then reduced by 10 MB.
 - 1G: The software rounds the drive capacity down to the nearest 1 GB boundary and then down by 1 MB. This corresponds to the terms most drive manufacturers use.
- **PDF Interval:** The PDF interval is the predictive disk failure polling interval. This is the time needed between disk polls to perform SMART polling.
- Alarm Control: Disable the alarm to turn off the on-board speaker alarm.
- **Interrupt Throttle Count** and Interrupt Throttle Time: Sets the interrupt throttle and count times. This is the number of times that interrupts are coalesced and the amount of time that firmware holds an interrupt before passing it to the host software. Set values lower for better performance—be aware that latency is impacted by these settings.
- Cache Flush Interval: This sets the cache flush interval. Valid settings are 2, 4, 6, 8, or 10 seconds.
- Spinup Drive Count: This setting controls the number of drives that spin up at one time.
- **Spinup Delay:** After the RAID controller completes its initialization process, the initial delay value defines the number of seconds before the first disk interrogation request is issued to the array or disk group. Do not change this value.
- Stop On Error: Stops system POST if any error is detected.
- NCQ: Enables NCQ (Native Command Queuing) to optimize physical drive performance and life.
- Stop CC On Error: Stops Consistency Check if any error is detected.
- Schedule CC: Schedules a Consistency Check.
- Maintain PD Fail History: Enables tracking of bad PDs across reboot.

Scan Devices Option

When you select the Scan Devices option on the Main screen, the Intel[®] RAID BIOS Console 2 checks the physical and virtual drives for any changes of the drive status. The Intel[®] RAID BIOS Console 2 displays the results of the scan in the physical and virtual drive descriptions.

Virtual Drives Screen

You can access the virtual drives screen by clicking on a virtual drive in the virtual drive list on the main screen. The upper right section of the screen displays the virtual drives that currently exist. The Virtual Drives screen provides options to:

• Initialize the virtual drives: The Slow Initialize option initializes the selected virtual drive by writing zeroes to the entire volume. You should initialize each new virtual drive that you configure.

Warning: Initializing a virtual drive deletes all information on the physical drives that compose the virtual drive.

- Check consistency (CC): This option verifies the correctness of the redundancy data and is available for arrays and disk groups using RAID 1, 5, 6, 10, 50, or 60. If a difference in the data is found, the Intel[®] RAID BIOS Console 2 assumes that the data is accurate and automatically corrects the parity value.
- Display the virtual drive properties: Through the Properties option, you can:
 - Display the virtual drive properties (such as RAID level, virtual drive size, and stripe size).
 - Display the read, write, Access, Disk Cache, BGI (Background Initialization), and I/O policies.
 - Change the read, write, Access, Disk Cache, BGI, and I/O policies.
 - Select Write Through, Write Back with BBU, or Always Write Back.
 - Start initialization.
 - Start a consistency check.

After setting any property, click **Go** to perform the selected operation. Click **Change** to apply any policy changes.

Physical Drives Screen

This screen displays the physical drives for each channel or port. From this screen, you can rebuild the physical arrays or disk groups, or view the properties for the physical drive you select.

- Click **Reset** to return to the configuration that existed before you made any changes.
- Select Properties and click **Go** to view the properties. An unconfigured drive can be made into a hot spare from the Properties screen.

Configuration Wizard Option

This option enables you to clear a configuration, create a new configuration, or add a configuration. "Setting Up a RAID Array Using the Configuration Wizard" on page 70 provides detailed steps for using the Configuration Wizard.

Events Screen

This option displays the events generated by physical drives, physical devices, enclosure, the Intel[®] Smart Battery, and SAS controller. See Appendix B: "Events and Messages" on page 175 for events and message descriptions.

Physical View/Logical View Option

This option toggles between Physical View and Logical View.

Exit

This option allows you to exit and reboot the system.

Configuration Mismatch Screen

A configuration mismatch occurs when the data in the NVRAM and the hard disk drives are different. It automatically displays after POST when a configuration mismatch occurs. The Configuration Mismatch screen allows you to:

- Select **Create New Configuration** to delete the previous configuration and create a new configuration.
- Select View Disk Configuration to restore the configuration from the hard disk.
- Select View NVRAM Configuration to restore the configuration from the NVRAM.

Setting Up a RAID Array Using the Configuration Wizard

This section provides detailed steps for using the Configuration Wizard to set up a RAID array.

1. Start the Configuration Wizard by selecting the **Configuration Wizard** icon on the Intel[®] RAID BIOS Console 2 main screen.

Intel(r) RAID BIOS Co	nsole Configuration Wizard				
					
	es you through the steps for configuring the RAID tly. The steps are as follows:				
1. Array definitions	1. Array definitions Group physical drives into arrays.				
2. Logical Drive definitions	Define logical drives using those arrays.				
3. Configuration Preview	Preview configuration before it is saved.				
Please choose appropriate c	onfiguration type:				
Clear Configuration	Allows you to clear existing configuration only.				
New Configuration	Clears the existing configuration. If you have any existing data \sim				
	in the earlier defined drives, the data will be lost.				
Add Configuration	Retains the old configuration and then adds new drives to the				
	configuration. This is the safest operation				
	as it does not result in any data loss.				
	Next X Cancel				
	Next X cancer				
Select Appropriate action.	Step 1/5				

Figure 19. Intel[®] RAID BIOS Console 2 - Configuration Types

- 2. Select New Configuration and click Next.
- 3. Then select Virtual Drive Configuration and click Next.

1000	Intel(r) RAID BIOS Console Select Configura	tion		
(intel	🗂 🕶 🔛 😢 🤋			
RA	ID BIOS Console			
Sele	ct Configuration			
•	Virtual Drive Configuration			
				ß
0	CacheCade(TM)Configuration			
			,	
		\times Cancel	ң <u>B</u> ack	
		X Cancel	∢ ⊪ <u>B</u> ack	⊪) <u>N</u> ext
		X Cancel	↓ m <u>B</u> ack	m } <u>N</u> ext
		<u>Cancel</u>	€ ack	m∳ <u>N</u> ext
		X Cancel	∳ ⊪ <u>B</u> ack	m ∳ <u>N</u> ext
		X Cancel	the Back	m≱ <u>N</u> ext
		X Cancel	<u> ∳</u> ∎ <u>B</u> ack	m≱ <u>N</u> ext
		X Cancel	the Back	m∳ <u>N</u> ext
		X Cancel	4m Back	m∳ <u>N</u> ext

Figure 20. Selecting Configuration

4. Choose the configuration method and click Next.

cintel	Intel(r) RAID BIOS Conso	ole Configuration Wizard
(inter	1	
Sel	ect Configuration Method :	
•	Manual Configuration	
	Manually create drive g	groups and virtual drives and set their parameters as desired.
0	Automatic Configuration	n
	Automatically create th	he most efficient configuration.
4	Redundancy:	Redundancy when possible
	Drive Security Method:	No Encryption
		🗙 Cancel 🛛 🗰 Back 🗤 Mext

Figure 21. Intel[®] RAID BIOS Console 2 - Configuration Methods

The following configuration methods options are provided:

— Automatic Configuration

There are two options in Redundancy. **Redundancy When Possible** or **No Redundancy**.

Redundancy When Possible configures configures RAID 1 for systems with two drives or RAID 5 for systems with three or more drives, or RAID 6 for systems with three or more drives. All available physical drives are included in the virtual drive using all available capacity on the disks.

No Redundancy configures all available drives as a RAID 0 virtual drive.

There is a **Drive Security Method** option which is reserved to be enabled in future.

- *Note:* You must designate hot-spare drives before starting auto configuration using all available capacity on the disks.
- Manual Configuration
 Allows you to configure the RAID mode.

Note: Automatic Configuration cannot be used for RAID 10, 50, or 60 or with mixed SATA and SAS drives.

Creating RAID 0, 1, 5, or 6 using Intel[®] RAID BIOS Console 2 (detailed)

This section describes the process to set up RAID modes using the custom configuration options.

1. When the server boots, hold the <Ctrl> key and press the <G> key when the following is displayed:

 $\ensuremath{\texttt{Press}}\xspace < \ensuremath{\texttt{Ctrl}}\xspace < \en$

The Controller Selection screen appears.

- 2. Select a controller and click **Start** to begin the configuration.
- 3. Choose Manual Configuration and click Next (see Figure 21).
- 4. At the Disk Group Definition (DG Definition) screen, hold down the <Ctrl> key and click each drive you want to include in the array or disk group.

See "RAID Levels" on page 9 for the required minimum number of drives that must be added.



Figure 22. Intel[®] RAID BIOS Console 2 - Add Physical Drives to Array

- 5. Click Add To Array. If you make a mistake and need to remove drives, click Reclaim.
- 6. Click Next.
- 7. In the next screen, click Add to Span and then click Next.

- 8. On the VD Definition window, select RAID 0, 1, 5, or 6 from the first dropdown box.
- 9. Enter the virtual drive size in the **Select Size** box.

This example shows a specific size. Depending on the RAID level you choose, you may need to manually type in the expected volume size. The possible sizes for some RAID levels are listed on right panel of the screen for reference.

10. If needed, change the Stripe Size, the policies for Access, Read, Write, IO, and Disk Cache and decide whether to use background initialization.

For information about setting these parameters, see "Setting Drive Parameters" on page 82.

(intel) Intel(r) R	AID BIOS Console Config Wiz	ard – Virtual Drive Definition
RAID Level	RAID 5	
Strip Size	64 KB	
Access Policy	RW	
Read Policy	Normal	
Write Policy	Write Through	
IO Policy	Cached 🔻	
Drive Cache	NoChange 🔻	Next LD, Possible RAID Levels R0:1.817 TB R1:930-500 GB R5:1-363 TB R6: 930-500 GB
Disable BGI	No V	
Select Size	1.363 TB 🔻	
	📮 Accept	Reclaim
		🗙 Cancel 🛛 🛻 Back 🗤 Next

Figure 23. Intel[®] RAID BIOS Console 2 - Set Array Properties

11. Click **Accept** to accept the changes, or click **Reclaim** to delete the changes and return to the previous settings.

The Intel[®] RAID BIOS Console 2 configuration utility displays a preview of the configuration.

12. Click **Accept** to save the configuration, or click **Back** to return to the previous screens and change the configuration.

(intel) Intel(r) RAID BIOS Console Config Wizard	– Preview		
Configuration Preview: This is the configuration defined. Click ACCEPT to save this configuration.			
Drives	Virtual Drives		
<pre>Slot: 8, SATA, HDD, 465.250 GB, Onli Slot: 9, SATA, HDD, 465.250 GB, Onli Slot: 10, SATA, HDD, 465.250 GB, Onl Slot: 11, SATA, HDD, 465.250 GB, Onl Slot: 12, SATA, HDD, 465.250 GB, Unc Slot: 12, SATA, HDD, 465.250 GB, Unc</pre>	VD 0		
	🗙 Cancel 🛛 🛻 Back 🏮 Accept		

Figure 24. Intel[®] RAID BIOS Console 2 - Confirm Configuration

13. Click **Accept** as necessary in the screens that follow. You are prompted to save the configuration and then to initialize the virtual drive.

- 14. Click **Yes** to initialize the new drive.
- 15. Click Initialize to begin the initialization process.
 - Fast initialization runs a quick preliminary initialization and then runs full initialization in the background after the operating system is booted.
 - Slow initialization may take several hours or even days to complete.

(ntel) RAID BIOS Console Virtual Drives	
RAID BIOS Console	
Abort Progress Operation VD0 0% Initialization Progress Progress	VDO: RAIDS: 1.363 TE: Initializat
Home	w Back

Figure 25. Intel[®] RAID BIOS Console 2 - Initialization Speed Setting

- 16. Click **Home** to return to the main configuration screen.
- 17. Select an additional virtual drive to configure or exit the Intel[®] RAID BIOS Console 2 configuration utility and reboot the system.

Creating RAID 10, RAID 50, and RAID 60 using Intel[®] RAID BIOS Console 2

RAID 10, RAID 50, and RAID 60 require setting up multiple RAID arrays/disk groups.

1. When the server boots, hold the <Ctrl> key and press the <G> key when the following is displayed:

Press <Ctrl><G> to enter the RAID BIOS Console

After you press <Ctrl>+<G>, the Controller Selection screen appears.

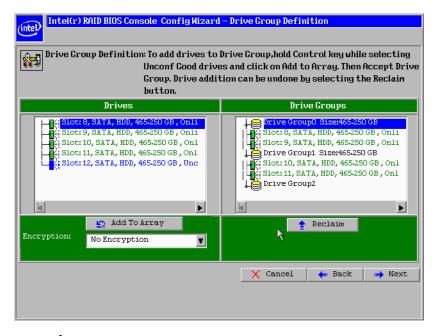
- 2. Select a controller and click **Start** to begin the configuration.
- 3. Select Custom Configuration and click Next (see Figure 21).
- 4. At the Virtual Drive Definition (VD Definition) screen, hold down the <Ctrl> key and click each drive you want included in the first array.
 - For RAID 10, use two drives.
 - For RAID 50, use at least three drives.
 - For RAID 60, use at least three drives.
- 5. Click Add To Array, and then click Accept DG in the right pane to confirm.

The first group of drives appears as a disk group in the right pane. These drives are no longer available in the left pane.

6. From the drives that are available in the left pane, choose an additional group of drives and again click **Add To Array**, and click **Accept DG** to confirm.

Each disk group must contain the identical quantity and size of drives.

Multiple drive groups are now displayed in the right pane. You can add up to eight arrays to the right pane for either RAID 10, RAID 50, or RAID 60.





- 7. Select all arrays or disk groups that are to be spanned in the RAID 10, 50, or 60 array by holding down the <Ctrl> key and selecting each array/disk group in the right pane.
- 8. Click Next.
- 9. In the next screen, click Add to SPAN to move all arrays from the left pane to the right pane. Use <Ctrl> to select all SPANs on the right pane.
- 10. Click Next.
- 11. At the Virtual Drive Definition (VD Definition) screen, select either RAID 10, RAID 50, or RAID 60 from the RAID Level drop-down.

RAID 10 is illustrated below.

12. Select the appropriate Stripe Size, Access Policy, Read Policy, Write Policy, IO Policy, Disk Cache Policy, and Enable/Disable BGI for your application.

For information about setting these parameters, see "Setting Drive Parameters" on page 82.

13. Set the drive size to a number in MB that is a size greater then the size of the RAID 1, RAID 5, or RAID 6 size listed in the disk group.

RAID Level	RAID 10	
Strip Size	64 KB 🔻	
Access Policy	RW	
Read Policy	Normal 🔻	
Write Policy	Write Through	
IO Policy	Cached 🔻	
Drive Cache	NoChange 🔻	Next LD, Possible RAID Levels R00:1.817 TB R10:930-500 GB
Disable BGI	No	
Select Size	930-500 GB 🔻	2
	👢 Accept	🐑 Reclaim
		🗙 Cancel 🛛 🖛 Back 🛛 🗰 Next

Figure 27. Intel[®] RAID BIOS Console 2 – Spanning Multiple Arrays

14. Click Next if the application does not automatically progress to the next screen.

The configuration preview screen displays the virtual drive as shown below. The configuration preview screen displays the virtual drive (RAID 1 for RAID 10, or RAID 50 or RAID 60).

(intel) Intel(r) R	AID BIOS Console Config	ig Wizard – Virtual Drive Definition
RAID Level	RAIDO	Drive Group 0
Strip Size	64 KB 🔻	→ Drive Group 1
Access Policy	RW	
Read Policy	Normal 🔻	
Write Policy	Write Through	
IO Policy	Cached 🔻	
Drive Cache	NoChange 🔻	Press Back Button To Add Another Virtual Drive.
Disable BGI	No 🔻	
Select Size	O KB V	
		Reclaim
		🗙 Cancel 🛭 🐳 Back 👐 Next

Figure 28. Intel[®] RAID BIOS Console 2 – Viewing Completed Settings

- 15. Click Accept to save the configuration.
- 16. When asked to save the configuration, click Yes.

This will store the configuration in the RAID controller.

- 17. When asked to initialize the drive, click Yes.
- 18. Select Fast Initialize and click Go.

The drives will initialize based on the RAID settings.

Note: Slow Initialize initializes the entire drive and may take several hours to complete.

rintel2	Console Virtual Drives	3
RAID BIOS Co	onsole	
Abort Progress	Operation Initialization Progress	<pre>VDO: RAIDIO: 930.500 GB: Initiali VDO: RAIDIO: 930.500 GB: Initiali</pre>
Home		🖕 Back

Figure 29. Intel[®] RAID BIOS Console 2 – Initialization Settings

19. Click **Home** at the Intel[®] RAID BIOS Console 2 screen to return to the main screen.

The RAID 10, RAID 50, or RAID 60 virtual drives are displayed. The following figure shows the RAID 10 virtual drives.

(intel(r) RAID BIOS Console Virtual Configuration			
RAID BIOS Console			
• Controller Selection	Logical View		
 <u>Controller Properties</u> <u>Drive Security</u> 	└── Virtual Drives └── Virtual Drive: 0, 930-500 GB, Optimal └── Drives, Span: 0 │↓↓; Slot: 8, S&TA, HDD, 465-250 GB, Online		
 <u>Scan Devices</u> <u>Virtual Drives</u> 	Ki Slot: 9, SATA, HDD, 465-250 GB, Online Drives, Span: 1		
<u>Drives</u> Configuration Wizard	UK Slot: 11, SATA, HDD, 465.250 GB, Online Unconfigured Drives Unconfigured National State (State State Stat		
Physical View			
• Events • Exit			
ß			

Figure 30. Intel[•] RAID BIOS Console 2 – RAID 10 Final Screen

20. Under Virtual Drives, select Virtual Drive 0: RAID 10, or select Virtual Drive 0: RAID 50, or select Virtual Drive 0: RAID 60 to display the drive properties.

(inte) Intel(r) RAID BIOS Console Virtual Drive Ø	
RAID BIOS Console	
Properties RAID Level: 10 Status: Optimal Strip Size: 64 KB Capacity: 930-500 GB Secured: No Policies	Drives:
Access RW V Read Normal V Default Write: Write Through V Current Write: Write Through	
Disable No V Disk Cache NoChange V BCI L/O Cached V Change	-
Operations C Del C Locate C FastInit C Slow Init C CC Go	
1 Home	🛶 Back

Figure 31. Intel[®] RAID BIOS Console 2 – RAID 10 Properties Screen

Intel(r) RAID BIOS Console Virtual Drive Ø	
RAID BIOS Console	
Properties RAID Level:50 Status: Optimal Strip Size: 64 KB Capacity: 930-500 GB Secured: No Policies	Drives:
Access RW V Read Normal V Default Write: Write Through V Current Write: Write Through	
Disable No V Disk Cache NoChange V BCI L/O Cached V Change	
Operations C Del C Locate C FastInit C Slow Init	
C CC Go	
1 Home	🛻 Back

Figure 32. Intel[®] RAID BIOS Console 2 – RAID 50 Properties Screen

Setting Drive Parameters

The following fields are displayed in the VD Definition screen (see Figure 23 and Figure 27), which can be used to set the virtual drive parameters:

- RAID Level:
 - RAID Level 0: Data striping
 - RAID Level 1: Data mirroring
 - RAID Level 5: Data striping with parity
 - RAID Level 6: Distributed Parity and Disk Striping
 - RAID level 10: Striped mirroring
 - RAID Level 50: Striped RAID 5
 - RAID Level 60: Distributed parity, with two independent parity blocks per stripe
- Stripe Size: Specify the size of the segment written to each disk. Available stripe sizes are 4, 8, 16, 32, 64, 128, 256, 512, and 1024 Kbytes.
- Access Policy: Select the type of data access that is allowed for this virtual drive. The choices are Read/Write, Read Only, or Blocked.
- **Read Policy:** Enables the read-ahead feature for the virtual drive. Read Adaptive is the default setting.
 - Normal: The controller does not use read-ahead for the current virtual drive.
 - Read-ahead: Additional consecutive stripes are read and buffered into cache. This
 option will improve performance for sequential reads.
 - Adaptive: The controller begins using read-ahead if the two most recent disk accesses occurred in sequential sectors.
- Write Policy: Determines when the transfer complete signal is sent to the host. Writethrough caching is the default setting.
 - Write-back caching (Further classified as Write Back with BBU or Always Write Back, which means Write Back is always enabled even if BBU is bad or missing): The controller sends a data transfer completion signal to the host when the controller cache receives all of the data in a transaction. Write-back caching has a performance advantage over write-through caching, but it should only be enabled when the optional battery backup module is installed. The risk of using Always Write Back should be fully recognized.
 - Write-through caching: The controller sends a data transfer completion signal to the host after the disk subsystem receives all the data in a transaction. Write-through caching has a data security advantage over write-back caching.

Caution: Do not use write-back caching for any virtual drive in a Novell NetWare* volume.

- **IO Policy:** Applies to reads on a specific virtual drive. It does not affect the read-ahead cache.
 - Cached IO: All reads are buffered in cache memory.
 - Direct IO: Reads are not buffered in cache memory. Data is transferred to cache and to the host concurrently. If the same data block is read again, it comes from cache memory.

- **Disk Cache Policy:** The cache policy applies to the cache on physical drives of the current array.
 - Enable: Enable disk cache. Enabling the disk cache in Write-back mode provides little or no performance enhancement, while the risk of data loss due to power failure increases.
 - Disable: Disable disk cache.
 - NoChange: Leave the default disk cache policy unchanged.
- **Disable BGI:** Enable or disable background initialization. Set this option to "Yes" to disable background initialization.
- Select Size: Set the size of the virtual drive in megabytes. The right pane of the virtual drive configuration window lists the maximum capacity that can be selected, depending on the RAID level chosen.

Creating a Hot Spare

To create a hot spare, follow these steps:

1. On the main screen, select the drive that should be used as the hot spare.

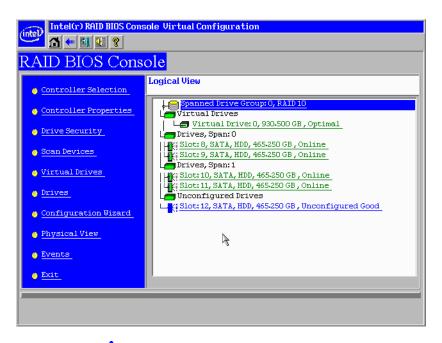


Figure 33. Intel[•] RAID BIOS Console 2 – Choosing a Hot Spare Drive

2. Select the disk group.

- 3. Click one of the following:
 - Click Make Dedicated HSP to add the drive as a hot spare dedicated for certain virtual drives.
 - Click Make Global HSP if you want to create a global hot spare for all disk groups.

(intel(r) RAID BIOS Console Drive 12			
RAID BIOS Co	onsole		
Enclosure ID	N/A	Drive Group 0	
Revision	A51A	Drive Group 1	
Slot Number	12		
Device Type	HDD (SATA)		
Connected Port	4		
Media Errors	0		
Pred Fail Count	0		
SAS Address	4433221105000000		
Physical Drive State	Unconfigured Good		
Ne	ext		
🕤 Make Global HSP	Make Dedica	ated HSP 💿 Make Unconf Bad	
🕤 Prepare Removal	🖧 Locate		
Go Go			
1 Home		🛶 Back	

Figure 34. Intel[•] RAID BIOS Console 2 – Setting a Hot Spare Drive

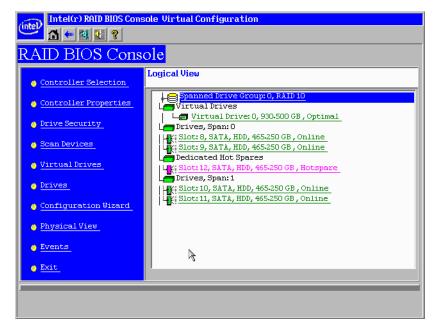
4. Click **Go** to create the hot spare.

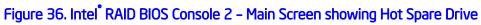
The Drive State changes to HOTSPARE, as shown below.

Intel(r) RAID BIOS Console Drive 12			
RAID BIOS CO	onsole		
Enclosure ID	N/A	Drive Group O	
Revision	A51A		
Slot Number	12		
Device Type	HDD (SATA)		
Connected Port	4		
Media Errors	0		
Pred Fail Count	0		
SAS Address	4433221105000000		
Physical Drive State	DED HOTSPARE		
Next			
Remove HOTSPARE D Locate			
		Go	
1 Home	3	🖕 Back	

Figure 35. Intel[®] RAID BIOS Console 2 – Viewing Hot Spare

5. Click **Home** to return to the main screen.





Viewing Event Details

Events contain information, warnings, and fatal events. Events can be captured on various RAID controller components, such as the battery, physical card, and within the configuration. You can view these using the following steps.

1. On the Main screen, select Events from the menu at the left.

The Events screen appears.

intel(r) RAID	BIOS Console Event Information
First Sequence #	1 1731
Last Sequence # Event Locale	Virtual Drive Physical Device Enclosure BBU SAS
Event Class	Informational
Start Sequence#	0
# of Events (Max 248 at a time)	0
ß	
🚹 Home	em Back

Figure 37. Intel[•] RAID BIOS Console 2 – Event Information Screen

- 2. Select the component to display from the Event Locale list.
- 3. Select the type of event to display from the Event Class drop-down.
- 4. Type the **Start Sequence#** and the **# of Events** to display.

The following example shows a selection that was made for informational events for the virtual drive, starting at sequence number 120 and displaying 10 events.

(nte) Intel(r) RAID BIOS Console Event Information		
First Sequence #	1	
Last Sequence #	1731	
Event Locale	Virtual Drive Image: Constraint of the second sec	
Event Class	Informational V	
Start Sequence#	120	
# of Events (Max 248 at a time)	10	
Home	🛻 Back	

Figure 38. Intel[®] RAID BIOS Console 2 – Selecting Events to View

5. Click Go.

In the following example, virtual drive events for informational messages were selected, starting with the event at sequence 120. The events screen displays the event information for sequence number 120 in the right pane.

Note: In the following example, the Start Sequence# and the # of Events fields display 0. This is because when you click **Go** to display the events, these fields automatically reset to 0.

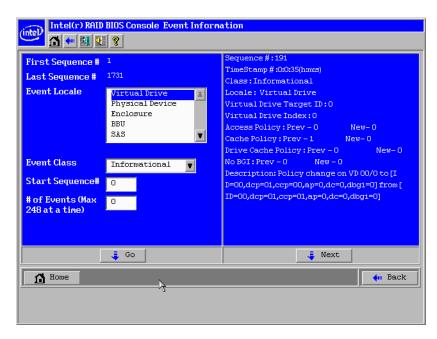


Figure 39. Intel[®] RAID BIOS Console 2 – Viewing an Event

6. Click **Next** to view the next message.

The Intel[®] RAID Web Console 2 enables you to configure, monitor, and maintain Intel[®] RAID controllers and the storage-related devices connected to the RAID controller. The Intel[®] RAID Web Console 2 graphical user interface (GUI) makes it easy to create and manage storage configurations.

Note: Depending on different version of Intel(*R*) RAID Web Console 2, the actual screen displayed could be different from this section. This section is for reference only.

Configuration Functions

The Intel[®] RAID Web Console 2 enables you configure the controllers, disk drives, battery backup units, and other storage-related devices installed on a system.

- The Configuration Wizard simplifies the process of creating disk groups and virtual drives.
- Auto Configuration mode automatically creates the best possible configuration for the available hardware.
- *Note:* Auto Configuration cannot be used for RAID 10, 50, or 60 or with mixed SATA and SAS drives.
- Guided Configuration mode asks you a few brief questions about the configuration, and then creates the array for you.
- Manual Configuration mode gives you complete control over all aspects of the storage configuration.
- The Reconstruction Wizard enables you to increase or reduce the size of a virtual drive and to change the RAID level of an array.

Monitoring Functions

The Intel[®] RAID Web Console 2 displays information on the status of virtual drives, physical disks, and other storage-related devices on the systems you are monitoring. System errors and events are recorded in an event log file and displayed on the screen. Special device icons appear on the screen to notify you of disk failures and other situations that require immediate attention.

Note: Intel[®] RAID Web Console 2 "Client Only" Installation type on the Client system doesn't support configuring email/alerting settings on local system. Necessary settings for local system need to be configured locally.

Maintenance Functions

Use the Intel[®] RAID Web Console 2 to perform system maintenance tasks such as running patrol read operations, updating firmware, and running consistency checks on arrays and disk groups that support redundancy.

Hardware and Software Requirements

The hardware requirements for Intel[®] RAID Web Console 2 software are as follows.

- PC-compatible computer system with at least one Intel[®] Xeon[®] architecture processor or an Intel[®] Extended Memory 64 Technology (Intel[®] EM64T) 64-bit processor
- At least 256 Mbytes of system memory
- Hard disk drive with at least 50 MB available free space
- A supported operating system:
 - Microsoft Windows 2000*, Microsoft Windows Server 2003*, Microsoft Windows Server 2008*, or Microsoft Windows XP*
 - Red Hat* Linux Enterprise 3.0, 4.0, or 5.0 with or without corresponding service packs
 - SuSE* Enterprise Linux 9.0, 10.0, or 11.0 with or without corresponding service packs
 - VMWare* ESX 3i, 4i

Installing the Intel[®] RAID Web Console 2 on a Microsoft Windows* Operating System

To install the Intel[®] RAID Web Console 2 on a Microsoft Windows 2000*, Microsoft Windows Server 2003*, Microsoft Windows Server 2008*, or Microsoft Windows XP* system, complete the following steps:

1. Insert the *Resource CD* in the CD-ROM drive.

OR

Download the Intel[®] RAID Web Console 2 installation package from *http://www.intel.com/support/motherboards/server/*.

- 2. When the Welcome screen is displayed, click Next.
- 3. When the next screen is displayed, read and accept the user license and click **Next**.

The Customer Information screen is displayed, as shown in Figure 40.

Customer Information Please enter your information.		
User Name:		
Administrator		1
Organization:		
	F	
Allow availability of this application	for:	
All users		
All users		

Figure 40. Intel[®] RAID Web Console 2 – Customer Information Screen

- 4. Enter your user name and organization name. At the bottom of the screen, select an installation option:
 - If you select **All users**, any user with administrative privileges can view or change the RAID configurations.
 - If you select **Only for current user (Administrator)**, only you can view or change the RAID configurations.
- 5. Click **Next** to continue.
- 6. Accept the default Destination Folder, or click **Change** to select a different destination folder. Click **Next** to continue.

The Setup Type screen is displayed, as shown in Figure 41.

Setup Type			
Choose the setup type that best suits your needs.			
Please select a setup type.			
	_		
This option will install all	program features.		
C Custom Installation			
This option will allow yo	u to select or omit in	dividual program c	omponents.
nstallShield			
	< <u>B</u> ack	<u>N</u> ext >	Cancel

Figure 41. Setup Type Screen

7. Select one of the following setup options.

- Select **Complete** if you are installing the Intel[®] RAID Web Console 2 on a system.
- Select Custom Installation if you want to select or omit individual program components to install. When selected, more custom options are provided. Please read the instructions on the screen carefully to make sure you select the preferred setup type.
- 8. Click Next to proceed and then click Finish to complete the installation process.

Installing the Intel[®] RAID Web Console 2 on Linux or SuSE* Linux Enterprise Server

To install Intel[®] RAID Web Console 2 on a system running Red Hat* Linux 3.0, 4.0, or 5.0, or SuSE* Linux Enterprise Server 9,10 or 11, complete the following steps:

- 1. Unzip the file ir3_Linux_RWC2_v....tgz.
- 2. In the unzipped files, read the readme.txt file and follow the instructions closely, in order to make the installation successful.
- 3. Run install.sh and follow the instructions that display on the screen.

The three setup options are the same as those shown in step 7 of the Microsoft Windows* installation instructions.

Intel[®] RAID Web Console 2 Support and Installation on VMWare

This section documents the installation of Intel[®] RAID Web Console 2 on VMWare Classic (with console operating system) and on the VMWare ESX 3i operating system.

Installing Intel[®] RAID Web Console 2 for VMWare Classic

VMWare does not support any graphics components. In order to install the server component of $Intel^{\mathbb{R}}$ RAID Web Console 2 (Intel[®] RAID Web Console 2 without popup and client), run the script file ServerInstall.sh and choose setup type "4". For the noninteractive (silent) mode, run ./ServerInstall.sh -x.

In order to manage Intel[®] RAID Web Console 2 on a VMWare system, install Intel[®] RAID Web Console 2 Client from a remote system.

Uninstalling Intel[®] RAID Web Console 2 for VMWare

To uninstall the Server Component of Intel[®] RAID Web Console 2 on VMWare, use the Uninstall command in the Program menu or run the script /uninstaller.sh.

Note the following points:

1. An Intel[®] RAID Web Console 2 upgrade is supported in this release. This release can be upgraded by future releases.

2. To shut down the Intel[®] RAID Web Console 2 Framework service, run the following command:

/etc/init.d/vivaldiframeworkd stop

It is recommended that you stop the Monitor service before you stop the Intel[®] RAID Web Console 2 Framework service. To stop the Monitor service run the following command:

/etc/init.d/mrmonitor stop

Installing Intel[®] RAID Web Console 2 Support on the VMWare ESX

This section outlines the product requirements needed to support the VMWare ESX operating system. Classic VMWare includes a Service Console that is derived from the Linux 2.4 kernel, but with reduced functionality.

The Intel[®] RAID Web Console 2 server part cannot be installed directly in VMWare ESX 3i. Management is performed through $Intel^{®}$ RAID Web Console 2 installed on a remote machine (Linux/Windows).

The Linux installer of $Intel^{\mathbb{R}}$ RAID Web Console 2 works under console with minimal changes. Hardware RAID is currently supported in ESX 3.x.

Note: There is a known limitation that virtual drives that are created or deleted will not be reflected to the kernel. The workaround is to reboot the server or to run *esxcfg-rescan <vmhba*#> from COS shell.

The network communication is a key element for a proper setup. Therefore, we recommend that you install the management on a VM within the ESXi. Follow these steps to install and configure Intel[®] RAID Web Console 2 support on the VMWare ESX operating system:

- 1. Network Configuration of the ESXi Host: -
 - Assignment of a ESXi hostname:

Even if it is not relevant for your network, you need a FQDN (Fully Qualified Domain Name). Example: local.lsi.com to be entered using the local ESXi console.

- Configuration of a virtual network environment:
 - i. You can use the already existing Vswitch, which has a VMkernel port already attached for the communication.
 - ii. Alternatively, you can build a new Vswitch without a link to the Host network card.

Which one of the two possibilities to choose depends on your application. It is recommended to choose between both possibilities at a early stage, because the creation of a new Vswitch with VMkernel requires a reboot. For those who want to reach the target as quickly as possible, no change is recommended.

Configuration of the IP address:

Configure the IP address. The address must be accessible by the VM that will be installed next.

2. VM Installation: -

Install the operating system as usual, including the VMWare guest tools. The virtual network card should be linked to a Vswitch that has a VMKernel port attached. For a quick installation, no change is recommended.

3. Intel[®] RAID Web Console 2 Installation: -

- Install Intel[®] RAID Web Console 2 with the option "complete".
- 4. VM Network Configuration: -
 - Case 1: Your network contains a DNS server:

Configure a host entry that belongs to your internal zone and make sure that the FQDN of the ESXi server can be resolved. (Example: local.lsi.com and 192.19.221.186)

— Case 2: Your network does not have a DNS server:

Edit your file C.\windows\system32\drivers\etc\hosts and add another entry:

IP of the ESXi Host	FQDN of the ESXi Host

192.19.221.186 local.lsi.com

5. Final Steps: -

Reboot the VM and start the Intel[®] RAID Web Console 2. The ESXi server should now appear in the list of the found hosts. You can now log in with the root account name and password of the ESXi Host.

Limitations

The following are the limitations of this installation and configuration:

- There is no active event notification, for example, by popup or email
- There is no status information for the controller
- There is no user authentification.
- Events are collected as long as Intel[®] RAID Web Console 2 runs on the Client.
- Intel[®] RAID Web Console 2 responds more slowly.

Differences in Intel[®] RAID Web Console 2 for VMware ESXi

The following are some of the differences in the $Intel^{\mathbb{R}}$ RAID Web Console 2 utility when you manage a VMWare server.

- 1. The following limitations apply to the system information exposed through the application:
 - Only the IP address and the Host name display.
 - The operating system type and the operating system architecture do not appear.
 - There is no support for the controller health information.

The following are the Intel[®] RAID Web Console 2 screens affected:

- Initial Intel[®] RAID Web Console 2 framework (hosts) discovery screen: No health information or operating system type display.
- Server property page: Only the IP address and the Host name display; the operating system type and operating system architecture do not display.
- 2. Authentication support:

Access control is not supported. There is no support for full view or view only access modes. It is always full view access, and multiple clients can have full view access at the same time on the same server

3. Event Logging:

Full functionality support is available for the VMware ESXi operating system, but it works differently than the normal Intel[®] RAID Web Console 2 framework mode. The event logging feature for the Intel[®] RAID Web Console 2 Client connected to a VMware ESXi system behaves as follows:

- There is no support for retrieving initial logs (the events that occurred before a client logs in). Only those events that occur after a client logs in appear in the event logger dialog.
- System log does not display.
- The "Save log" feature is not supported; however, the "Save Log as Text" is still supported.
- The "View Log" option allows you to view the logs saved in a text file on the event logger dialog.
- The event descriptions might not be identical to a normal Intel[®] RAID Web Console
 2 Client because the descriptions come from the firmware through the provider.
- There is no filtering of events, unlike Monitor Service.
- Refreshing of the Intel[®] RAID Web Console 2 GUI after any updates on the firmware is slower for a client connected to VMWare ESXi hosts, compared to one connected to Windows/Linux/Solaris hosts.
- 4. Remote discovery and heartbeat mechanism:

For networks that do not have DNS configured, the "hosts" file in the machine on which the Intel[®] RAID Web Console 2 is installed must be edited as follows:

- Add an entry to map the VMWare host's IP address with the hostname. This is for the discovery to happen correctly. In the absence of this entry, the VMWare host would be discovered as 0.0.0.0.
- Add an entry to map its own IP address (not the loop back address) with the Hostname. This is to ensure that the Alert Event Notifications (AENs) are delivered correctly.

For networks that has DNS configured, the "hosts" file in the machine on which Intel[®] RAID Web Console 2 is installed must be edited as follows:

- When you do the initial configurations for the VMWare host, provide the correct DNS server IP address.
- In the hosts file of the machine on which Intel[®] RAID Web Console 2 is installed, add an entry to map its own IP address (not the loop back address) with the Hostname. This is to ensure that the Asynchronous Event Notifications (AENs) are delivered correctly.
- 5. The VMWare hosts are discovered only when the Framework service starts on the host where Intel[®] RAID Web Console 2 is installed.
- 6. The VMWare ESX3i does not support the heartbeat mechanism to let Intel[®] RAID Web Console 2 know whether VMWare ESX3i is still connected. When the connection to the remote VMWare ESX3i is lost, Intel[®] RAID Web Console 2 does not indicate this. The only option is to rediscover by restarting the Intel[®] RAID Web Console 2 framework.

- 7. This is supported only on a full installation of Intel[®] RAID Web Console 2; standalone, client-only, and server-only modes do not support VMWare ESX3i management.
- 8. Supported on following guest operating systems:
 - Windows Server 2003* and Windows Server 2008*
 - Linux RHEL 4 and 5
- 9. The following describes the status of components related to VMWare ESX3i:
 - Intel[®] RAID Web Console 2 client GUI is supported.
 - There is no support for Monitor Configurator; you cannot configure the severity of the AENs.
 - There is no pop-up service support.
 - There is no email and system log support.
 - Monitor service support is not available.
- 10. For Red Hat Enterprise Linux 5, you must create the following symbolic links:

Note: This step is not required for Intel[®] RAID Web Console 2 version 2.90-02 or later.

- cd /usr/lib on RHEL 5
- Search for libcrypto, libssl and libsysfs libraries as follows:
- ls -lrt libcrypto*, ls -lrt libssl*, ls -lrt libsysfs*
- If the files libcrypto.so.4, libssl.so.4, and libsysfs.so.1 are missing, manually create sym links as follows:
- ln -s libcrypto.so libcrypto.so.4
- ln -s libssl.so libssl.so.4
- ln -s libsysfs.so libsysfs.so.1
- If the '.so' files are not present in the /usr/lib directory, create a link with the existing version of the library. For example, if libcrypto.so.6 is present and libcrypto.so is not, create the link as follows:
- ln -s libcrypto.so.6 libcrypto.so.4

Running Intel[®] RAID Web Console 2 on VMWare ESX 3.5i U2

If you are using VMWare ESX 3.5i U2, perform the following steps to make Intel[®] RAID Web Console 2 work:

- 1. Open the maintenance console/shell in ESX3.
 - a. Press ALT+F1.

A shell without any prompt appears.

b. Type unsupported (all lowercase) and press ENTER.

Typed text is not prompted back.

c. Enter your password when prompted.

There is no password by default for the shell. If you have set any password from the "yellow" screen (DCUI), use that password.

You are prompted (#) next.

2. Enable ssh for remote copy.

- a. Type the following command.
- vi /etc/inetd.conf
- b. Search for ssh in the file.

By default, the line that contains ssh has comments.

- c. Remove the comment by deleting the symbol # in front of the line.
- d. Save the file and exit.
- 3. Restart the inetd daemon for the changes to take effect.
 - a. Type the following command to get the pid for inetd: ps | grep inetd
 - b. Type the following command to kill the inetd process:
 Kill -9 <inetd pid>
 - c. Type the following command to restart the inetd daemon: #inetd
- 4. Type the following command to use scp to copy storelib from a remote machine to the following path:

/lib dir scp <user@ip:path to
storelib>/libstorelib.so.2.53 /lib/libstorelib.so

- 5. Restart SFCB and check its status.
 - a. Type the following command to restart SFCB: /etc/init.d/sfcbd restart
 - b. Type the following command to check the status of SFCB: /etc/init.d/sfcbd status
 - *Note:* The updated Storelib library in the /lib directory does not persist across reboots. Each time you restart the VMWare host, you have to follow this procedure to replace the Storelib library.

Starting the Intel[®] RAID Web Console 2

Complete the following steps to start the Intel[®] RAID Web Console 2 (Different Operating Systems may have slightly different directories):

- Microsoft Windows*: Select Start | All Programs | RAID Web Console 2 | StartupUI, or double-click the Intel[®] RAID Web Console 2 icon on the desktop.
- Red Hat* Enterprise Linux 3 U6: Select Start | System Tools | RAID Web Console 2 StartupUI.
- SuSE* Linux Enterprise Service 9 SP1: Select Start | System | More Programs | RAID Web Console 2 StartupUI.

Intel[®] RAID Web Console 2 Screens

This section describes the main $Intel^{\mathbb{R}}$ RAID Web Console 2 screens. When you start the $Intel^{\mathbb{R}}$ RAID Web Console 2, the Select Server window is displayed.

Note: Depending on the revision of Intel[®] RAID Web Console 2 software installed, the following screen may vary slightly.

Intel [®] RAID Wel	b Console 2	Hart	intel
Server Details			
This page displays all the servers that were d You will be prompted for entering host creder	liscovered.Choose a server and click on Login I ntials while logging in.	o start managing that server.	
Use Configure Host to configure the hosts th	at you want to view.		
IP Address:	Discover Host Stop Discovery		<u>_</u> onfigure Host
Remote servers:			
Host	IP Address	Operating System	Health
WIN-CQ0TKHM59XZ	10.239.56.188	Windows Server 2008	Optimal
Login			

Figure 42. Intel[•] RAID Web Console 2 – Select Server Screen

Note: To access systems on a different subnet, type in the box in middle-left side of the screen the IP address of a system in the desired subnet where Intel[®] RAID Web Console 2 is running and click Discover Host. If you check the Connect to remote framework box, you can also access a standalone server running Intel[®] RAID Web Console 2, if it has a network connection.

Color Coding: If the circle in the server icon is yellow instead of green, it means that the system is running in a degraded state (for example, a disk drive used in a virtual drive has failed). If the circle is red, the storage configuration in the system has failed.

To log in to a system, follow these steps:

1. Double-click the icon of the system from "Remote servers" list that you want to access.

The Server Login window appears.

Enter User Name & Password		×
Intel [®] RAID Web Console 2		(intel)
Server :	10.239.56.188	
<u>U</u> ser Name:	Use your Operating System's login username and password to login the MSM server	
Password:		
Login <u>M</u> ode:	Full Access	
	_ogin Cancel	

Figure 43. Intel[®] RAID Web Console 2 – Login Screen

- 2. Select an access mode from the drop-down menu.
 - Select **Full Access** if you need to view the current system configuration and change the configuration.
 - Select **View Only** if you only need to view the system configuration.
- 3. Enter your user name and password and click Login.

If your user name and password are correct for the login mode you have chosen, the main screen displays.

Note: Intel[®] RAID Web Console 2 uses the username and password of your server operating system. In Microsoft Windows*, you can use the username Administrator and appropriate password to log on to Intel[®] RAID Web Console 2. In Linux, you can use the username root and appropriate password to log on to log on to Intel[®] RAID Web Console 2. If you do not know the password, contact the server system administrator to obtain the password.

RAID Web Console 2 - 6.90.0300				
Manage <u>G</u> o To Log <u>T</u> ools <u>H</u> elp				
i 🛡 🍫 🕗 🖹 🕫 🕜				
Intel [®] RAID W	eb Conso	le 2		intel
Dashboard Physical Logical				Welcome: administrator Log Off
Controller: Intel (R) RAID Controller R528	3L080DE (Bus 10.Dev 0)			
Properties		Usage		Background Operations
🏩 Status: 🧿 Optim	al			Virtual drive operations in progress: 0
🕡 Enclosures: 0			Total capacity:	
Backplanes: 1			927.594 GB	
So Drives: 4			Configured Capacity: 0 Bytes	, Drive operations in progress: 0
Drive groups: 0			Unconfigured Capacity: 927.594 GB	
🚺 Virtual Drive(s): 0		100%	- 927.594 GB	
View server profile				More details
Features		Actions		Help
🗊 Alarm:	Disabled	Create virtual drive		How to use MSM?
I MegaRAID RECOVERY	Enabled	Create super sized cache (550	<u>-)</u>	How to create virtual drive?
🗊 Super sized cache:	Enabled	Load configuration		How to enable premium feature?
🗊 Drive security:	Disabled	Update firmware		Glossary
间 Unconfigured good spin down:	Disabled	Silence alarm		
间 Hot spare spin down:	Enabled			
🗑 Cluster:	Disabled			
]			
ID Error Level Date / Tir			Description	
250 [Information 2010-04-23, 20:48 Displaying log from server	3:30 Successful log	on to the server User: administra	tor, Client: 10.239.56.188, Acce	ess Mode: Full, Client Time: 2010-04-23,20:48:30

Figure 44. Intel[®] RAID Web console 2 dashboard

The information displayed on this Dashboard screen provides an overview of the RAID ecosystem on the selected server system. Some frequently used functions are listed in the Dashboard tab, such as Create Virtual Drive etc.

<u>Manage</u> <u>G</u> o To Log <u>T</u> ools <u>H</u> elp		
i 関 🛸 📀 🖹 🕸 🕢		
Intel [®] RAID Web Conse	ole 2	intel
Dashboard Physical Logical		Welcome: administrator Log Off
WIN-CQ0TKHM59XZ	Properties	
Gardiner R328L08082 (603 10,000 0) Gardiner R328L08082 (603 10,000 0) Gardiner R328L08082 (603 10,000 0)	Host Name	WIN-CQ0TKHM59XZ
	IP Address	10.239.56.188
Slot: 2, SATA, 232.886 GB, Unconfigured Good	Operating System	Windows Server 2008
	OS Version	6.0
	OS Architecture	x86
ID Error Level Date / Time 251 [Information 2010-04-23, 21:00:57 Controller II	Description D: 0 Time established since power on: Time 2010-04-23,21:00:57	3721 Seconds
251 [Information 2010-04-23, 21:00:57 [Controller II]	 o nine established since power on: nine 2010-04-23,21:00:57 	3721 Jeconus

Figure 45. Intel[®] RAID Web Console 2 – Main Screen

The information on the screen in Figure 45 shows the connected devices such as RAID controllers, physical devices, battery and so on.

The following subsections describe this screen in more detail.

Physical/Virtual View Panel

Depending on the tab selected, the left panel displays either the Physical View or the Virtual View of the system and the devices in it.

Note: The word 'Virtual' maybe displayed as 'Logical' depending on different versions of the utility.

- The Physical View shows the hierarchy of physical devices in the system. At the top of the hierarchy is the system itself. Controllers are installed in the system, and each controller has one or more ports. Disk drives and other physical devices are attached to the ports.
- The Virtual View shows the hierarchy of systems, controllers, virtual drives, and arrays and disk groups that are defined for the system.

Small icons represent the servers, controllers, and other devices. A red circle to the right of an icon indicates that the device has failed. For example, this icon indicates that a disk drive has failed: w = 0

A yellow circle to the right of an icon indicates that a device is running in a degraded state. For example, this icon indicates that a virtual drive is running in a degraded state due to the failure of a disk drive:

Properties/Operations/Graphical View Panel

Depending on the kind of device selected in the left panel and your login mode (full-access or view-only), the right panel has either two or three tabs.

The Properties tab displays information about the selected device.

Note: Depending on different Intel(R) RAID Web Console 2 versions, Operations and Graphical tabs may not exist, or only exist in old version utility. The screen displays in following sections show all these view panels for user reference, in case different versions of Intel[®] RAID Web Console 2 is installed on server system.

<u>File</u> Og	erations <u>G</u> roup	Operations Log Tools H	elp	
	ntel [®] l	RAID Web	Cor	isole 2
Physical	Logical			
	_w2k3_32	ntroller SRCSASJV (Bus 10,De		Properties Operations
- Y 1	Backplane (0) Slot: 0, 5 Slot: 1, 5 Slot: 2, 5 Slot: 2, 5			 C Enable Alarm ✓ Figsh Firmware C Set Patrol Read Properties C Start Patrol Read C Set Adjustable Task Rates C Schedule Consistency Check C Consistency Check Settings
				Go
	1		-	
ID	Error Level	Date / Time	-	Description
83 82	-	2008-11-03, 16:46:18 2008-11-03, 16:46:18		ler ID: 0 Unexpected sense: PD = :0 - Invalid field in CDB, CDB = 0x12 0x01 0x00 0x00 0xff 0x00 , Sense = 0x70 0x
82		2008-11-03, 16:46:18	2	ler ID: 0 Unexpected sense: PD = :0-Invalid rield in CDB, CDB = 0x12 0x01 0x00 0x00 0xm 0x00 , sense = 0x70 0x — ler ID: 0 Created VD: 0
80		2008-11-03, 16:46:17	2	ler ID: 0 VD is now OPTIMAL VD 0
79		2008-11-03, 16:46:17	2	ler ID: 0 State change: PD =::3 Previous = Unconfigured Good Current = Online
79	•	2008-11-03, 16:46:17		ler ID: 0 State change: PD =::2 Previous = Unconfigured Good Current = Online
77	•	2008-11-03, 16:46:17	2.0.00.00	ler ID: 0 State change: PD =::1 Previous = Unconfigured Good Current = Online
76	•	2008-11-03, 16:46:17		ler ID: 0 State change: PD =::0 Previous = Unconfigured Good Current = Online
	g log from server		Condro	
	,			

Figure 46. Intel[®] RAID Web Console 2 – Operations Tab

The Operations tab lists the operations that can be performed on the device selected in the left panel. This tab is available only when you are logged in to Intel[®] RAID Web Console 2 in Full-access mode. Options available for controllers include: enabling or silencing the alarm, flashing the firmware, and so on. Some types of devices, such as arrays, disk groups, and ports, do not have operations associated with them.

If a physical or virtual drive is selected in the left panel, the Graphical tab is available in the right panel. In the Graphical View, the device's storage is color coded to show used capacity, unused capacity, and so on.

Note: This Graphical View feature may or may not be displayed in the utility depending on the version of the utility.

Physical Logical Provervica3_32 Implementation (Note: SRC5A537) (Bus 10, Dev 0) Backplane (0) Solut, 1, 565, 76 GB, Online Solut, 1, 557, 76 GB, Online Dittermition, 2009, 11, 03, 164, 013 Commutation, 2009, 11, 03, 164, 013 Commutation, 2009, 11, 03, 164, 013 Controller ID: 0 Unrependencies: PD P Difformation, 2009, 11, 03, 164, 013 Controller ID: 0 Unrependencies: PD Difformation, 2009, 11, 03, 164, 013 Controller ID: 0 Unrependencies: PD Difformation, 2009, 11, 03, 164, 013 Contr	10 M	perations Group Operations Log Tools		el
Backplane (0) Slot 1, SATA, 465.76 GB, Online Slot 1, SATA, 465.76 GB, Online Slot 2, SATA, 455.76 GB, Online Slot 2, SATA, 455.76 GB, Online Slot 3, SATA, 455.76 GB, Online Slot 3, SATA, 455.76 GB, Online Slot 3, SATA, 455.76 GB, Online Slot 3, SATA, 455.76 GB, Online Slot 4, SATA, 465.76 GB, Unconfigured Got Plot 4, SATA, 465.76 GB, Unconfigured Got Reserved Selected VD Selected VD Selected VD Selected VD Selected VD Selected VD Information 2008-11-03, 16:46:18 Controller ID: 0 Unformation 2008-11-03, 16:46:18 Controller ID: 0 Unformation 2008-11-03, 16:46:17 Controller ID: 0 Unexpected sense: PD = :0-Invald field in CDB, CDB = 0:12 1pformation	Physical	l Logical ie_w2k3_32	Properties Operations Graphical View	
ID Error Level Date / Time Description ID Error Level Date / Time Description S1 [Information 2008-11-03, 16:46:18 Controller ID: 0 Unexpected sense: PD = :0 - Invalid field in CDB, CDB = 0x12 0x01 0x00 0xff 0x00 , Sense = 0x70 S2 [Information 2008-11-03, 16:46:17 Controller ID: 0 Unexpected sense: PD = :0 - Invalid field in CDB, CDB = 0x12 0x01 0x00 0x0ff 0x00 , Sense = 0x70 S1 [Information 2008-11-03, 16:46:17 Controller ID: 0 Created VD: 0 0 <th>Y</th> <th>Backplane (0) Slot: 0, SATA, 465.76 GB, Online Slot: 1, SATA, 465.76 GB, Online Slot: 2, SATA, 465.76 GB, Online Slot: 3, SATA, 465.76 GB, Online Slot: 3, SATA, 465.76 GB, Online</th> <th>rred Goo: Configured Available Reserved Selected VD Select Virtual Disk</th> <th></th>	Y	Backplane (0) Slot: 0, SATA, 465.76 GB, Online Slot: 1, SATA, 465.76 GB, Online Slot: 2, SATA, 465.76 GB, Online Slot: 3, SATA, 465.76 GB, Online Slot: 3, SATA, 465.76 GB, Online	rred Goo: Configured Available Reserved Selected VD Select Virtual Disk	
83 [Information 2008-11-03, 16:46:18 Controller ID: 0 Unexpected sense: PD = :0 - Invalid field in CDB, CDB = 0x12 0x01 0x00 0x00 0xff 0x00 , Sense = 0x70 82 [Information 2008-11-03, 16:46:18 Controller ID: 0 Unexpected sense: PD = :0 - Invalid field in CDB, CDB = 0x12 0x01 0x00 0x00 0xff 0x00 , Sense = 0x70 81 [Information 2008-11-03, 16:46:17 Controller ID: 0 Created VD: 0 80 [Information 2008-11-03, 16:46:17 Controller ID: 0 VD is now OPTIMAL VD 0 91 [Information 2008-11-03, 16:46:17 Controller ID: 0 State change: PD = -:-::3 Previous = Unconfigured Good Current = Online 73 [Information 2008-11-03, 16:46:17 Controller ID: 0 State change: PD = -:-::1 Previous = Unconfigured Good Current = Online 74 [Information 2008-11-03, 16:46:17 Controller ID: 0 State change: PD = -:-::1 Previous = Unconfigured Good Current = Online				
82 [Information 2008-11-03, 16:46:18 Controller ID: 0 Unexpected sense: PD = :0 - Invalid field in CDB, CDB = 0x12 0x01 0x00 0x00 0x00 0xff 0x00 Sense = 0x70 81 [Information 2008-11-03, 16:46:17 Controller ID: 0 Created VD: 0 0 80 [Information 2008-11-03, 16:46:17 Controller ID: 0 VD is now OPTIMAL VD 0 79 [Information 2008-11-03, 16:46:17 Controller ID: 0 State change: PD = -:-:-:3 Previous = Unconfigured Good Current Online 77 [Information 2008-11-03, 16:46:17 Controller ID: 0 State change: PD = -:-:-:1 Previous = Unconfigured Good Current Online 77 [Information 2008-11-03, 16:46:17 Controller ID: 0 State change: PD = -:-:-:1 Previous = Unconfigured Good Current Online		Frror Level Date / Time	Description	2
81 [Information 2008-11-03, 16:46:17 Controller ID: 0 Created VD: 0 80 [Information 2008-11-03, 16:46:17 Controller ID: 0 VD is now OPTIMAL VD 0 79 [Information 2008-11-03, 16:46:17 Controller ID: 0 State change: PD = -::3 Previous = Unconfigured Good Current Online 71 [Information 2008-11-03, 16:46:17 Controller ID: 0 State change: PD = -::1 Previous = Unconfigured Good Current Online 77 [Information 2008-11-03, 16:46:17 Controller ID: 0 State change: PD = -::1 Previous = Unconfigured Good Current Online 77 [Information 2008-11-03, 16:46:17 Controller ID: 0 State change: PD = -::1 Previous = Unconfigured Good Current Online	ID			0x70 0x
80 [Information] 2008-11-03, 16:46:17 Controller ID: 0 VD is now OPTIMAL VD 0 79 [Information] 2008-11-03, 16:46:17 Controller ID: 0 State change: PD =:-:3 Previous = Unconfigured Good Current = Online 78 [Information] 2008-11-03, 16:46:17 Controller ID: 0 State change: PD = -:-:2 Previous = Unconfigured Good Current = Online 77 [Information] 2008-11-03, 16:46:17 Controller ID: 0 State change: PD = -:-:-1 Previous = Unconfigured Good Current = Online 77 [Information] 2008-11-03, 16:46:17 Controller ID: 0 State change: PD = -:-:-1 Previous = Unconfigured Good Current Online	ID 83	[Information 2008-11-03, 16:46:18	Controller ID: 0 Unexpected sense: PD = :0 - Invalid field in CDB, CDB = 0x12 0x01 0x00 0x00 0xff 0x00 , Sense =	
78 [Information 2008-11-03, 16:46:17 Controller ID: 0 State change: PD = -:-:2 Previous = Unconfigured Good Current = Online 77 [Information 2008-11-03, 16:46:17 Controller ID: 0 State change: PD = -:-:1 Previous = Unconfigured Good Current = Online	ID 83 82	[Information 2008-11-03, 16:46:18 [Information 2008-11-03, 16:46:18	Controller ID: 0 Unexpected sense: PD = :0 - Invalid field in CDB, CDB = 0:12 0:x01 0:x00 0:x00 , Sense = Controller ID: 0 Unexpected sense: PD = :0 - Invalid field in CDB, CDB = 0:x12 0:x01 0:x00 0:x00 , Sense =	
78 [Information 2008-11-03, 16:46:17 Controller ID: 0 State change: PD = -:-:2 Previous = Unconfigured Good Current = Online 77 [Information 2008-11-03, 16:46:17 Controller ID: 0 State change: PD = -:-:1 Previous = Unconfigured Good Current = Online	ID 33 32 31	[Information 2008-11-03, 16:46:18 [Information 2008-11-03, 16:46:18 [Information 2008-11-03, 16:46:17	Controller ID: 0 Unexpected sense: PD = :0 - Invalid field in CDB, CDB = 0x12 0x01 0x00 0x00 0xff 0x00 , Sense = Controller ID: 0 Unexpected sense: PD = :0 - Invalid field in CDB, CDB = 0x12 0x01 0x00 0x06 0xff 0x00 , Sense = Controller ID: 0 Created VD: 0 0	
77 [Information 2008-11-03, 16:46:17 Controller ID: 0 State change: PD = -:-:1 Previous = Unconfigured Good Current = Online	ID 83 82 81 80	Information 2008-11-03, 16:46:18 Information 2008-11-03, 16:46:18 Information 2008-11-03, 16:46:17 Information 2008-11-03, 16:46:17	Controller ID: 0 Unexpected sense: PD = :0 - Invalid field in CDB, CDB = 0x12 0x01 0x00 0x00 0xff 0x00 , Sense = Controller ID: 0 Unexpected sense: PD = :0 - Invalid field in CDB, CDB = 0x12 0x01 0x00 0x00 0xff 0x00 , Sense = Controller ID: 0 Controller ID: 0 VD is now OPTIMAL VD 0	120
	ID 83 82 81 80 79	[Information 2008-11-03, 16:46:18 [Information 2008-11-03, 16:46:18 [Information 2008-11-03, 16:46:17 [Information 2008-11-03, 16:46:17 [Information 2008-11-03, 16:46:17	Controller ID: 0 Unexpected sense: PD = :0 - Invalid field in CDB, CDB = 0x12 0x01 0x00 0x00 0xff 0x00 , Sense Controller ID: 0 Unexpected sense: PD = :0 - Invalid field in CDB, CDB = 0x12 0x01 0x00 0x00 0xff 0x00 , Sense = Controller ID: 0 Created VD: 0 Controller ID: 0 VD is now OPTIMAL VD 0 Controller ID: 0 State change: PD = -:-:-:3 Previous = Unconfigured Good Current = Online	
76 [Information	ID 83 82 81 80 79 78	[Information 2008-11-03, 16:46:18 [Information 2008-11-03, 16:46:18 [Information 2008-11-03, 16:46:17 [Information 2008-11-03, 16:46:17 [Information 2008-11-03, 16:46:17 [Information 2008-11-03, 16:46:17 [Information 2008-11-03, 16:46:17	Controller ID: 0 Unexpected sense: PD = :0 - Invalid field in CDB, CDB = 0x12 0x01 0x00 0x00 0xff 0x00 , Sense = Controller ID: 0 Unexpected sense: PD = :0 - Invalid field in CDB, CDB = 0x12 0x01 0x00 0x00 0x0f 0x00 , Sense = Controller ID: 0 Created VD: 0 -	

Figure 47. Intel[•] RAID Web Console 2 – Graphical Tab (Optional feature)

Event Log Panel

The lower part of the screen displays the event log entries for the system. New event log entries display during the session. Each entry has a time and date stamp, an Error Level that indicates the severity of the event, and a brief description of the event. For information about the event log entries, see Appendix B: "Events and Messages" on page 175

Menu Bar/Manage Menu

The File menu includes the Exit option to close the Intel[®] RAID Web Console 2. It also includes a Refresh option to update the screen with the latest RAID configuration information.

Other options may include: Server option to discover and enter other server system's RAID configuration; Check Consistency; Initialize to initialize a RAID; Show progress.

Menu Bar/Go To Menu

The Go To menu has sub-menus like Controller, Drive Group, Physical Drive, Virtual Drive, BBU, etc.

Each of above sub-menu may have some or all items greyed out, unless controller, physical, virtual drive, drive group, BBU or other storage object is selected. For example, the Enable Alarm and Silence Alarm options are available only when a controller is selected. The options also vary depending on the current state of the selected object. For example, if an offline physical drive is selected, the Make Drive Online option is displayed in the menu.

There is a general tip here that, most functions in the Go To menu are equal to right-clicking the storage object selected in Physical or Logical view tab. For example, selecting Go To | Controller | Create Virtual Drive, is equal to selecting the controller in Physical (or Logical) tab, right-clicking it and choosing Create Virtual Drive.

File Menu/Log Menu

The Log menu includes options for saving, clearing, and loading the message log.

File Menu/Tool Menu

The Tools menu includes options for configuring alerts.

File Menu/Help Menu

The Help menu provides access to the online help file and $Intel^{\ensuremath{\mathbb{R}}}$ RAID Web Console 2 version.information.

Drive Configuration Tasks

You can use Intel[®] RAID Web Console 2 to perform the following configuration tasks:

- "Creating a Virtual Drive Using Simple Configuration" on page 105
- "Creating a Spanned Disk Group" on page 116
- "Creating Hot Spares" on page 117
- "Setting Adjustable Task Rates" on page 119
- "Adding a Drive to a Virtual Disk" on page 120

- "Removing a Drive or Changing the RAID Level of a Virtual Disk" on page 123
- "A Reconstruct operation begins on the virtual disk. You can monitor the progress of the reconstruction in the Group Show Progress window. Select Manage -> Show Progress." on page 124
- "Changing Virtual Disk Properties" on page 124
- "Deleting a Virtual Disk" on page 125
- "Managing Configurations" on page 126

Create Virtual Drive

Use the Create Virtual Drive to create disk groups and virtual disks. The Create Virtual Drive can create simple configurations automatically. For more complex configurations, the Create Virtual Drive allows you to customize the configuration parameters according to your needs.

The Modify Drive Group allows you to easily change RAID levels, or to expand or reduce the capacity of existing virtual drives.

Note: Unless you are logged on to a system with Administrator privileges, you cannot create or modify a storage configuration.

Creating a Virtual Drive Using Simple Configuration

Simple configuration is the quickest and easiest way to create a new storage configuration. When you select simple configuration mode, the system creates the best configuration possible using the available drives

Note: You cannot created spanned drives using the simple configuration procedure. To create spanned drives, use the advanced configuration procedure described in "Creating a Virtual Drive Using Advanced Configuration" on page 109

Follow these steps to create a new storage configuration in simple configuration mode.

- 1. Perform either of the following steps:
 - Right click on the controller node in the device tree in the left frame of the Intel[®] RAID Web Console 2 window and select Create Virtual Drive
 - Select the controller node and select Go To -> Controller -> Create Virtual Drive in the menu bar, as shown in Figure 48

Intel [®] RAID Web (Console 2			(intel)
			Welcome: administrator	Le
shboard Physical Logical WIN-CQOTKHM59XZ	Properties			
Model (R) RAID Controller FS2BL080EC (Bus 10.0cm III Bachpane (S2) Solt: 0, SATA, 232.886 GB, Online Sibt: 1, SATA, 232.866 GB, Online Sibt: 1, SATA, 232.866 GB, Unconfigured Sibt: 3, SATA, 232.886 GB, Unconfigured	Create Virtual Drive Enable Alarm Stat Patrol Read Sate Patrol Read Sate Patrol Read Sate Patrol Read Configuration Cad Configuration Cade Configuration Caler Configuration Set Consistency Check Preserved Cache Preserved Cache	Intel (R) RAID Controller RS28L0800E SV93500714 0x1000 0x8086 0x79 8 PCIE 0	Backend SAS Address D Backend SAS Address 1 Backend SAS Address 2 Backend SAS Address 3 Backend SAS Address 4 Backend SAS Address 5 Backend SAS Address 6 Backend SAS Address 7 Correctable Error Count	0x4433221 0x4433221 0x4433221 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0 0x0
	Power Settings Enable Drive Security Update Controller Firmware Alarm Enabled Cache Fluch Interval Coercion Mode	Yes No 4 sec 1 GB	Memory uncorrectable count Cluster Enable Cluster Active SSD Guard Drive Security Properties:	0 No Enabled

Figure 48. Virtual Drive Creation Menu

The dialog box for the configuration mode (simple or advanced) appears, as shown in Figure 49

Ereate Virtual Drive - Choose mode
Intel® RAID Web Console 2
This wizard will help you quickly create virtual drives.
Choose how to create the virtual drive:
• Emple Specify a limited number of settings and have the system pick drives for you. This is the easiest way to create a virtual drive.
Advanced Choose additional settings and customize virtual drive creation. This option provides greater flexibility when creating virtual drives for your specific requirements.
Cancel Next Help

2. Click Simple and press Next.

The Create Virtual Drive screen appears, as shown in Figure 50.

Create Virtual Drive - Choose mode
Intel® RAID Web Console 2
This wizard will help you quickly create virtual drives.
Choose how to create the virtual drive:
 Specify a limited number of settings and have the system pick drives for you. This is the easiest way to create a virtual drive.
C Advanced
Choose additional settings and customize virtual drive creation. This option provides greater flexibility when creating virtual drives for your specific requirements.
Cancel Next Help

Figure 50. Create Virtual Drive Screen

3. Select the RAID level desired for the virtual drive.

When you use simple configuration, the RAID controller supports RAID levels 1, 5, and 6. In addition, it supports independent drives (configured as RAID 0). The screen text gives a brief description of the RAID level you select. The RAID levels you can choose depend on the number of drives available. To learn more about RAID levels, see Chapter-2 "RAID Levels" on page 9

- 4. Click the box next to **Assign a hot spare** if you want to assign a hot spare drive to the virtual drive. Hot spares are drives that are available to replace failed drives automatically in a redundant virtual drive (RAID 1, RAID 5, or RAID 6).
 - *Note:* In the simple configuration procedure, you can assign dedicated hot spares to a maximum of 16 arrays at one time. This is because the dedicated hot spares can support only up to 16 drive groups. If you try to create more than 16 drive groups at one time, dedicated hot spares will not be assigned to drive groups beyond the first 16.

To create more than 16 drive groups with hot spares, you need at least 35 drives of the same capacity.

- 5. Select the number of virtual drives that you want to create.
- 6. Select the capacity for the virtual drives.

Each virtual drive has the same capacity.

7. Click Next.

The **Create Virtual Drive - Summary** window appears, as shown in Figure 51. This window shows the selections you made for simple configuration.

📰 Create Virtual Drive - Dri	ve group	and ¥irtual drive settings
Intel [®] RAID W	eb Co	nsole 2
Use the suggested virtual driv	e settings	or change them if needed.
Pick a RAID level to specify the	e amount o	of fault tolerance and performance for the virtual drive (s).
RAID level:	RAID 0	Suitable for high performance with zero data redundancy. Choose this option only for non-critical data.
🗖 Assign a h <u>o</u> t spare	٥)	Hot spare will be assigned depending upon the availability of eligible hot spare candidate drives. A hot spare drive will takeover for a drive if a failure happens, ensuring your data will remain intact.
Uge drive security	ß	Drive security method will be assigned depending upon the controller settings. The drive security will make the virtual drive secure by applying encryption logic to the data in the drive
Virtual drives:		Choose how many virtual drives you want to create.
Capacity: 463.797 GB ▼		Select the capacity for the virtual drive(s).Each virtual drive have the same capacity.
		Cancel Back Next Help

Figure 51. Create Virtual Drive - Summary Window

8. Click Back to return to the previous screen to change any selections or click Finish to accept and complete the configuration.

The new storage configuration will be created and initialized.

Note: If you create a large configuration using drives that are in powersave mode, it could take several minutes to spin up the drives. A progress bar appears as the drives spin up. If any of the selected unconfigured drives fail to spin up, a box appears to identify the drive or drives.

After the configuration is completed, a dialog box may or may not notify (depending on different utility version) you that the virtual drives were created successfully, as shown in Figure 52. If more drive capacity exists, the dialog box asks whether you want to create more virtual drives. If no more drive capacity exists, you are prompted to close the configuration session.



Figure 52. Option to Create Additional Virtual Drives

9. Select Yes or No to indicate whether you want to create additional virtual drives.

If you select **Yes**, the system takes you to the Create Virtual Drive screen, as shown in Figure 50. If you select **No**, the utility asks whether you want to close the wizard, as shown in Figure 53.

10. If you selected No in step 9, select Yes or No to indicate whether to close the wizard.



Figure 53. Option to Close the Configuration Wizard

If you select **Yes**, the configuration procedure closes. If you select **No**, the dialog box closes and you remain on the same page.

Creating a Virtual Drive Using Advanced Configuration

The advanced configuration procedure provides an easy way to create a new storage configuration. Advanced configuration gives you greater flexibility than simple configuration because you can select the drives and the virtual drive parameters when you create a virtual drive. In addition, you can use the advanced configuration procedure to create spanned drive groups.

Follow these steps to create a new storage configuration in the advanced configuration mode. In this example, we will create a spanned drive group.

- 1. Perform either of the following steps:
 - Right click on the controller node in the device tree in the left frame of the Intel[®] RAID Web Console 2 window and select Create Virtual Drive
 - Select the controller node and select Go To -> Controller -> Create Virtual Drive in the menu bar, as shown in Figure 54

Intel [®] RAID Web (Console 2			(intel)
			Welcome: administrator	Lo
shboard Physical Logical WIN-CQ0TKHM59XZ	Properties			
Titlel (R) RAID Controller R52BL080DE (Bus 10,De) Backplane (252) Slot: 0, SATA, 232.886 GB, Online	Create Virtual Drive Enable Alarm		Backend SAS Address 0	0x44332211
 Slot: 1, SATA, 232.886 GB, Online Slot: 2, SATA, 232.886 GB, Unconfigured Slot: 3, SATA, 232.886 GB, Unconfigured 	Start Patrol Read Set Patrol Read Properties Disable SSD Guard	Intel (R) RAID Controller RS28L080DE SV93500714	Backend SAS Address 1 Backend SAS Address 2	0x44332211 0x44332211
	Scan Foreign Configuration Load Configuration Save Configuration	0×1000 0×8086	Backend SAS Address 3 Backend SAS Address 4	0x44332211 0x0
	Clear Configuration Set Consistency Check Properties	0×79 8	Backend SAS Address 5 Backend SAS Address 6	0x0 0x0
	Schedule Consistency Check Set Adjustable Task Rates Preserved Cache	PCIE	Backend SAS Address 7	0x0
	Power Settings Enable Drive Security	0	Memory uncorrectable count	0
	Update Controller Firmware Alarm Enabled	Yes No	Cluster Enable Cluster Active	No
	Cache Flush Interval	4 sec	SSD Guard	Enabled
	Coercion Mode	1 GB	Drive Security Properties:	2

Figure 54. Virtual Drive Creation Menu

The dialog box shown in Figure 55 appears.

F Create Virtual Drive - Choose mode
Intel® RAID Web Console 2
This wizard will help you quickly create virtual drives.
Choose how to create the virtual drive:
Specify a limited number of settings and have the system pick drives for you. This is the easiest way to create a virtual drive.
Advanced Choose additional settings and customize virtual drive creation. This option provides greater flexibility when creating virtual drives for your specific requirements.
Cancel Next Help

Figure 55. Virtual Drive Creation Mode

2. Click Advanced and press Next.

The Create Drive Group Settings screen appears, as shown in Figure 56.

Intel [®] RAID We	b Cor	nsole 2		intel
Create the drive group by specif <u>R</u> AID level: Select	ying the R	AID level and I	·	the amount of fault tolerance and performance for
Drive security method: Select		-	Drive security will make the underlying data in the drive	virtual drive secure by applying encryption logic to e.
Select unconfigured drives:				Drive groups:
Drive	Туре	Capacity	I	Intel (R) RAID Controller R52BL080DE (Bus 10,1
Backplane (252), Slot: 1 Backplane (252), Slot: 2	SATA SATA	232.88	<u>A</u> dd >	Envire Group0
Backplane (252), Slot: 3	SATA	232.88	Add Hot Spare >	
4			< Remo <u>v</u> e	
				<u>Create Drive Group</u> Create Span
				Cancel Back Next Help

Figure 56. Create Drive Group Settings Screen

- 3. Select the following items on the Create Drive Group Settings screen:
 - a. Select the RAID level desired for the drive group from the drop-down menu. To make a spanned drive, select **RAID 10**, **RAID 50**, or **RAID 60** in the **RAID level** field.

Drive Group 0 and **Span 0** appear in the **Drive groups** field when you select RAID 10, 50, or 60.

The RAID controller supports RAID levels 1, 5, 6, 10, 50, and 60. In addition, it supports independent drives (configured as RAID 0 and RAID 00). The screen text gives a brief description of the RAID level you select. RAID levels you can choose depend on the number of drives available. To learn more about RAID levels, see Chapter 2, "RAID Levels" on page 9

b. Select unconfigured drives from the list of drives and click Add> to add them to the drive group.

The selected drives appear under Span 0 below Drive Group 0, as shown in Figure 57

Ereate Drive Group - Drive	Group Settings			×
Intel [®] RAID Web	o Console 2		intel	
Create the drive group by specify	ing the RAID level and [Drive security method.		
RAID 10 – Spanned Drive Group		RAID level 10 is a stripe of r	nirrors.	
Drive security method:	Ţ	Drive security will make the underlying data in the drive	virtual drive secure by applying encryption logic to	
Select unconfigured drives:			Drive groups:	
Drive	Type Capacity		🗼 Intel (R) RAID Controller R52BL080DE (Bus 10	<u>, i</u>
	SATA 232.88	<u>A</u> dd >	E Srive Group0	
Backplane (252), Slot: 3	SATA 232.88	Add Hot Spare >	☐ ∰ 5pan 0 Backplane (252), Slot: 0: SATA: 23	~
			Backplane (252), Slot: 0: SATA: 23 Backplane (252), Slot: 1: SATA: 23	
•		< Remo <u>v</u> e		-
			Greate Drive Group Create Span	
			Cancel <u>B</u> ack <u>M</u> ext <u>H</u> el;	P

Figure 57. Span 0 of Drive Group 0

- c. Click Create Span to create a second span in the drive group.
- d. Select *unconfigured* drives from the list of drives and click Add> to add them to the drive group.
- e. The selected drives appear under **Span 1** below **Drive Group 0**, as shown in Figure 58

📰 Create Drive Group - Drive Group Settings	×
Intel [®] RAID Web Console 2	inter
Create the drive group by specifying the RAID level and D RAID level:	Drive security method.
RAID 10 – Spanned Drive Group	RAID level 10 is a stripe of mirrors.
Drive security method:	Drive security will make the virtual drive secure by applying encryption logic to underlying data in the drive.
Select unconfigured drives:	Drive groups:
Drive Type Capacity	□ · · · · · · · · · · · · · · · · · · ·
	Add > Backplane (252), Slot: 0: SATA:
	Add Hgt Spare > Span 1
	Remove A Sackplane (252), Slot: 2: SATA: ▼ A
	Create Drive Group Create Span
	Cancel <u>B</u> ack <u>M</u> ext <u>H</u> elp

Figure 58. Span 0 and Span 1 of Drive Group 0

- f. Click Create Drive Group to make a drive group with the spans.
- g. Click Next to complete this step.

The Virtual drive settings window appears, as shown in Figure 59. The drive group and the default virtual drive settings appear. The options to update the virtual drive or remove the virtual drive are grayed out until you create the virtual drive.

📰 Create Virtual Drive - Virtual drive settings	×
Intel [®] RAID Web Console 2	intel
Specify parameters for the new virtual drive.	Drive groups:
Virtual drive name: VD_0	Intel (R) RAID Controller R52BL080DE (Bus 10,Dev 0) Solution of the group
Capacity: 463.797 🗄 Uni <u>t</u> s: GB 💌	
Initialization state: No Initialization	
Stripe size: 256 KB 💌	
Read policy: Always Read Ahead	
Write policy: Write Back with BBU	
I/O policy: Direct IO	
Access policy: Read Write	
Disk cache policy: Disabled	
Update Virtual Drive	Remove Virtual Drive
	Cancel <u>Back</u> <u>M</u> ext <u>H</u> elp

Figure 59. Virtual Drive Settings Window

- 4. Change any virtual drive settings, if desired.
- 5. Click Create Virtual Drive.

The new virtual drive appears under the drive group, as shown in Figure 60. The options **Update Virtual Drive** and **Remove Virtual Drive** are now available. **Update Virtual Drive** allows you to change the virtual drive settings and **Remove Virtual Drive** allows you to delete the virtual drive.

📰 Create Virtual Drive - Virtual drive settings	×
Intel [®] RAID Web Console 2	inter
Specify parameters for the new virtual drive. Virtual drive name: VD_0 Capacity: 463.797 Units: GB Initialization state: No Initialization Stripe size: 256 KB Rgad policy: Always Read Ahead	Drive groups: Intel (R) RAID Controller R52BL080DE (Bus 10,Dev 0) Drive Group0: RAID 10: Available Capacity0 Bytes Virtual Drive 0,VD_0:463.797 GB
Write policy: Write Back with BBU I/O golicy: Direct IO Access policy: Read Write Disk cache policy: Disabled	
Update Virtual Drive	Remove Virtual Drive Cancel Back Next Help

Figure 60. New Virtual Drive 0

6. Click Next.

The **Create Virtual Drive - Summary** window appears, as shown in Figure 61. This window shows the selections you made for advanced configuration.

create Virtual Drive -	Summary AID Web Console 2			(intel)
	Review the summary and go back if you need to make o Summary:	orrections. The virtual drive(s) will be created when you click	finish.	12
	Drive group name:	Drive Group O		
	RAID level:	RAID 50		
	Number of drives per span:	4		
	Number of spans:	2		
	Drive security method:	No Encryption		
	Hot spare	No		
	Total capacity:	1.362 TB		
	Free capacity:	0 Bytes		
	Virtual drive 1 name:	VD_0		
	Capacity:	1.362 TB		
			Cancel < Bac	k <u>Einish H</u> elp

Figure 61. Create Virtual Drive Summary Window

7. Click **Back** to return to the previous screen to change any selections or click **Finish** to accept and complete the configuration.

The new storage configuration will be created and initialized.

Note: If you create a large configuration using drives that are in powersave mode, it could take several minutes to spin up the drives. A progress bar appears as the

drives spin up. If any of the selected unconfigured drives fail to spin up, a box appears to identify the drive or drives.

8. After the configuration is completed, a dialog box may or may not notify (depending on different utility version) you that the virtual drives were created successfully, as shown in Figure 62. If more drive capacity exists, the dialog box asks whether you want to create more virtual drives. If no more drive capacity exists, you are prompted to close the configuration session.

?	The virtual drives w Do you want to crea		
	Yes	No 1	

Figure 62. Option to Create Additional Virtual Drives

9. Select Yes or No to indicate whether you want to create additional virtual drives.

If you select **Yes**, the system takes you to the **Create Virtual Drive** screen, as shown in Figure 50. If you select **No**, the utility asks whether you want to close the wizard, as Figure 63.

10. If you selected **No** in <hyperactive>step 8, select Yes or No to indicate whether you want to close the wizard.

If you select **Yes**, the configuration procedure closes. If you select **No**, the dialog box closes and you remain on the same page.

Create	virtual Drive - Co	onfirmation	×
?	Do you want to	close this wizard	7
	Yes	No	

Figure 63. Option to Close the Configuration Wizard

Creating a Spanned Disk Group

Spanning allows you to configure multiple arrays as a single virtual disk. Spanned arrays provide additional levels of data redundancy and storage capacity. The Intel[®] RAID Web Console 2 supports three types of spanned arrays or disk groups:

- RAID 00 (multiple RAID 0 arrays or disk groups)
- RAID 10 (multiple RAID 1 arrays or disk groups)
- RAID 50 (multiple RAID 5 arrays or disk groups)
- RAID 60 (multiple RAID 6 arrays or disk groups)

For spanned disk group creation steps, refer to the section Creating a Virtual Drive Using Advanced Configuration.

Creating Hot Spares

Hot spares are disk drives that are available to automatically replace failed drives in a virtual disk. There are two kinds of hot spares: 1) dedicated hot spares, which are available to one or more specified arrays or disk groups, and 2) global hot spares, which are available to any array or disk group defined on the controller.

To create a global hot spare, follow these steps:

- 1. In the left panel of the Intel[®] RAID Web Console 2 window, right-click the icon of disk drive that is not assigned to a storage configuration. If it is assigned to a storage configuration, a check mark is displayed on the disk drive icon.
- 2. In the Menu, click the **Go To** -> **Physical Drive** tab and select **Assign Global Hotspare**, as shown in Figure 64.

nage Go To Log Tools Help Controller Drive Group					
Physical Drive > Assign Global Hot Spare Virtual Drive > Assign Dedicated Hot Sp BBU > Start Locating Drive Stop Locating Drive Stop Locating Drive	are isole 2		Welcome: +	administrator	
shboard Physical Logica Prepare for Removal					
WIN-CQ0TKHM59XZ A Intel (R) RAID Controller R52BL080DE (Bus 10,Dev	0) Properties				
Backplane (252)	General:		Power Status	On	
	Usable Capacity	231.898 GB	Revision Level	G	
	Raw Capacity	232.886 GB	Media Error Count	0	
	Certified	No	Pred Fail Count	0	
	Product ID	ST3250820N5	Enclosure Properties		
	Vendor ID	ATA	Enclosure ID	252	
	Device ID	2	Enclosure Model	Backplane	
	Status	Unconfigured Good	Enclosure Location	Internal	
	Drive Speed	3.0 Gbps	Slot Number	3	
	Negotiated Link Speed	3.0 Gbps	Drive Security Properties:		
	SCSI Device Type	Disk	Full Disk Encryption capable	No	
	SAS Address 0	0×4433221100000000	Secured	No	
	1				
ID Error Level Date / Time 4 [Information, 0] 2010-04-25, 20:00:56	Controller ID: 0 Time established sin		cription		

Figure 64. Assign Global Hotspare

You normally create a dedicated hot spare when you create a new configuration with the Manual Configuration option. To add a dedicated hot spare to an existing array or disk group, follow these steps:

- 1. In the left panel of the Intel[®] RAID Web Console 2 window, click the icon of a disk drive that is not assigned to a storage configuration. If it is assigned to a storage configuration, a check mark is displayed on the disk drive icon.
- In the Menu, click the Go To -> Physical Drive tab and select Assign Dedicated Hotspare, as shown in Figure 65.

Controller Drive Group Physical Drive Assign Global Hot Spare Wirtual Drive Start Incetion Drive BBU Start Incetion Drive	nsole 2			(intel)
Stop Locating Drive	IIISOSKE N		Welcome: a	administrator
shboard Physical Logica Prepare for Removal				
WIN-CQ0TKHM59XZ R Intel (R) RAID Controller R52BL080DE (Bus 10,Dev 0)	Properties			
Backplane (252)	General:		Power Status	On
Slot: 1, SATA, 232.886 GB, Online Slot: 2, SATA, 232.886 GB, Online	Usable Capacity	231.898 GB	Revision Level	G
Slot: 3, SATA, 232.886 GB, Unconfigured God	Raw Capacity	232.886 GB	Media Error Count	0
	Certified	No	Pred Fail Count	0
	Product ID	ST3250820N5	Enclosure Properties	
	Vendor ID	ATA	Enclosure ID	252
	Device ID	2	Enclosure Model	Backplane
	Status	Unconfigured Good	Enclosure Location	Internal
	Drive Speed	3.0 Gbps	Slot Number	3
	Negotiated Link Speed	3.0 Gbps	Drive Security Properties:	
	SCSI Device Type	Disk	Full Disk Encryption capable	No
	SAS Address 0	0×4433221100000000	Secured	No
	2			

Figure 65. Assign Dedicated Hotspare

3. Select the array or disk group to which the hotspare will be dedicated from the list in the pop-up window.

Assign Dedicated Hot Spare	×			
Intel [®] RAID Web Console 2	(intel)			
Description : Designates a ready or Unconfigured Good drive as a dedica hotspare to the specified array(s)	ted			
A dedicated hot spare will only replace problematic drives on selected drive groups.				
Select drive group(s):				
Drive Group: 0, RAID 5				
Ok Cancel				

Figure 66. Select Hotspare Drive

4. Click **OK** to create the dedicated hot spare.

Setting Adjustable Task Rates

To change the Rebuild rate and other task rates for a controller, you must first log onto the system in All Access mode (versus View-Only mode). Complete the following steps to set the adjustable task rates:

- 1. Select a controller icon in the left panel, and select the Physical View tab.
- 2. In the Menu, select the Go To -> Controller tab and select Set Adjustable Task Rates.

The task rates appear in a new pop-up window, as shown in Figure 67.

📰 Set Adjustable Task Rates			×
Intel [®] RAID Web Console 2			(intel)
Description : User configurable task rate priorities for co	ontroller		
R	eb <u>u</u> ild Rate (%)	30 🛫	
F	Patrol Rate (%)	30 📩	
	<u>B</u> GI Rate (%)	30 ×	
Ch <u>e</u> ck Consist	ency Rate (%)	30 📩	
Re <u>c</u> onstru	iction Rate (%)	30 💌	
	Ok Cano	el	

Figure 67. Set Adjustable Task Rates

- 3. Enter changes as needed to any of the task rates:
 - Rebuild Rate. Enter a number from 0 to 100 to control the rate at which a rebuild is performed on a disk drive when one is necessary. The higher the number, the faster the rebuild will occur. However, if a higher number is selected, the system I/O rate may be slower.
 - Patrol Rate. Enter a number from 0 to 100 to control the rate at which patrol reads are performed. Patrol read is a preventive procedure that monitors physical disks to find and resolve potential problem that might cause a disk failure. The higher the number, the faster the patrol read occur.s However, if a higher number is selected, the system I/O rate may be slower.

- **Background Initialization (BGI) Rate** Enter a number from 0 to 100 to control the rate at which virtual disks are initialized in the background. Background initialization makes the virtual disk immediately available for use, even while the initialization is occurring. The higher the number, the faster the initialization occurs. However, if a higher number is selected, the system I/O rate may be slower.
- Check Consistency Rate. Enter a number from 0 to 100 to control the rate at which a consistency check is done. A consistency check scans the consistency data on a fault tolerant virtual disk to determine if the data is corrupted. The higher the number, the faster the consistency check is done. However, if a higher number is selected, the system I/O rate may be slower.
- Reconstruction Rate. Enter a number from 0 to 100 to control the rate at which
 reconstruction of a virtual disk occurs. The higher the number, the faster the
 reconstruction will occur. However, if a higher number is selected, the system I/O
 rate may be slower.
- 4. Click **OK** to accept the new task rates.
- 5. When the warning message is displayed, click **OK** to confirm that you want to change the task rates.
- *Note:* The Controller Go To tab also has options for disabling or silencing the alarm on the controller. Ordinarily, you should leave the alarm enabled so it can warn you of abnormal conditions on the controller. If the alarm is malfunctioning, you may need to silence it.

Adding a Drive to a Virtual Disk

You can use Intel[®] RAID Web Console 2 to increase the capacity of an existing virtual disk by adding physical disk drives to it. In order to do this, you must be logged on to the system in All Access mode.

Warning: Before you change a virtual disk's capacity, back up the data on the virtual disk.

To increase the capacity of a virtual disk, follow these steps:

User Logical View and select a Drive Group icon in the left panel and then select Go To
 -> Drive Group -> Modify Drive Group.

RAID Web Console 2 - 6.90.0300			
Manage Go To Log Tools Help			
Controller Controller			
Physical Drive N	ON A PARA		
	nsole 2		(intel)
BBO	IRES - Saust		
Dashboard Physical Logical		Welcome: administrator	Log Off
WIN-CQ0TKHM59XZ	Properties		(
Intel (R) RAID Controller R52BL080DE (Bus 10, Dev 0)			1
Virtual Drive(s):	General:		
☐ Uirtual Drive: 1, VD_1, 181.898 GB, Optim	Total Capacity	231.898 GB	
	Free Capacity	50.000 GB	
Backplane (252), Slot: 1, SATA, 232.886 (Drive Security Properties:		
Capacity: 50.000 GB	Secured	No	
Government of the second	Jeculeu	no	
Backplane (252), Slot: 3, SATA, 232.886 GB,			
<u> </u>			
ID Error Level Date / Time		Description	
373 [Information, 0] 2010-04-25, 20:51:23 Cor	troller ID: 0 Deleted VD: 0	Description	
Displaying log from server	ávallar ID) - 0. Dalisis disanan an VD) - 1 Drasiasis 😑	Current Write Dalinu Write Dalin Current = Current Write Dalin	u Welle Through

Figure 68. Starting Modify Drive Group

The Modify Drive Group window is displayed, as shown in Figure 69.

rrent drive group configuration-			
Drive group come: Drive Creves 0			
Drive group name: Drive Group 0			
RAID level: RAID1			
Virtual drive state: Optimal			
Drive	Туре	Capacity	Status
Backplane (252), Slot: 0	SATA	232,886 GB	Online
Backplane (252), Slot: 0	SATA	232.886 GB	Online
t the RAID level you want to mic			

Figure 69. Select RAID level to migrate

- 2. Click Add Drive.
 - *Note:* Depending on current RAID level, the targeted migrated RAID level and the available Unconfigured Good drive numbers, pop-up window may appear to allow selection among Add drives, Remove drives, and Migrate RAID level.

The following screen appears:

📰 Modify Drive Group ·	- Add drive to the curre	ent configuration		×
Intel® RAID W	leb Console 2		-1	intel
You have selected RAID without adding any drive		to RAID 0, you can ei	ther add the drives from	the table below or proceed
Select the unconfigured	drive to <u>a</u> dd:			
	Available Drives	Туре	Capacity	Status
	🧇 Backplane (252), S		232.886 GB	Unconfigured Good
	Seckplane (252), 🤉	5ATA	232.886 GB	Unconfigured Good
,				
			Cancel <u>B</u> ack	<u>N</u> ext <u>H</u> elp

Figure 70. Selecting Drives to Add

- 3. In the panel, check the disk drives that you want to add to the virtual disk.
- 4. When you are finished adding disk drives, click **Next**. The next screen displays, which allows you to review the summary and go back if you need to make corrections as shown in Figure 71.

Modify Drive Gro	oup - Summary		×
Intel [®] RA	ID Web Console 2		(intel)
Review the summa Summary:	ry and go back if you need to mak	e corrections. The Changes will be made	e when you click Finish.
Current settings:		Post modification settings:	
Drive group name:	Drive Group: 0, RAID 1	Drive group name:	Drive Group: O, RAID O
RAID level:	RAID 1	RAID level:	RAID O
Virtual drive name:	-	Virtual drive name:	VD_1
Total capacity:	231.898 GB	Total capacity:	695.695 GB
Number of drives:	2	Number of drives:	3
		Ca	ncel <u>Back</u> Einish <u>H</u> elp

Figure 71. Changing RAID Level

5. When everything is acceptable, click **Finish** to accept the new configuration.

A Reconstruct operation begins on the virtual disk. You can monitor the progress of the reconstruction in the Group Show Progress window. Select **Manage** -> **Show Progress**.

Removing a Drive or Changing the RAID Level of a Virtual Disk

You can use Intel[®] RAID Web Console 2 to remove a physical disk drive from a virtual disk. In order to do this, you must be logged on to the system in All Access mode.

Warning: Be sure to back up the data on the virtual disk before you change its capacity.

- 1. Select a Drive Group icon and start the Modify Drive Group, as described in the previous section.
- 2. Click Remove Drive.
 - *Note:* Depending on current RAID level, the targeted migrated RAID level and the available Unconfigured Good drive numbers, pop-up window may appear to allow selection among Add drives, Remove drives, and Migrate RAID level.

The following screen appears:

📰 Modify Drive Group	- Add drive to the currer	t configuration		×
Intel [®] RAID W	leb Console 2			(intel)
You have selected RAID without adding any drive		o RAID 0, you can (either add the drives fror	n the table below or proceed
Select the unconfigured	drive to <u>a</u> dd:			
	Available Drives	Туре	Capacity	Status
	🧇 Backplane (252), SA		232.886 GB	Unconfigured Good
	🧇 Backplane (252), SA	TA	232.886 GB	Unconfigured Good
,				
			Cancel <u>B</u> ack	<u>N</u> ext <u>H</u> elp

Figure 72. Selecting Drives to Remove

- 3. In the panel, check the disk drives that you want to remove from the virtual disk.
- 4. When you are finished removing disk drives, click **Next**. The next screen displays, which allows you to review the summary and go back if you need to make corrections as shown in Figure 73.

📰 Modify Drive Gro	oup - Summary			×
Intel [®] RA	ID Web Console 2		Ú.	ntel)
Review the summa Summary:	ry and go back if you need to mak	e corrections. The Changes will be ma	de when you click Finish.	
Current settings:		Post modification settings:		
Drive group name:	Drive Group: 0, RAID 1	Drive group name:	Drive Group: O, RAI	D O O
RAID level:	RAID 1	RAID level:	RAID O	
Virtual drive name:	VD_1	Virtual drive name:	VD_1	
Total capacity:	231.898 GB	Total capacity:	695.695 GB	
Number of drives:	2	Number of drives:	3	
		C	ancel <u>Back</u> <u>F</u> inish	Help

Figure 73. Changing RAID Level

5. When everything is acceptable, click **Finish** to accept the new configuration.

A Reconstruct operation begins on the virtual disk. You can monitor the progress of the reconstruction in the Group Show Progress window. Select **Manage** -> **Show Progress**.

Changing Virtual Disk Properties

You can change a virtual disk's Read Policy, Write Policy, and other properties after the disk is created. To do this, follow these steps:

 Select a virtual disk (or drive) icon in the left panel and then select Go To -> Virtual Drive -> Set Virtual Drive Properties. Alternatively, click the Properties panel and then click Set Virtual Disk Properties. Figure 74 shows the Set Virtual Disk Properties screen.

Set Wirtual Drive Properties	x (inter)
Description : Defines virtual disk operation parameters	
<u>N</u> ame:	
Rgad Policy:	No Read Ahead
<u>W</u> rite Policy:	Write Through
IO Policy :	Direct IO
Access Policy:	Read Write 💌
Dis <u>k</u> Cache Policy:	Disabled •
Background Initialization	Enabled
Ok	Cancel

Figure 74. Set Virtual Disk Properties

- 2. As needed, change the properties in the pop-up window.
- 3. Click **OK** to accept the changes.

Deleting a Virtual Disk

Warning: Before you delete a virtual disk, back up the data on it.

You can delete one or more virtual disks. Before you can do this, you must be logged on to the system in All Access mode. To delete a virtual disk, follow these steps:

- 1. Back up all user data on the virtual disk you intend to delete.
- 2. In the left panel, select the **Virtual** (or **Logical**) tab and click the icon of the virtual disk (or drive) you want to delete.
- 3. In the menu, select the Go To -> Virtual Drive and click Delete Virtual Drive.
- 4. When the warning message displays, click **Yes** to confirm that you want to delete the virtual disk.

Managing Configurations

You can use Intel[®] RAID Web Console 2 to manage the configurations that you create. For example, you can save a storage configuration that you have defined on a controller and load this configuration from the disk to another controller, after first clearing the existing configuration from that controller. In order to do this, you must be logged on to the system in All Access mode. This section explains how to do these tasks.

Saving a Configuration to Disk

You can save an existing controller configuration to a file so you can apply it to another controller. To save a configuration file, follow these steps:

- 1. Select a controller icon in the left panel of the Intel[®] RAID Web Console 2 window.
- RAID Web Console 2 6.90. - 🗆 × Go To Log Tools Help oller 🔹 🕨 Create Virtual Drive Contri Drive Grou Enable Alarm Physical Drive > ple 2 Virtual Drive (intel) BBU Disable SSD Guard Scan Foreign Configuration Load Configuration Dashboard Physical Logica Save Configuration TKHM59XZ A Intel (R) RAID Contro Clear Configuration Backend SAS Address 0 Unconfigured Dri Set Consistency Check Properties eral: 0x443322110 Sackplane (25 duct Name Backplane (25 Intel (R) RAID Controller RS2BL080DE Backend SAS Address 1 0x443322110 Set Adjustable Task Rates Backplane (25) Backplane (25) al No SV93500714 Backend SAS Address 2 0x443322110 Power Settings dor ID 0×1000 Backend SAS Address 3 0x443322110 Enable Drive Security Backend SAS Address 4 Update Controller Firmv /endor ID 0x8086 0x0 Backend SAS Address 5 0x79 0x0 Device ID Device Port Count Backend SAS Address 6 0x0 8 Host Interface Backend SAS Address 7 PCIE 0x0 Host Port Count Correctable ErrorCount 0 0 FRU nory uncorrectable coun 0 Alarm Presen Cluster Enable No Yes Alarm Enabled No Cluster Active No Cache Flush Interval 4 sei SSD Guard Enabled Coercion Mode 1 GB Drive Security Properties
 ID
 Error Level
 Date / Time

 36
 [Information, 0] 2010-04-25, 22:52:15

 36
 Information, 0] 2010-04-25, 22:52:15
 Description Controller ID: 0 State change: PD = --:--:3 Previous = Online Current = Unconfigured Good Controller ID: 0 State change: PD = -:-:3 Previous = Online Current = Unconfigured Good Ase Information (Displaying log from server
- 2. Select Go To -> Controller -> Save Configuration.

Figure 75. Save Configuration to File

The Save dialog box displays as shown in Figure 76.



Figure 76. Save Configuration Dialog Box

- 3. In the dialog box, type a name for the configuration file.
- 4. Click Save to save the configuration file, or accept the default name: hostname.cfg

Clearing a Configuration from a Controller

If you want to manually create a new storage configuration on a controller, or load a configuration file on a controller, you must first clear the existing configuration.

Warning: Before you clear a configuration, make sure to save any data you want to keep! Clearing a configuration deletes all data from the disks in the existing configuration.

To clear a configuration from a controller, follow these steps:

- 1. Select a controller icon in the left panel of the Intel[®] RAID Web Console 2 window.
- 2. Select Go To -> Controller -> Clear Configuration.

anage Go To Log Tools	Help				
Controller >	Create Virtual Drive				
Drive Group	Enable Alarm	1 Same		State All	
Physical Drive	Start Patrol Read				(Inter
Virtual Drive 🕨	Set Patrol Read Properties	ole 2			(inter
BBU	Disable SSD Guard			The delay	
	Scan Foreign Configuration			Welcome: administrator	Log C
ashboard Physical Logica	Load Configuration				
WIN-CQ0TKHM59XZ	Save Configuration Clear Configuration	ties			
Intel (R) RAID Contro	Set Consistency Check Properties	heral:		Backend SAS Address 0	0x443322110
- @ Backplane (25	Schedule Consistency Check	ici di:		Dauxeriu DAD Aduress u	0.1445522110
- C Backplane (25 -	Set Adjustable Task Rates	duct Name	Intel (R) RAID Controller RS2BL080DE	Backend SAS Address 1	0×443322110
🧼 Backplane (25 _ 🧼 Backplane (25	Preserved Cache	al No	SV93500714	Backend SAS Address 2	0×443322110
	Power Settings	dor ID	0×1000	Backend SAS Address 3	0×443322110
	Enable Drive Security	00F1D	0,1000	Dauxeria SMS Maaress 5	02443322110
	Update Controller Firmware	Vendor ID	0x8086	Backend SAS Address 4	0×0
		Device ID	0x79	Backend SAS Address 5	0×0
		Device Port Count	8	Backend SAS Address 6	0×0
		Host Interface	PCIE	Backend SAS Address 7	0×0
		Host Port Count	0	Correctable ErrorCount	0
		FRU		Memory uncorrectable count	0
		Alarm Present	Yes	Cluster Enable	No
		Alarm Enabled	No	Cluster Active	No
		Cache Flush Interval	4 sec	SSD Guard	Enabled
		Coercion Mode	1 GB	Drive Security Properties:	
					•
▼					
ID Error Level 36 [Information, 0] 201	Date / Time		Description =::3 Previous = Online Current = Unco		

Figure 77. Clear Configuration

A Warning message displays.

3. Click Yes to clear the configuration or No to cancel the operation.

Adding a Configuration from a File

When you replace a controller or when you want to duplicate an existing storage configuration on a new controller, you can add a saved configuration to the controller.

Warning: When you add a saved configuration to a replacement controller, make sure that the number and size of the physical disks connected to the controller is exactly the same as it was when the configuration was saved.

To add a saved configuration, follow these steps:

- 1. Select a controller icon in the left panel of the Intel[®] RAID Web Console 2 window.
- 2. Select Go To -> Controller -> Load Configuration.

lanage Go To Log Tools	Help				
Controller 🕨	Create Virtual Drive				
Drive Group	Enable Alarm				
Physical Drive	Start Patrol Read				(-L-I)
Virtual Drive 🕨	Set Patrol Read Properties	ole 2			(intel/
BBU	Disable SSD Guard	Elsen Mil			\smile
	Scan Foreign Configuration			Welcome: administrator	Log
Dashboard Physical Logica	Load Configuration				
WIN-CQ0TKHM59XZ	Save Configuration Clear Configuration	ties			
🖻 🥪 Unconfigured Driv	Set Consistency Check Properties	heral:		Backend SAS Address 0	0×443322110
🧼 Backplane (25 🧇 Backplane (25	Schedule Consistency Check	duct Name	Intel (R) RAID Controller R52BL080DE	Backend SAS Address 1	0x443322110
- @ Backplane (25	Set Adjustable Task Rates	_			
- 🧇 Backplane (25	Preserved Cache	al No	SV93500714	Backend SAS Address 2	0×443322110
_	Power Settings	dor ID	0×1000	Backend SAS Address 3	0x443322110
_	Enable Drive Security				
	Update Controller Firmware	Vendor ID	0×8086	Backend SAS Address 4	0×0
	C	evice ID	0x79	Backend SAS Address 5	0×0
		evice Port Count	8	Backend SAS Address 6	0×0
		lost Interface	PCIE	Backend SAS Address 7	0×0
	H H	lost Port Count	0	Correctable ErrorCount	0
	F	RU		Memory uncorrectable count	0
	A	larm Present	Yes	Cluster Enable	No
	A III	ilarm Enabled	No	Cluster Active	No
		ache Flush Interval	4 sec	SSD Guard	Enabled
		Coercion Mode	1 GB	Drive Security Properties:	
				<u>'</u>	Þ
ID Error Level	Date / Time		Description		

Figure 78. Add Saved Configuration

A Warning message displays.

- 3. Click Yes.
- 4. When the Open dialog box is displayed, select the configuration file and click **Open**.
- 5. View the configuration detail, then select Apply.
- 6. When prompted, confirm the new configuration.

Monitoring System Events and Devices

The Intel[®] RAID Web Console 2 enables you to monitor the status of disk drives, virtual disks, enclosures, and other devices. You can monitor the following:

- Monitoring System Events
- Monitoring Controllers
- · Monitoring Disk Drives and Other Physical Devices
- Monitoring Virtual Disks
- Monitoring Enclosures
- Another method to use the BBU operations is to right-click the BBU icon to open the operations menu and select Start Learn Cycle.
- Monitoring Rebuilds and Other Processes

Monitoring System Events

Intel[®] RAID Web Console 2 monitors the activity and performance of all controllers in the system and the devices attached to them. When an "event" occurs—such as the completion of a consistency check or the removal of a physical drive—an event message displays in the log at the bottom of the Intel[®] RAID Web Console 2 screen, as shown in Figure 79. These event messages also display in the Microsoft Windows* application log (the Event Viewer).

	S 🕗 😫 🕷 🕢		
	ntel [®] RAID Web	Console 2	
		Welcome: administrator	Log C
Dashboa	rd Physical Logical		
	CQ0TKHM59XZ	Properties	
	ntel (R) RAID Controller RS2BL080DE (Bus 10,D		- 6
B-6	🗟 Unconfigured Drives		Þ
V			_
ID	Error Level Date / Time	Description	
37	[Information, 0] 2010-04-25, 23:00:56	Controller ID: 0 Time established since power on: Time 2010-04-25,23:00:56 183727 Seconds	_
36	[Information, 0] 2010-04-25, 22:52:15	Controller ID: 0 State change: PD =:-:3 Previous = Online Current = Unconfigured Good	
35	[Information, 0] 2010-04-25, 22:52:15	Controller ID: 0 State change: PD =:: 2 Previous = Online Current = Unconfigured Good	
34	[Information, 0] 2010-04-25, 22:52:15	Controller ID: 0 State change: PD = -:-:1 Previous = Online Current = Unconfigured Good	
33	[Information, 0] 2010-04-25, 22:52:15	Controller ID: 0 State change: PD =:-:0 Previous = Online Current = Unconfigured Good	
32	[Information, 0] 2010-04-25, 22:52:15	Controller ID: 0 Deleted VD: 0	
31	[Information, 0] 2010-04-25, 22:00:56	Controller ID: 0 Time established since power on: Time 2010-04-25.22:00:56 180127 Seconds	
30	[Information, 0] 2010-04-25, 21:29:11	Controller ID: 0 Initialization complete on VD 0	
29	[Information, 0] 2010-04-25, 21:29:11	Controller TD: 0 East initialized on VD: 0	
28	[Information, 0] 2010-04-25, 21:29:11	Controller ID: 0 Policy change on VD: 0 Previous = Current Write Policy: Write Back Current = Current Write Policy: Write Through	
27	[Information, 0] 2010-04-25, 21:29:10	Controller 10: 0 Yorky change which of the set of the s	
26	[Information, 0] 2010-04-25, 21:29:10	Controller ID: 0 Created VD: 0	
25	[Information, 0] 2010-04-25, 21:29:10	Controller ID: 0 VD Is now OPTIMAL VD 0	
124	[Information, 0] 2010-04-25, 21:29:10	Controller ID: 0 State change: PD =::3 Previous = Unconfigured Good Current = Online	
123	[Information, 0] 2010-04-25, 21:29:10	Controller Dio 0 state change: PD = -:-:2 Previous = Unconfigured Good Current = Online	
122	[Information, 0] 2010-04-25, 21:29:10	Controller ID: 0 State change: PD = -:-:1 Previous = Unconfigured Good Current = Online	
121	[Information, 0] 2010-04-25, 21:29:10	Controller ID: 0 State change: PD = -:-:0 Previous = Unconfigured Good Current = Online	
120	[Information, 0] 2010-04-25, 21:28:09	Controller ID: 0 State change: PD = -:-:3 Previous = Online Current = Unconfigured Good	
19	Information, 0] 2010-04-25, 21:28:09	Controller ID: 0 State change: PD = -:-:2 Previous = Online Current = Unconfigured Good	
118	[Information, 0] 2010-04-25, 21:28:09	Controller ID: 0 State change: PD = -:-:1 Previous = Online Current = Unconfigured Good	
17	[Information, 0] 2010-04-25, 21:28:09	Controller ID: 0 State change: PD = -:-:0 Previous = Online Current = Unconfigured Good	
16	[Information, 0] 2010-04-25, 21:28:09	Controller TD: 0 Deleted VD: 0	
15	Information, 0] 2010-04-25, 21:26:12	Controller D: 0 Policy change on VD: 0 Previous = Current Write Policy: Write Back Current = Current Write Policy: Write Through	
114	[Information, 0] 2010-04-25, 21:26:12	Controller 10: 0 Policy change of V0: 0 Previous = Current white Policy, write back Current = Current write Policy, write middight	
13	Information, 0] 2010-04-25, 21:26:12	Controller ID: 0 Created VD: 0	
12	[Information, 0] 2010-04-25, 21:26:12	Controller ID: 0 VD is now OPTIMAL VD 0	
112	Information, 0] 2010-04-25, 21:26:12	Controller ID: 0 State change: PD =:-:3 Previous = Unconfigured Good Current = Online	
410	Information, 012010-04-25, 21:26:12	Controller ID: 0 State change: PD =:2 Previous = Unconfigured Good Current = Online	
			-

Figure 79. Event Information Window

Each event in the log includes an error level—Information, Warning, Critical, Fatal, or Dead a date/time stamp, and a brief description. (For a list of all events, see Appendix B: "Events and Messages" on page 175) The status bar at the bottom of the screen indicates whether the log is a system log (as in Figure 79) or a log from a locally stored file. (This file could have been generated by a previous "Save Log" action.)

When a system log displays, the Log menu has four options:

- Save Log: Saves the current log to a .log file.
- Save as Text: Saves the current text to a .txt file.
- Clear: Clears the current log information, if you have full access (versus View-only access).
- Load: Enables you to load a local .log file.

When a local log is displayed, the status bar lists the name of the local log file, and the Log menu has an additional option, **Rollback to Current Log**, which enables you to retrieve the system log.

Monitoring Controllers

When $Intel^{(R)}$ RAID Web Console 2 is running, you can see the status of all controllers in the left panel. If the controller is operating normally, the controller icon looks like this: \clubsuit . If the controller has failed, a small red circle is displayed to the right of the icon.

To display complete controller Information, click on a controller icon in the left panel. Figure 80 shows the Controller Information window on the right panel.

Manage GolTo Log Icols Help				
関 🛸 📀 😫 🕫 🚱				
Intel [®] RAID We	b Console 2			(intel)
Dashboard Physical Logical			Welcome: adm	inistrator Log Off
WIN-CQ0TKHM59XZ	Properties			
Ref (R) RAID Controler RS28L080DE (Bu Decorfigured Drives	Vendor ID	0×1000	Backend SAS Address 3	0x4433221103000000
	SubVendor ID	0x8086	Backend SAS Address 4	0x0
	Device ID	0x79	Backend SAS Address 5	0x0
	Device Port Count	8	Backend SAS Address 6	0x0
	Host Interface	PCIE	Backend SAS Address 7	0x0
	Host Port Count	0	Correctable ErrorCount	0
	FRU		Memory uncorrectable count	0
	Alarm Present	Yes	Cluster Enable	No
	Alarm Enabled	No	Cluster Active	No
	Cache Flush Interval	4 sec	SSD Guard	Enabled
	Coercion Mode	1 GB	Drive Security Properties:	
	BBU Present	No	Drive security enabled	No
	NVRAM Present	Yes	Drive security method	FDE Only
	NVRAM Size	32.000 KB	Drive security capable	Yes
	BIOS Version	3.13.00	Background Operation Properties:	
	Native Command Queuing	Enabled	Rebuild Rate	30
	Flash Size	8.000 MB	Patrol Read Rate	30
	Memory Size	512.000 MB	Reconstruction Rate	30
	Firmware Properties:		BGI Rate	30
	Firmware Package Version	12.8.0-0003	Consistency Check Rate	30
	Firmware Version	2.80.03-0838	MegaRAID Recovery Properties:	
	Firmware Build Time	Apr 06 2010 10:31:48	MegaRAID Recovery	Enabled 💉

Figure 80. Controller Information

Note the following:

- The *Rebuild rate, Patrol read rate, Reconstruction rate, Consistency check rate,* and *BGI rate* (background initialization) are all user-selectable. For more information, see "Setting Adjustable Task Rates" on page 119.
- The BBU Present field indicates whether a battery backup unit is installed.
- The *Alarm Present* and *Alarm Enabled* fields indicate whether the controller has an alarm to alert the user with an audible tone when there is an error or problem on the controller. There are options on the controller Properties tab for silencing or disabling the alarm. For more information, see "Setting Adjustable Task Rates" on page 119.

Monitoring Disk Drives and Other Physical Devices

When the Intel[®] RAID Web Console 2 is running, you can see the status of all physical disk drives and other physical devices in the left panel. If the physical drive is operating normally, the controller icon looks like this: \checkmark . If the physical drive has failed, a small red circle is displayed to the right of the icon.

To display complete physical drive Information, click on a physical drive icon in the left panel. Figure 81 shows the Properties panel for a physical drive.

/sical Logical				
intel-ih5f9gaph.sh.intel.com	Properties Operations			
Slot: 8, SATA, 465.762 GB, Online	Slot Number	8	Product ID	ST3500320N5
 Slot: 9, SATA, 465.762 GB, Online Slot: 10, SATA, 465.762 GB, Online 	Туре	SATA	Vendor ID	ATA
Slot: 11, SATA, 465.762 GB, Online Slot: 12, SATA, 465.762 GB, Unconfigured Good	Usable Capacity	465.250 GB	Revision Level	SN04
Battery Backup Unit	Status	Online	Device ID	8
	SCSI Device Type	Disk	Media Error Count	0
	Raw Capacity	465.762 GB	Pred Fail Count	0
	Full disk encryption capable	No	SAS Address 0	0×4433221101000000
	Encrypted	No	Power Status	On
	<u></u>			
ID Error Level Date / Time		Descriptio	n	
	oller ID: 0 Created VD: 0 oller ID: 0 VD is now OPTIMAL VD	0		
29 [Information 2009-06-16, 14:09:13 Contr	oller ID: 0 State change: PD =	::11 Previous = Unconfigure		
		::10 Previous = Unconfigure ::9 Previous = Unconfigured		
		::8 Previous = Unconfigured		

Figure 81. Physical Drive Information

There are no user-selectable properties for physical devices. Icons for other physical devices such as CD-ROM drives and DAT drives may also display in the left panel.

If the physical drives are in a disk enclosure, you can identify which physical drive is represented by a disk icon on the left. To do this, follow these steps:

1. Click the physical disk icon in the left panel.

- 2. Click the Go To -> Physical Drive tab.
- 3. Click Start Locating Drive (see Figure 82).

Controller Drive Group Physical Drive Virtual Drive BBU	Assign Global Hot Spare	onsole 2			j (in	tel
ashboard Physical Logic				Weko	me: administrator	Log
WIN-CQ0TKHM59XZ		Properties				
E Backplane (252)	ller RS2BL080DE (Bus 10,Dev 0)	General:		Power Status	On	
- 🥪 Slot: 1, SATA	, 232.886 GB, Unconfigured Goc , 232.886 GB, Unconfigured Goc	Usable Capacity	231.898 GB	Revision Level	G	
	, 232.886 GB, Unconfigured Goc	Raw Capacity	232.886 GB	Media Error Count	0	
		Certified	No	Pred Fail Count	0	
		Product ID	ST3250620N5	Enclosure Properties		
		Vendor ID	ATA	Enclosure ID	252	
		Device ID	1	Enclosure Model	Backplane	
		Status	Unconfigured Good	Enclosure Location	Internal	
		Drive Speed	3.0 Gbps	Slot Number	0	
		Negotiated Link Speed	3.0 Gbps	Drive Security Properties		
		SCSI Device Type	Disk	Full Disk Encryption capable	No	
		SAS Address 0	0×4433221103000000	Secured	No	

Figure 82. Locating a Physical Drive

The LED on the physical disk drive in the enclosure starts blinking to show its location.

Note: LEDs on global or dedicated hot-spare drives do not blink.

4. To stop the disk drive light from blinking, click **Stop Locating Drive**.

Running a Patrol Read

A Patrol Read periodically verifies all sectors of physical disks that are connected to a controller, including the system reserved area in the RAID configured drives. Patrol Read works for all RAID levels and for all hot-spare drives. A patrol read is initiated only when the controller is idle for a defined period and has no other background activities.

To enable and configure Patrol Read, follow these steps:

- 1. Click a controller icon in the left panel.
- 2. Select the **Go To** -> **Controller** tab and click **Set Patrol Read Properties to** display a pop-up window, as shown in Figure 83.

📰 Patrol Read - Set properties	×
Intel [®] RAID Web Console 2	intel
Select Patrol Read mode: Automatic v Maximum number of Physical drives allowed for Patrol Read concurrently:	
Include the Virtual drives for whose physical drives, Patrol Read should be performed: Available Virtual drives:	Included Virtual drives:
- Virtual Drive	Add > Virtual Drive
🚺 Virtual Drive: 0, 927.594 GB, Optimal	Add All >>
-	
-	<u>Remove <</u>
	Remove All <<
Patrol Read Interval	
Select: Weekly V Run Patrol Read non-stop.	
Patrol Read Schedule	
<u>Perform Patrol Read when I press OK.</u> Start Patrol Read on:	
Month: Dato: Year: Time:	
May ¥ 2 ¥ 2010 ¥ 02:00 PM ¥	
	OK Cancel

Figure 83. Patrol Read Configuration

- 3. Select an Operation Mode for patrol read. The options are:
 - Automatic: Patrol Read runs automatically at the time interval you specify on this screen.
 - Manual: Patrol Read runs only when you manually start it by selecting Start Patrol Read from the controller options screen (see Figure 83).
 - **Disabled**: Patrol Read does not run at all.
- 4. (Optional) Specify a maximum count of physical drives to include in the patrol read. The default number is 255; if you want, you can specify a lower number.
- 5. (Optional) Select virtual disks on this controller to exclude from the Patrol Read. The existing virtual disks are listed in the gray box. To exclude a virtual disk, select the check box next to it.
- 6. Enter the Interval at which the Patrol Read will run.
- 7. If Run Patrol Read non-stop check box is selected, Patrol Read will run continuously.
- 8. Click OK to enable these Patrol Read options.

Monitoring Virtual Disks

When the Intel[®] RAID Web Console 2 is running, you can see the status of all virtual disks. If a virtual disk is operating normally, the icon looks like this: $\boxed{1}$. If the virtual disk is running in degraded mode—for example, if a physical disk has failed—a small yellow circle is displayed to the right of the icon, which looks like this: $\boxed{1}$.

When the Virtual tab is selected, the panel on the left shows which physical disks are used by each virtual disk. In Figure 84 you can see that the virtual disk uses physical disks 1, 2, and 3. Multiple virtual disks can use the same physical disk.

To display complete virtual disk information, click the **Virtual** tab in the left panel, click on a virtual disk icon in the left panel. Figure 84 shows the Properties tab for a virtual disk in the right panel.

Manage Go to Log Iools telo Senage Go to Log Iools telo Intel® RAID Web Consol	e 2			ekome: administrator	
Dashboard Physical Logical WIN-CQ0TKHM59xZ	Properties				
Win-CQUIRHIN9322 win-CQUIRHIN932 win-CQUIRHIN93 win-CQU	General:		Write P	olicy	
🗔 🧊 😑 Virtual Drive: 0, 463.797 GB, Partially Degraded	RAID Level	6	IO Policy		Direct IO
Drives:	Size	463.797 G	3 Current	Write Policy	Write Through
	Stripe Size	256 KB	Default V	Write Policy	Write Back with BBU
	Virtual Disk State	e Partially De	graded Reason I	for difference in Write Policy	BBU is not installed
	IO and Cache I	Policies	Drive S	ecurity Properties:	
	Access Policy	Read Write	Secured		No
	Disk Cache Policy	y Disable	Power	State Properties:	
	Read Policy	Always Re	ad Ahead Power sa	ave mode	No power saving
	•				•

Figure 84. Virtual Drive Properties

The RAID level, stripe size, and access policy of the virtual disk are set when it is configured.

Note: You can change the Read Policy, Write Policy, and other virtual disk properties by selecting Go To - > Virtual Drive -> Set Virtual Drive Properties.

Monitoring Enclosures

When the Intel[®] RAID Web Console 2 is running, you can see the status of all enclosures that are operating normally. Information about the enclosure is displayed in the right panel. Figure 85 shows it.

📰 RAID Web Console 2 - 6.90.0300		
Manage <u>G</u> o To Log Tools <u>H</u> elp		
) 👣 🥱 🕗 🖹 🕸 🕢		
Intel [®] RAID Web Console	2	intel
		Welcome: administrator Log Off
Dashboard Physical Logical	1	
WIN-CQ0TKHM59XZ	Properties	
Backplane (252) Backplane (252)	Vendor ID	LSI
	Enclosure ID	252
	Enclosure Model	Backplane
	Enclosure Location	Internal
▲▼		

Figure 85. Enclosure Information

The display in the **Dashboard** tab also includes enclosure information in the **Properties** part.

Monitoring Battery Backup Units

When Intel[®] RAID Web Console 2 software is running, you can monitor the status of all of the BBUs connected to controllers in the server. If a BBU is operating normally, the icon looks like this: . If it has failed, a red dot appears next to the icon.

To show the properties for a BBU, perform the following steps:

- 1. Click the **Physical** tab on the main menu to open the physical view.
- 2. Select the BBU icon in the left panel.

The BBU properties, such as the battery type, temperature, and voltage, appear in the right panel, as shown in Figure 86.

	Web Console 2 - 3.04.0500 erations Group Operations Log Tools H	teln					_ _ _ / ×
	l I glob obciggous Fod Toos I	Teib					
Servers							
	ntel® RAID Web	Con	sole 2			(intel)	
Physical	Logical						
	ih5f9gaph.sh.intel.com		Properties Operations				
	ntel Server RAID Controller RS2BL080 (Bus 1) Backplane (21) Slot: 0, SATA, 232,886 GB, Unconfigu		Battery Type	IBBU	Auto Learn Period	30 Days	
			Full Capacity	1299 mAh	Next Learn Cycle	Jul 11 2009 18:42:02	
	Slot: 3, SATA, 232.886 GB, Unconfigur	red Goc	Remaining Capacity	1274 mAh	Relative State of Charge	98 %	
	Slot: 5, SATA, 232.886 GB, Unconfigu		Temperature	25.0 C (77.0 F)	Absolute State of Charge	94 %	
	SCAHSBPM1 (18), Connector: Port 4 - 7 Slot: 0, SATA, 232.886 GB, Unconfigured Slot: 0, SATA, 232.886 GB, Slot: 0, SATA, 232.886 GB, Slot: 0, SATA, 232.886 GB, 234.886 GB,		Voltage	4163 mV	Run time to Empty	65535 min	
	Slot: 1, SATA, 232.886 GB, Unconfigured Slot: 2, SATA, 2, S		Current	0 mA	Average Time to Empty	65535 min	
	Slot: 4, SATA, 232.886 GB, Unconfigur Battery Backup Unit	red Goc	Cycle Count	1	Average Time to Full	65535 min	
			Automatic Learn Cycles:	Enabled	Maximum Error Margin	2 %	
							-
		Ľ			1		
	Error Level Date / Time	1		De	scription		
4913	Information 2009-06-24, 13:15:44	Controll	er ID: 0 Unexpected sense: Pi		scription dition.on, CDB = 0x03.0x00.0x00) 0x00 0x40 0x00 , Sense =	
4912	[Information 2009-06-24, 13:15:44		er ID: 0 Unexpected sense: Pi er ID: 0 Unexpected sense: Pi		ver condition on. CDB = $0x03 0x00 0x00$		en
4911	[Information 2009-06-24, 13:15:44		er ID: 0 Unexpected sense: P		ver condition on, $CDB = 0x03 0x0$		
4910	[Information 2009-06-24, 13:15:44		er ID: 0 Unexpected sense: P		ver condition on, $CDB = 0x03 0x0$		ien
4909	[Information 2009-06-24, 13:15:44		er ID: 0 Unexpected sense: P		ver condition on, $CDB = 0x03 0x0$		en
4908	[Information 2009-06-24, 13:15:44		er ID: 0 Unexpected sense: P		dition on, CDB = $0 \times 03 \ 0 \times 00 \ 0 \times 00$		
4907	[Information 2009-06-24, 13:15:44		er ID: 0 Unexpected sense: P		dition on, CDB = 0x03 0x00 0x00		
4906	Information 2009-06-24, 13:15:44	Controlk	er ID: 0 Unexpected sense: P		dition on, CDB = 0x03 0x00 0x00		
Displayin	g log from server						

Figure 86. Battery Backup Unit Information

The BBU properties include the following:

- The number of times the BBU has been recharged (Cycle Count)
- The full capacity of the BBU, plus the percentage of its current state of charge, and the estimated time until it will be depleted
- The current BBU temperature, voltage, current, and remaining capacity
- If the battery is charging, the estimated time until it is fully charged

Battery Learn Cycle

Learn Cycle is a battery calibration operation performed by the controller periodically to determine the condition of the battery. You can start battery learn cycles manually or automatically. To choose automatic battery learn cycles, enable automatic learn cycles. To choose manual battery learn cycles, disable automatic learn cycles.

If you enable automatic learn cyles, you can delay the start of the learn cycles for up to 168 hours (7 days). If you disable automatic learn cycles, you can start the learn cycles manually, and you can choose to receive a reminder to start a manual learn cycle.

Setting Learn Cycle Properties

To set the learn cycle properties, perform the following steps:

- 1. Click the **Physical** tab to open the physical view.
- 2. Select the BBU icon in the left panel.

3. Click the **Go To -> BBU** tab.

The BBU operations appear, as shown in Figure 87 (Depending on different utility version, the BBU operation also may appear in a new pop-up window).

	Web Console :						<u>الم</u>
	arauons group	Operations Log Tools He	ah				-
Servers	ntel® F	RAID Web (Consc	ole 2		intel	
Physical	Logical						
	h5f9gaph.sh.int		Prope	rties Operations			
	Backplane (21 Slot: 0, 5/ Slot: 1, 5/ Slot: 2, 5/ Slot: 3, 5/ Slot: 3, 5/ Slot: 3, 5/ Slot: 4, 5/ Slot: 5, 5/ Slot: 6, 5/ Slot: 7, 5/ Slot: 7, 5/ Slot: 9, 5/ ScAH5BMC 10, 5/ Slot: 1, 5/ Slot: 2, 5/ Slot: 2, 5/	ATA, 232.886 GB, Unconfigure ATA, 232.866 GB, Unconfigure ATA, 232.886 GB, Unconfigure	d Goc d Goc d Goc d Goc d Goc d Goc d Goc d Goc d Goc d Goc	gefresh Properties Tab Start Lgarn Cycle Set Learn Cycle Properties	* *	Selected Operation : Set Learn Cycle Properties Description : Sets the learn cycle properties for the battery backup unit Automatic Learn Cycles: C Engble automatic learn cycles Next Learn Cycle: Jul 11 2009 18:42:02 Delay next learn cycle: Diract hours C Disable automatic learn cycles Image: Regind me when to start a learn cycle Image: Regind me when to start a learn cycle Image: Regind me when to start a learn cycle Image: Regind me when to start a learn cycle	
ID	Error Level	Date / Time				Description	
4913		2009-06-24, 13:15:44		0 Unexpected sense: PD		Low power condition on, CDB = 0x03 0x00 0x00 0x00 0x40 0x00 , Sense =	*
4912		2009-06-24, 13:15:44		0 Unexpected sense: PD		7:1:4 - Low power condition on, CDB = 0x03 0x00 0x00 0x00 0x40 0x00 , Sen	
4911		2009-06-24, 13:15:44		0 Unexpected sense: PD		7:1:2 - Low power condition on, CDB = 0x03 0x00 0x00 0x00 0x40 0x00 , Sen	
4910		2009-06-24, 13:15:44		0 Unexpected sense: PD		7:1:1 - Low power condition on, CDB = 0x03 0x00 0x00 0x00 0x40 0x00 , Sen	
4909		2009-06-24, 13:15:44		0 Unexpected sense: PD		7:1:0 - Low power condition on, CDB = 0x03 0x00 0x00 0x00 0x40 0x00 , Sen	
4908		2009-06-24, 13:15:44		0 Unexpected sense: PD		Low power condition on, CDB = 0x03 0x00 0x00 0x00 0x40 0x00 , Sense =	
4907		2009-06-24, 13:15:44		0 Unexpected sense: PD		Low power condition on, CDB = 0x03 0x00 0x00 0x00 0x40 0x00 , Sense =	
4906 Displaying	[Information log from server	2009-06-24, 13:15:44	Controller ID:	0 Unexpected sense: PD	=::1 - L	Low power condition on, CDB = $0x03 0x00 0x00 0x00 0x40 0x00$, Sense =	-

Figure 87. Battery Backup Unit Operations

4. Select Set Learn Cycle Properties.

The options appear in the right frame.

5. To enable automatic learn cycles, click Enable automatic learn cycles and click Go.

You can delay the start of the next learn cycle by up to 7 days (168 hours) using the Delay next learn cycle field.

6. To disable automatic learn cycles, click **Disable automatic learn cycles** and click **Go**.

You can start the learn cycles manually. In addition, you can check the box next to the field **Remind me when to start a learn cycle** to receive a reminder to start a manual learn cycle.

Starting a Learn Cycle Manually

To start the learn cycle properties manually, perform the following steps:

- 1. Click the **Physical** tab to open the physical view.
- 2. Select the BBU icon in the left panel.
- 3. Click the **Go To -> BBU** tab.

The BBU operations appear, as shown in Figure 87 (Depending on different utility version, the BBU operation also may appear in a new pop-up window).

4. Click Start Learn Cycle and click OK.

Another method to use the BBU operations is to right-click the BBU icon to open the operations menu and select **Start Learn Cycle**.

Monitoring Rebuilds and Other Processes

The Intel[®] RAID Web Console 2 allows you to monitor the progress of rebuilds and other lengthy processes in the Group Show Progress window, shown in Figure 88. You open this window by selecting **Manage** -> **Show Progress**.

Group Show Progress	
Intel [®] RAID Web Console 2	(intel)
Intel(R) RAID Controller SRCSASJV (Bus 10,Dev 0)	
Ongoing Operations on Virtual Disks Virtual Drive: 0, 929.45 GB, Optimal Foreground Initialize 0% Abort Elapsed time: 2Sec Estimated time left: 1Hrs 43Min 59Sec	Ongoing Operations on Physical Drives
۲	
	Abort All

Figure 88. Group Show Progress Window

Operations on virtual disks appear in the left panel of the window, and operations on physical drives appear in the right panel. The types of operations that appear in this window are as follows:

- Initialization of a virtual disk (see "Initializing a Virtual Disk" on page 140).
- Rebuild (see "Rebuilding a Drive" on page 142).
- Reconstruction (see "Adding a Drive to a Virtual Disk" on page 120).
- Consistency check (see "Running a Consistency Check" on page 141).
- *Note:* A Reconstruction process cannot be aborted. To abort any other ongoing process, click *Abort* next to the status indicator. Click *Abort All* to abort all ongoing processes. Click *Close* to close the window.

Maintaining and Managing Storage Configurations

This section explains how to use Intel[®] RAID Web Console 2 to maintain and manage storage configurations. You must log on to the system in Full Access mode to complete these maintenance and management tasks. This following maintenance and management functions can be done:

- Initializing a Virtual Disk
- Running a Consistency Check
- Rebuilding a Drive
- Removing a Drive
- Flashing the Firmware

Initializing a Virtual Disk

When you create a new virtual disk with the Configuration Wizard, you can choose to initialize the disk initialized immediately. To initialize a virtual disk after the configuration process, follow these steps:

- 1. Select the Virtual tab in the left panel, and click the icon of the virtual disk to initialize.
- 2. Select Manage -> Initialize.

Group Initialization		
Intel [®] RAID Web Co	nsole 2	(intel)
ntel (R) RAID Controller R52BL080DE (Bus 10,De	(0)	
Select Virtual Disks:		
Virtual Drive: 0, 463.797 GB, Optimal		
itialization Type :		
iciaización rype -		
	Fast Initialization	
	Select All Deselect All Start Cancel	
	Intialization Start	

Figure 89. Selecting Initialize

The Group Initialize dialog box is displayed.

3. Select the virtual disk(s) to initialize. If you want to use this option, select **Fast Initialization**.

Fast Initialization quickly formats the virtual disk by writing zeros to the first few sectors of the physical disks in the virtual disk. Depending on the number and size of the physical disks in the virtual disk, regular initialization takes longer.

4. Click **Start** to begin the initialization.

If needed, you can monitor the progress of the initialization. See "Monitoring Rebuilds and Other Processes" on page 139 for more information.

Running a Consistency Check

You should periodically run a consistency check on fault-tolerant virtual disks. A consistency check scans the virtual disk to determine whether consistency data is corrupted and needs to be restored. It is especially important to do this if you suspect that the virtual disk consistency data is corrupted.

To run a consistency check, follow these steps:

1. Select Manage -> Check Consistency.

The Group Consistency Check window is displayed, as shown in Figure 90.

Group Consistency Check	×
Intel [®] RAID Web Console 2	(intel)
Intel(R) RAID Controller SRCSASJV (Bus 10,Dev 0)	
Select Virtual Disks:	
Virtual Drive: 0, 929.45 GB, Optimal	
Select <u>All</u> Deselect All Start Cancel	

Figure 90. Group Consistency Check Window

- 2. Select the virtual disks you want to check, or click Select All to select all disks.
- 3. Click **Start** to begin.

You can monitor the progress of the consistency check. For more information, see "Monitoring Rebuilds and Other Processes" on page 139.

Note: You can also run a consistency check by selecting the virtual disk icon in the left panel and rightclick the option *Start Consistency Check*.

Scanning for New Drives

The Intel[®] RAID Web Console 2 normally detects newly installed disk drives and other storage devices and displays icons for them on the main screen. If the Intel[®] RAID Web Console 2 does not detect a new drive, you can use the **Scan for Foreign Configuration** option to find it. To do this, follow these steps:

- 1. Select a controller icon in the left panel.
- 2. Select Go To -> Controller -> Scan Foreign Configuration.

Controller 🕨	Enable Alarm				
Drive Group	Start Patrol Read				
Physical Drive 🕨	Set Patrol Read Properties	Grand and a state of the			
Virtual Drive 🕨	Disable SSD Guard	le 2			tel
BBU 🕨	Scan Foreign Configuration	The second			
	Load Configuration			Welcome: administrator	Log
ashboard Physical Logica	Save Configuration			Thereafter a similar a con	
WIN-COOTKHM59XZ _	Clear Configuration	rties			
A Intel (R) RAID Contro	Set Consistency Check Properties	003			
🗄 🥪 Drive Group: 0, R.	Schedule Consistency Check	heral:		Backend SAS Address 0	0×443
🖻 👣 Virtual Drive(s	Set Adjustable Task Rates				
🗌 🧊 Virtual Dri – E 🥪 Drives:	Preserved Cache	duct Name	Intel (R) RAID Controller R528L080DE	Backend SAS Address 1	0×44
- Backplane	Power Settings	al No	SV93500714	Backend SAS Address 2	0×44
Backplane	Enable Drive Security	dor ID	0×1000	Backend SAS Address 3	0×44
	Update Controller Firmware	- dor 10	001000	backend SAS Address 3	UX44.
		SubVendor ID	0x8086	Backend SAS Address 4	0×0
		Device ID	0x79	Backend SAS Address 5	0x0
		Device Port Count	8	Backend SAS Address 6	0×0
		Host Interface	PCIE	Backend SAS Address 7	0×0
		Host Port Count	0	Correctable ErrorCount	0
		RU		Memory uncorrectable count	0
		Alarm Present	Yes	Cluster Enable	No
		Alarm Enabled	No	Cluster Active	No
		Cache Flush Interval	4 sec	SSD Guard	Enabl
		Coercion Mode	1 GB	Drive Security Properties:	
		BU Present	No	Drive security enabled	No

Figure 91. Scan for Foreign Configuration

If the Intel[®] RAID Web Console 2 detects any new disk drives, it displays a list of them on the screen.

Rebuilding a Drive

If a single drive in a fault tolerant system fails, the system is protected from data loss by the parity data (in RAID 5, RAID 50, or RAID 60) or by data redundancy (RAID 1, RAID 10). You must replace the failed drive and rebuild the drive's data on a new drive to restore the system to fault tolerance. (Or, if the drive is still operational, you can rebuild the data on the failed drive.) If dedicated or global hot-spare disks are available, the failed drive is rebuilt automatically without any user intervention.

If a drive has failed, a red circle is displayed to the right of the disk drive icon: @@@. A small yellow circle is displayed to the right of the icon of the virtual disk that uses this physical disk: @@@. This indicates that the virtual disk is in a degraded state, but the data is still intact.

If you need to rebuild a physical drive, follow these steps:

1. Right click the icon of the failed drive and select Rebuild.

2. When the warning message displays, click Yes. If the drive is still good, a rebuild starts.

You can monitor the progress of the rebuild in the Group Show Progress window by selecting **Go To** -> **Show Progress**. If the drive cannot be rebuilt, an error message is displayed, and you must replace the drive before a rebuild can occur. Continue with the next step.

- 3. Click the icon of the failed drive in the left panel.
- 4. Right-click and select Prepare for Removal.

Intel [®] RA	o ND Web Consol	e 2		and the second s	(intel)
and the states	1			Welcome: administrate	or Log
ashboard Physical Logical WIN-COOTKHM59XZ		Properties			
RAID Controlle		General:		Power Status	On
	: Drive: 0, 463.797 GB, Partially Degraded	Usable Capacity	231.898 GB	Revision Level	G
Drives: Backplane (252), Slot: 0, SATA, 232.886 GB, Online		Raw Capacity	232.886 GB	Media Error Count	0
	252), Slot: 1, SATA, 232.886 GB, Online 252), Slot: 2, SATA, 232.886 GB, Online	Certified	No	Pred Fail Count	0
Unconfigured Drive Backplane (25)		Product ID	ST3250820N5	Enclosure Properties	
	Assign Global Hot Spare Assign Dedicated Hot Spare	Vendor ID	ATA	Enclosure ID	252
	Start Locating Drive Stop Locating Drive	Device ID	2	Enclosure Model	Backplane
	Replace Missing Drive	Status	Unconfigured Good	Enclosure Location	Internal
	Prepare for Removal	Drive Speed	3.0 Gbps	Slot Number	3
	Spins down t	he selected drive to ready it for re Negotiated Link Speed	moval 3.0 Gbps	Drive Security Properties:	
		SCSI Device Type	Disk	Full Disk Encryption capable	No
		SAS Address 0	0x4433221100000000	Secured	No

Figure 92. Preparing Drive for Removal

5. Physically remove the failed drive and replace it with a new drive of equal or greater capacity.

When the new drive spins up, the drive icon changes to green, and the rebuild begins automatically. You can monitor the progress of the rebuild in the Group Show Progress window by selecting **Manage** -> **Show Progress**.

Note: If you want to force a disk drive into Fail status to trigger a rebuild, right-click the drive icon and select *Make Drive Offline*.

Removing a Drive

You may sometimes need to remove a non-failed drive that is connected to the controller. For example, you may need to replace the drive with a larger drive. Follow these steps to remove a drive safely:

- 1. Click the icon of the drive in the left panel and right-click it.
- 2. Select Make Drive Offline.
- 3. Right-click again and select Mark Drive as Missing.

- 4. Right-click again and select **Prepare for Removal**. This will change drive status to **Ready to Remove**
- 5. If you change your mind, right-click it and select **Undo Prepare for Removal**. Otherwise, wait until the drive spins down and then remove it.

Warning: While the system is powered off, never replace a drive that has not failed (and is not marked by the controller as failed). A drive must always be failed before it is replaced in an array.

Flashing the Firmware

The Intel[®] RAID Web Console 2 enables you to easily upgrade the controller firmware. To flash the controller firmware, follow these steps:

- 1. In the left panel, click on the icon of the controller you need to upgrade.
- 2. Right-click it and select Update Controller Firmware.
- 3. Browse for the .rom flash update file and click **OK**.

The Intel[®] RAID Web Console 2 displays the version of the existing firmware and the version of the new firmware file.

4. When you are prompted to ask if you want to upgrade the firmware, click Yes.

The controller is updated with the new firmware code contained in the .ROM file.

Enabling RAID Premium Features

Enabling Full Disk Encryption feature

This feature is supported by Intel[®] RAID controller with Intel[®] RAID Premium Feature Key AXXRPFKDE or AXXRPFKDE2 installed. This feature also requires that Self-Encrypting Drives (SEDs) are connected to the RAID controller. Refer to *Intel[®] RAID Premium Feature Key AXXRPFKSD, AXXRPFKDE, and AXXRPFKSNSH Installation Guide* (E88588-00x), or *Intel[®] RAID Premium Feature Keys AXXRPFKSSD2, AXXRPFKDE2, and AXXRPFKSNSH2 Installation Guide* (G29824-00x) for physical installation of the Premium Feature Key.

This feature enables authentication key management for data security protection for Self Encrypting Drives (SED), auto-lock, and instant erase of self-encrypting drives.

- It transparently auto-Locks Volumes; Volumes are automatically locks when powered down.
- It provides secure data when a drive is misplaced, failed, experiencing drive theft, experiencing Server theft "Smash & Grab"
- It provides Instant Secure Erase: Before returning leased Drives; Before redeploying with the datacenter.
- It helps reduce risk of data being compromised when drives eventually leave the data center.
- It significantly reduces the cost and time of repurposing or retiring drives.

• It is 100% transparent to storage systems and end users; appears the same as traditional non-encrypting drives; operates at full drive speed - No impact to performance; automatically encrypts or decrypts all data.

The following steps describe the steps to use Full Disk Encryption feature:

- Enable this feature within the Intel[®] RAID Web Console 2.
- Build a logical volume containing Self-Encrypting Disks.
- Specify that the volume be secured.

Detailed steps are as below:

1. Select the RAID controller and choose **Physical** tab in the left panel of Intel[®] RAID Web Console 2. Check **Drive Security Properties** in the right panel to see whether the RAID controller is **Drive Security capable**.

RAID Web Console 2 - 6.71.0100 Manage Go To Log Tools Help				<u>_ 8 ×</u>
Intel* RAID Web Console 2				(intel)
Physical Logical				
WIN-R18H4RNHPVC	Prop	erties		
E 🦣 Intel (R) RAID Controller RS2BL080 (Bus 3,Dev 0)		Cluster Active	No	_
Backplane (252)				
Slot: 4, SAS, 465.762 GB, Unconfigured Good		SSD Guard	Enabled	
Slot: 6, SAS, 465.762 GB, Unconfigured Good		Drive Security Properties:		
Slot: 7, SAS, 465.762 GB, Unconfigured Good				
		Drive security enabled	No	
		Drive security method	FDE and Controller-based	
		Drive security capable	Yes	
		Background Operation Properti	ies:	
		Rebuild Rate	30	
		Rebuild Rate	50	
		Patrol Read Rate	30	
				الح ا
				<u> </u>
ID Error Level Date / Time		Description		
384 [Informa 2010-04-15, 13:03:54 Controller ID: 0 C				<u> </u>
383 [Informa 2010-04-15, 13:03:33 Controller ID: 0 Di 382 [Informa 2010-04-15, 13:00:18 Controller ID: 0 T			04-15,13:00:18 5616 Seconds	
	inte es	tablished since power on: Time 2010-	-04-15,13:00:18 5010 Seconds	•
Displaying log from server				

Figure 93. Check Controller Security status

2. Select the physical drive and choose **Physical** tab in the left panel of Intel® RAID Web Console 2. Check **Drive Security Properties** in the right panel to see whether the RAID controller is **Full Disk Encryption capable**.

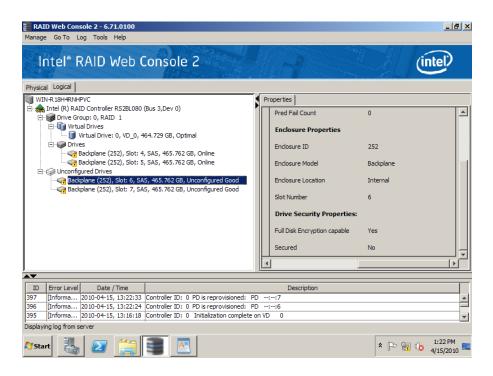


Figure 94. Check Drive Security status

3. Right-click on the controller and select Enable Drive Security.

Intel [®] RAID V	Web Console 2			el
hysical Logical		1		
WIN-R 18H4RNHPVC	Proper	ties		
Backplane (252)	Create Virtual Drive	-ral:		Back
Slot: 4, SAS, 465	Enable Alarm	rai.		Back
- 🦏 Slot: 5, SAS, 465		t Name	Intel (R) RAID Controller RS2BL080	Back
			010000000	De d
🛶 Slot: 7, SAS, 465	Disable SSD Guard	-No	SV92900269	Back
	Scan Foreign Configuration	r ID	0×1000	Bad
	Load Configuration			
	Save Configuration	ndor ID	0x8086	Bad
	Clear Configuration	ID	0x79	Bad
	Set Consistency Check Properties	-		
	Schedule Consistency Check	Port Count	8	Bad
	Set Adjustable Task Rates		PCIE	Bad
	Preserved Cache	-		
	Power Settings	ort Count	0	Con
				<u> </u>
•	Enable Drive Security			
ID Error Level Date	Update Controller Firmware		scription	
	13:03:54 Controller ID: 0 Configura			
	, 13:03:33 Controller ID: 0 Drive secu , 13:00:18 Controller ID: 0 Time esta		e 2010-04-15,13:00:18 5616 Seconds	
splaying log from server	, 15.00.15 Controller 1D: 0 Time esta	bisned since power on: Tim	ie 2010-07-13,13.00.16 3010 Seconds	

Figure 95. Enable Drive Security

4. In the Security Wizard, click Next.

able Drive Security - Introduction Image: Control of the security - Introduction I' RAID Web Console 2 Image: Control of the security of the security on the security on the security on the security on the security is a security is a security is a security key. RAID Control of the security is control of the security	Back Back Back Back
ever you must enter the security key. If you have multiple security the identifier will help you determine which security key to enter. , you will create the security key. You may need to enter the security order to perform certain operations. The controller can suggest a g security key. y, you will have the option to create a pass phrase. The pass phrase des additional security. If you choose to require a pass phrase, you enter it wherever you how you server	Back Back Back Back Corr
Cancel Next	
y d	order to perform certain operations. The controller can suggest a security key. , you will have the option to create a pass phrase. The pass phrase les additional security. If you choose to require a pass phrase, you enter it whenever you boot your server.

Figure 96. Start Security Wizard

5. Create the required Security key Identifier. Use the default suggestion, or create your own, then click **Next**.

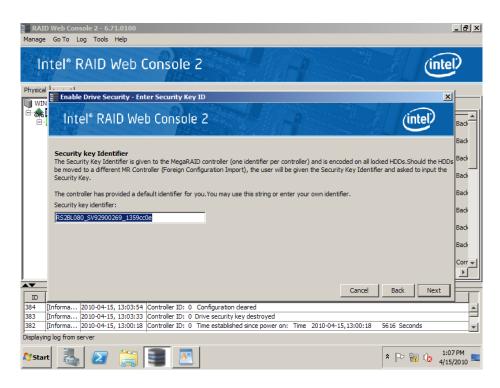


Figure 97. Enter Security Key Identifier

6. Create the required Security key. Use the default suggestion, or create your own, then click **Next**.

	D Web Console 2 - 6.71.0100 2 Go To Log Tools Help	<u>- 8 ×</u>
	ntel* RAID Web Console 2	2
-	I Logical Finable Drive Security - Enter Security Key X	i i
₩I 		Back
	Security key The Security Key will be used to lock each Self Encrypting Drive attached to the controller. You will not be asked to enter the Security Key in normal operation; however, to move HDDs from this controller to a foreign controller, this security key will be required.	Back Back
	The security key is case-sensitive. It must be between eight and thirty two characters and contain at least one number, one lower case letter, on uppercase letter, and one non-alphanumeric character. (e.g. > @ +).	Back Back
	Note: For maximum security, use thirty-two varied characters. You may optionally choose for the system to suggest a strong security key.	Back
	Suggest Security Key Security key:	Back
	InteRAID@1	Back
	Confirm:	
	IntelRAID@1	Forr →
	Cancel Back Next	
ID		
384	[Informa 2010-04-15, 13:03:54 Controller ID: 0 Configuration deared	_
383 382	[Informa 2010-04-15, 13:03:33 Controller ID: 0 Drive security key destroyed [Informa 2010-04-15, 13:00:18 Controller ID: 0 Time established since power on: Time 2010-04-15, 13:00:18 5616 Seconds	
		-
Displayi	ng log from server	
A Star	rt 🛃 🖉 🚝 🔳 🔼 * 🖻 🔞 1:00	2010 ==

Figure 98. Enter Security Key

7. Create an optional Pass Phrase for additional security, then click Next.

-	ID Web Console 2 - 6.71.0100 je Go To Log Tools Help	<u>₽</u> ×
	ntel* RAID Web Console 2)
Physic Wi	Enable Drive Security - Enter Pass Phrase	
	Pass phase Pass phrase provides additional security and should be different from the security key. The pass phrase is case-sensitive and must be between eight and thirty-two characters. Pause for Password at Boot Time - If it is checked this is the password required at boot time and whenever you provide the security key. Enforce Strong Password - If it is checked then Pass pharse should contain atleast one number, one lowercase letter, one uppercase letter, and on non-alphanumeric character (e.g. 1 * @ + #). Image: the pass phrase in addition to the security key Pass phrase: Confirm:	ack ack ack ack ack ack ack ack ack
	Cancel Back Finish	
384 383 382 Display	[Informa 2010-04-15, 13:03:54 Controller ID: 0 Configuration cleared [Informa 2010-04-15, 13:03:33 Controller ID: 0 Drive security key destroyed [Informa 2010-04-15, 13:00:18 Controller ID: 0 Time established since power on: Time 2010-04-15, 13:00:18 5616 Seconds /ing log from server Controller ID: 0 Time established since power on: Time 2010-04-15, 13:00:18 5616 Seconds	▲ ▼
ata ang sta		м 010 📼

Figure 99. Enter Pass Phrase

8. Accept the confirmation to complete the wizard and enable drive security, then click **Finish**.

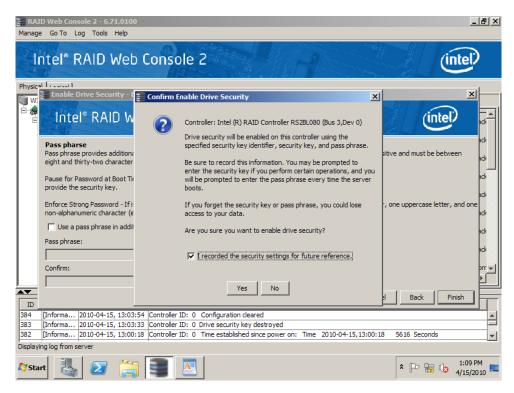


Figure 100. Confirm Enable Drive Security

9. Controller properties now indicate Drive security enabled is Yes.

罪 RAID Web Console 2 - 6.71.0100				_ 8 ×
Manage Go To Log Tools Help				
Intel [®] RAID Web C	onsole 2			(intel)
Physical Logical				
WIN-R 18H4RNHPVC		perties		
intel (R) RAID Controller RS2BL080 (E Backplane (252)		SSD Guard	Enabled	-
	configured Good	Drive Security Properties:		
Slot: 7, SAS, 465.762 GB, Un		Drive security enabled	Yes	
		Drive security method	FDE and Controller-based	
		Drive security capable	Yes	
		Background Operation Properties:		
		Rebuild Rate	30	
		Patrol Read Rate	30	
		Reconstruction Rate	30	
<u> </u>				•
ID Error Level Date / Time		Description		
385 [Informa 2010-04-15, 13:09:21 0				
	384 [Informa 2010-04-15, 13:03:54 Controller ID: 0 Configuration deared =			
383 [Informa 2010-04-15, 13:03:33 0	Controller ID: 0 Drive se	ecurity key destroyed		v
Displaying log from server				
🌆 Start 🛃 🛛			* 🖻 🖬 🤇	1:09 PM 4/15/2010

Figure 101. Check Drive Security Enabled status

10. Select Unconfigured Good drives and select Drive security method, here FDE to create the virtual drive.

<u> </u>) Web Console 2 - 6.71.0100 Go To Log Tools Help	- 8 ×
N. 34 .	Create Drive Group - Drive Group Settings)
Physical WIN	Intel® RAID Web Console 2	
	Create the drive group by specifying the RAID level and Drive security method. RAID level: RAID 1 Disk mirroring" suitable for high performance with the best data availability.	
	Drive security method: Full disk encryption (FDE) Data in the virtual dirves will be encrypted by the drive itself.	
	Select unconfigured drives: Drive Type Capar Image: Control of the state of	
	Create Drive Group Create Span	
385 384 383 Displayin	g log from server (E)xpand	•
Star		

Figure 102. Select Full Disk Encryption

11. Follow same steps for creating a RAID virtual drive. After a virtual drive is created, Selecting this virtual drive in left panel shows its **secured** status and **Drive security method** status in the **Drive Security Properties** part in the right panel. Log information at the bottom of the window also indicates the virtual drive security status. Full Disk Encryption feature has now been enabled.

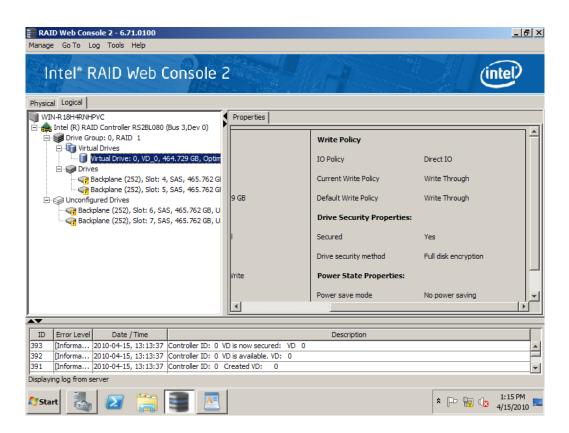


Figure 103. Create RAID Virtual Drive with FDE enabled

12. (Optional) For Self-Encrypting Drives (SEDs) that need to have their data permanently erased for security reason, follow normal steps to delete the secured RAID virtual drive, and mark all SEDs as Unconfigured Good physical drives. Then select one SED, right-click it and select **Instant Erase**.

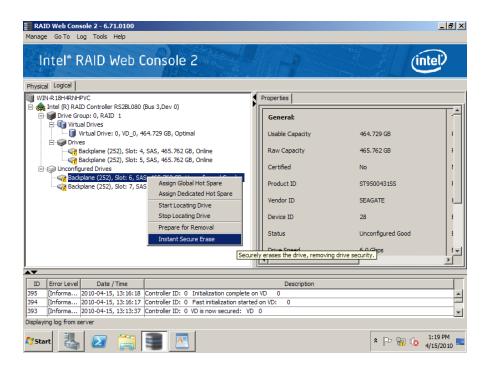


Figure 104. Instant Secure Erase

13. Accept confirmation to permanently erase disk drive.

RAID Web Console 2 - 6.71.0100 Manage Go To Log Tools Help	X
Intel* RAID Web Console 2	(intel)
Physical Logical	
WIN-R 18H4RNHPVC Properties	
Antel (R) RAID Controller R52BL080 (Bus 3,Dev 0) Solution of the second secon	
Virtual Drive Confirm Secure Erase	×I 9 GB F
Prives Gackplane (2 Gackpla	2 GB F
Are you sure you want to securely erase the drive in Enclosure 252, Slot 6?)431SS F
	TE [
Yes No	ìgured Good E
	Gbps E ♥
ID Error Level Date / Time Description	
395 [Informa 2010-04-15, 13:16:18 Controller ID: 0 Initialization complete on VD 0	
394 [Informa 2010-04-15, 13:16:17 Controller ID: 0 Fast initialization started on VD: 0	
393 [Informa 2010-04-15, 13:13:37 Controller ID: 0 VD is now secured: VD 0	•
Displaying log from server	
🎊 Start 🛃 🛛 🞇	♠ ♣ ♣ ♣ ♣ ♣ ♣ ♣ ♣ ♣ ♣ ♣ ♣ ♣ ♣ ♣ ♣ ♣ ♣ ♣

Figure 105. Confirm Secure Erase

Enabling Snapshot feature

This feature is supported by Intel[®] RAID RAID controller with Intel[®] RAID Premium Feature Key AXXRPFKSNSH or AXXRPFKSNSH2 installed. Refer to *Intel[®] RAID Premium Feature Key AXXRPFKSSD, AXXRPFKDE, and AXXRPFKSNSH Installation Guide* (E88588-00x), or *Intel[®] RAID Premium Feature Keys AXXRPFKSSD2, AXXRPFKDE2, and AXXRPFKSNSH2 Installation Guide* (G29824-00x) for physical installation of the Premium Feature Key.

The MegaRAID Recovery feature, also known as Snapshot, offers a simplified way to recover data and provides automatic protection for the boot volume. You can use MegaRAID Recovery to take a snapshot of a volume and to restore a volume or file.

Snapshot functionality allows users to capture data changes to the volume. If data is deleted accidentally or maliciously, you can restore the data from view or roll back to a snapshot at a previous Point in Time (PiT).

You can make up to 8 snapshots of Point in Times for each volume.

You can either restore files or roll back applications to a previous point in time.

Recovers lost data from disk in minutes, minimizing the downtime experienced by users and eliminating the lengthy process of restoring data from tape.

Allows isolation of a server's boot volume to a separate virtual drive; by enabling the Auto Snapshot feature, users are guaranteed that bootable snapshots exist, in case corruption of operating system occurs.

Note: MegaRAID Recovery Snapshots are not a substitute for a tested backup strategy. When Recovery Snapshot is enabled, changes to the selected volume are tracked. When a roll back to a snapshot at a previous Point in Time (PiT) is done, you are "undoing" changes to the volume that caused corruption or a file deletion. The first snapshot does not create a full volume backup. Recovery Snapshot is equivalent to Microsoft* System Restore with additional features and capabilities.

Detailed Configuration steps are as below:

- 1. Select the **Logical** view. Select and highlight a **virtual drive** from the list of virtual drives (If required, initialize, allocate and format the virtual drive).
- 2. Select Go To -> Virtual Drive -> Enable MegaRAID Recovery on the menu bar.

Manage Go To Log Tools Help				
Controller Drive Group Physical Drive BBU BBU Controller Control	sole 2			intel
Dashboard Physical Logica Enable MegaRAID Recovery WINI-CQ0TKHM59XZ Start Locating Virtual Drive Stop Locating Virtual Drive	roperties		Welcome: administrator	Log Off
Drive Group: 0, R/ Start Consistency Check	General:		Write Policy	
Virtual Drive(s Start Initialization Virtual Drive, o, to_o, zotoro do, opuno Virtual Drive, o, to_o, zotoro do, opuno Orives:	RAID Level	1	IO Policy	Direct IO
 Badqplane (252), Slot: 0, SSD (SATA), 29. Badqplane (252), Slot: 1, SSD (SATA), 29. 	Name	VD_0	Current Write Policy	Write Through
E Solution Drive Group: 1, RAID 1	Size	28.870 GB	Default Write Policy	Write Back with BBU
 Wirtual Drive(s): Wirtual Drive: 1, VD_1, 28.870 GB, Optima 	Stripe Size	256 KB	Reason for difference in Write Policy	BBU is not installed
⊡	Virtual Disk State	Optimal	Drive Security Properties:	
Backplane (252), Slot: 3, SSD (SATA), 29.	IO and Cache Policies		Secured	No
	Access Policy	Read Write	Power State Properties:	
	Disk Cache Policy	Disable	Power save mode	No power saving
	Read Policy	Always Read Ahead		

Figure 106. Enable MegaRAID Recovery

- 3. On the Enable MegaRAID Recovery Wizard screen, select the virtual drive to use as the Snapshot Repository in the **Snapshot Repository** field. (You can leave the suggested virtual drive as the Snapshot Repository.)
- 4. Enter the capacity to use in the Snapshot Repository for changes to the base virtual drive. The available capacity is the largest free block of capacity on the snapshot repository virtual drive.

Enable MegaRAID Recovery
Intel [®] RAID Web Console 2
Virtual Drive: 0, VD_0, 28.870 GB, Optimal
This base virtual drive will have an associated snapshot repository virtual drive where the snapshot-related data will be stored. Use the suggested snapshot repository or change it if needed. Then determine the capacity to set aside in the snapshot repository for changes to the base virtual drive. The available capacity is the largest free block of capacity on the snapshot repository virtual drive.
Snapshot Repository:
Virtual Drive: 1, VD_1, 28.870 GB, Optimal 💌
Available capacity:28.861 GB
Select Capacity:
28.8(
Take snapshot on reboot
Selecting this option will take a snapshot of the VD on boot after every successful shutdown. This feature is mainly intended to take snapshot of boot VDs to allow restoring the OS on the VD in case of corruption. Before selecting take snapshot on reboot on the VD, please ensure that you have copied all data to the VD
OK Cancel

Figure 107. Enter the Capacity for Snapshot Respository

- 5. Choose whether to have a snapshot taken on reboot. To enable this option, check the box next to the **Take snapshot on reboot** field. If you select this option, a snapshot is taken on boot after every successful shutdown. You can use this snapshot of the boot virtual drive to restore the operating system on the virtual drive in case the virtual drive becomes corrupted.
 - *Caution:* Before you select this option, make sure that you backup all data to the virtual drive. If there is any existing data on this virtual drive, it will be lost after converting to the Snapshot repository.
- 6. Click OK.
- 7. A confirmation dialog box appears. Check the box next to the Confirm field to enable snapshots on the selected virtual drive and then click **Yes**.

Confirm	Enable Snapshots			
	Once you enable snapshots on this virtual drive, you cannot change the allocated capacity percentage or the snapshot repository without first disabling snapshots and losing any snapshot data.			
	Virtual Drive: 1 VD_1 will become a snapshot repository. It should now only be used for storing snapshot-related data. If there is any existing data on Virtual Drive: 1 VD_1 it will be lost.			
	Are you sure you want to enable snapshots on Virtual Drive: 0 VD_0 ?			
	Confirm Yes No			

Figure 108. Confirm Enable Snapshot

- 8. This virtual drive becomes a snapshot repository. Use it only for storing snapshot-related data.
 - *Caution:* After you enable snapshots on this virtual drive, you cannot change the allocated percentage of capacity or the snapshot repository without first disabling snapshots and losing any snapshot data.
 - *Note:* With the current generation of the MegaRAID Recovery product there is no guidance on the size of the repository other than saying that it is completely dependent on the amount of data being written and the frequency of snapshots being taken. This is different in every application. Currently a customer will have to use empirical data on the behavior of their application to estimate this. If the repository runs out of space they will have to delete the oldest snapshot. Then at some time when it is appropriate they will have to disable the feature and reenable it, re-sizing the repository.

The existing snapshots are lost when the feature is disabled. Repository virtual drives will be lost if you disable snapshots.

In future development, users will be able to grow the size of the repository dynamically, without losing snapshots.

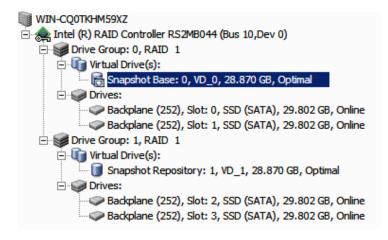


Figure 109. Snapshot Base is shown

- 9. Following steps create Snapshots and Views, based on above configurations for Snapshot Base and Snapshot Repository.
 - *Note:* You can create up to eight snapshots of a volume. snapshots are showed in chronological order from the oldest to the newest. Each snapshot is a PiT snapshot of the virtual drive that is the Snapshot Base

The snapshots appear on the timeline from the oldest on the left to the newest on the right. If you create the maximum number of snapshots allowed, eight, the **Create Snapshot** button is disabled. You cannot create an additional snapshot unless you delete a snapshot.

After you create the snapshots, you can create views of the PiT snapshots. You can search the views to find a snapshot that does not contain corrupt data or a snapshot that contains deleted data, depending on the situation. You can reboot and roll back to that snapshot to restore the data.

10. Click the **Logical** view on the main menu screen. Click the **Snapshot Base** virtual drive in the left frame. Click the **Snapshots** tab in the right frame.

Intel [®] RAID V	Web Console 2	A A		(intel)
Dashboard Physical Logical	Properties Snapshots		Welcome: administrator	Log (
Intel (R) RAID Controller RS2MB0 Trive Group: 0, RAID 1 Wirkual Onver(s): Drives: Badqlane (252), Slot Drives: Drive Group: 1, RAID 1 Strapshot Base: 0, VG Drives: Drive		Snapshot Base Details Associated Repository: Snapshot State Capacity Left Snapshot on Reboot Auto Deletion of oldest Snapshot OS disk name	Snapshot Repository: 1, VD_1 Operational 28.572 GB Enabled Disabled Disk 1	

Figure 110. Enter Snapshot Name

11. Enter the snapshot name in the Enter snapshot name field. Click Create Snapshot.

12. Repeat above step so that additional snapshots can be created. The snapshot you create appears in the snapshot timeline. The oldest snapshot is on the left end of the timeline.

Deathboard Physical Logical Witk-CQUIKM45952 Properties Snapshots Snapshot Base Details Associated Repository: Snapshot Base Dotails Snapshot Repository: Snapshot Repository: Note: This will create a snapshot in the snapshot Badghare (252), Solt: 0, SD (SATA), 29. Snapshot Repository: Note: This will create a snapshot in the snapshot Snapshot Repository: Snapshot Repository: Note: This will create a snapshot in the snapshot Snapshot Repository: I, AUD 1 Snapshot Repository: Note: This will create a snapshot in the snapshot Snapshot an Reboot Deabled Snapshot Repository: I, ND_1, 28.870 (SATA), 29. Snapshot snapshot Deabled Snapshot State Operational Snapshot State Operation of oldest Snapshot Deabled Auto Delebied Snapshot State Operational Snapshot Repository: I, ND_1, 28.870 (SATA), 29. Snapshot State Operational Snapshot Repository: Snapshot State Or 1 Snapshot Repository: I, ND_1, 28.870 (SATA), 29. Snapshot Repository: No Snapshot Repository: Snapshot Repository: Snapshot Repository: No Snapshot Repository: I, ND_1, 28.870 (SATA), 29. Snapshot Repository: Snapshot Repository: Snapshot Repository: Snapshot Repository: Snapshot Repo	Intel [®] RAID Web Cor	ns	ole 2		H			in	tel
Intel (R) RAD Controller R52/48044 (Bus 10,Dev 0) Create Snapshot Drive Group: 0, RAD 1 Create Snapshot Issee: 0, ND 0, 28.970 (GS, CR) Drive Group: 1, RAD 1 Drive: Drive: Drive: Drive: Drive: Badplane (252), Solt: 3, SSD (SATA), 29. Oldest Drive: Drive: Drive: Badplane (252), Solt: 3, SSD (SATA), 29. Oldest Drive: Drive: Snapshot Repository: Snapshot Repository:	Dashboard Physical Logical						Welcome: ad	ministrator	Log C
Clease Shapshot Provest Snapshot Repository: 1, VD_1 Backplane (252), Sol: 0, SSD (SATA), 25. Backplane (252), Sol: 1, SSD (SATA), 25. Mote: This will create a mapshot in the maximum supported count, Create Snapshot Create Snapshot Wrutal Drive(s): Snapshot Repository: 1, VD_1, 28.870 GS. Mote: This will create a mapshot in the maximum supported count, Create snapshot Create Snapshot Snapshot Snapshot Repository: 1, VD_1 Snapshot Repository: 1, VD_1, 28.870 GS. Snapshot Repository: 1, VD_1, 28.870 GS. Snapshot Repository: 1, VD_1 Snapshot Repository: 1, VD_1 Snapshot Repository: 1, VD_1, 28.870 GS. Snapshot Repository: 1, VD_1, 28.870 GS. Snapshot Repository: 1, VD_1 Snapshot Repository: 1, VD_1 Snapshot Repository: 1, VD_1, 28.870 GS. Snapshot Repository: 1, VD_1, 28.870 GS. Snapshot Repository: 1, VD_1 Snapshot Repository: 1, VD_1 Snapshot Repository: 1, VD_1, 28.870 GS. Snapshot Repository: 1, VD_1, 28.870 GS. Snapshot Repository: 1, VD_1 Snapshot Repository: 1, VD_1 Snapshot Repository: 1, VD_1, 28.870 GS. Snapshot Repository: 1, VD_1, 28.870 GS. Snapshot Repository: 1, VD_1 Snapshot Repository: 1, VD_1 Snapshot Repository: 1, VD_1, 28.870 GS. Snapshot Repository: 1, VD_1 Snapshot Repository: 1, VD_1 Snapshot Repository: 1, VD_1 Snapshot Repository: 1, VD_1 Oldest<		Prop	perties Snapshots						
First snapshot Resceiptory: Snapshot Re		C	Create Snapshot						
Create Snapphot Create Snapphot Backplane (252), Sobt 1, SSD (SATA), 29. Note: This will create a napphot in the snapphot in th	🖃 👣 Virtual Drive(s):		Enter snapshot name:				itory:		y: 1, VD_1
Backplane (252), Sot: 0, SSD (SATA), 29. Backplane (252), Sot: 1, SSD (SATA), 29. Backplane (252), Sot: 1, SSD (SATA), 29. Withuid Dive(s): Snapshot Repository: 1, VD_1, 28.870 GE Backplane (252), Sot: 2, SSD (SATA), 29. Backplane (252), Sot: 3, SSD (SATA), 29. Oldest Image: Interview of the stapshot Int				Create Snap	shot 1				
Worker in the wind tested a stagator. Auto Deletion of oldest Snapshot. Deletion of oldest Snapshot. Deletion of oldest Snapshot. Deletion of oldest Snapshot. Deletion of oldest Snapshot. Deletion of oldest Snapshot. Disk 1 Snapshot Repository: 1, VD_1, 28.870 ct; Snapshot Repository: 1, VD_1, 28.870 ct; Deletion of oldest Snapshot. Disk 1 Snapshot Repository: 2, SDS (SATA), 29. Snapshot Snapshot. Deletion of oldest Snapshot. Disk 1 Snapshot Repository: 1, VD_1, 28.870 ct; Snapshot. Deletion (252), Slot: 2, SSD (SATA), 29. Snapshot. Oldest I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I							ot		
Snapshot Repository: 1, VD_1, 28.870 G OS disk name Disk 1 Snapshot Repository: 1, VD_1, 28.870 G Snapshot Repository: 1, VD_1, 28.870 G Snapshot Repository: 1, VD_1, 28.870 G Badqlane (252), Slot: 2, SSD (SATA), 29. Snapshot Repository: 1, VD_1, 28.870 G T Didest I I I I I								Disabled	
Snapshots time line Drives: Badplane (252), Sobt 2, SSD (SATA), 29. Badplane (252), Sobt 3, SSD (SATA), 29. Snapshots time line 7:March, 31, 2010:15:21:16 Oldest U U Delete Snapshot Create View Delete View Snapshot Details Nome 7 Time of creation 15:21:16 Status Optimal State Normal			count, Create snapshot b	outton will be disabled.		OS disk name		Disk 1	
Bedglane (252), Slot: 2, SSD (SATA), 29. Bedglane (252), Slot: 3, SSD (SATA), 29. Oldest I 2 3 4 5 6 7 Delete Snapshot SnapShot Details Note: Only oldest anapshot Information can be deleted Name 7 Time of creation 15:21:16 Status Optimal State Normal	Snapshot Repository: 1, VD_1, 28.870 GE		nanchote time line						
Badoplane (252), Slot: 3, SSD (SATA), 29. Oldest Oldest Oldest Oldest Oldest Oreate View Delete View Delete View Delete View SnapShot Details Nome 7 Time of creation 15:21:16 Status Optimal State Normal									
1 1			7:March, 51, 2010;15:21:	10					Si
0 1 2 3 4 5 6 7 Delete Snapshot Create View Delete View Snapshot Details Note: Only didest snapshot information can be deleted Name 7 Time of creation 15:21:16 Status Optimal State Normal			Oldest						La
0 1 2 3 4 5 6 7 Delete Snapshot Create View Delete View Snapshot Details Note: Only didest snapshot information can be deleted Name 7 Time of creation 15:21:16 Status Optimal State Normal									J
SnapShot Details Note: Only oldest snapshot information can be deleted Name 7 Time of creation 15:21:16 Status Optimal State Normal) 1		1 3	1	5	6	7
SnapShot Details Note: Only oldest snapshot information can be deleted Name 7 Time of creation 15:21:16 Status Optimal State Normal			Delete Spanshot	Create View	Delete	View			
Note: Only oldest snapshot information can be deleted Name 7 Time of creation 15:21:16 Status Optimal State Normal					Durin				
information can be deleted Name 7 Time of creation 15:21:16 Status Optimal State Normal			SnapShot Details						
Time of creation 15:21:16 Status Optimal State Normal									
Status Optimal State Normal			Name	7					
State Normal			Time of creation	15:21:16					
State Normal			Status	Optimal					
			State	Normal					
			Canacity used	0 Bytes					
			separty used	,				[►

Figure 111. Create Snapshot

13. (Assuming you experience a file deletion or corruption, following steps create MegaRAID Recovery Views based on snapshots created previously, and can roll back snapshots.) Click the **Logical** view on the main menu screen. Click the **Snapshot Base** virtual drive in the left frame. Click the **Snapshots** tab in the right frame (This screen shows the Snapshot Base details and any existing snapshots). Click **Create View**.

Create View	×
Intel® RAID Web Console 2	(intel)
Determine the capacity to set aside in the snapshot by specifying a p the base virtual drive capacity.	ercentage of
Enter View name:	
Available Capacity: 18.861 GB	
Select Capacity:	
OK Cancel	

Figure 112. Create View

14. Enter the name of the view in the **Enter View name** field and the capacity to set aside in the snapshot. Click **OK**.

- *Note:* The "View name" can be found in the snapshots screen view in the View Details information box after a snapshot has been created
- 15. Enter into "My computer", and then you can see a new drive.
- 16. Copy the files in the new drive to the original drive and cover them. Now the system rolls back to the selected PiT.
- 17. Following steps delete and clear snapshots.

Note: When deleting single snapshots, you can only delete the oldest snapshot.

18. Follow these steps to delete a single snapshot:

Click the **Logical** view on the main menu screen; Click the **Snapshot Base** virtual drive in the left frame; Click the **Snapshots** tab in the right frame; Click the oldest snapshot in the timeline; Click the **Delete Snapshot** button.

19. Follow these steps to clear (delete) all snapshots:

Click the **Logical** view on the main menu screen; Click to select the **Snapshot Base** virtual drive in the left frame; Click **Go To** -> **Virtual Drive** -> **Clear Snapshots** on the menu bar (Or right click the Snapshot Base Virtual Drive and click Clear Snapshots); A confirmation dialog box appears. It warns that any snapshot-related data that is on the associated Snapshot Repository virtual drives will be lost if you clear the snapshots; Check the box next to the **Confirm** field and click **Yes** and the snapshots will be cleared.

20. Follow these steps to Set MegaRAID Recovery Properties:

Click the **Logical** view on the main menu screen; Click the **Snapshot Base** virtual drive in the left frame; Click **Go To** -> **Virtual Drive** -> **Set MegaRAID Recovery Properties** on the menu bar; Check the box to the properties selections you desire and click **OK**.

Set MegaRAID Recovery Properties	×
Intel [®] RAID Web Console 2	(intel)
Snapshot Base: 0, VD_0, 28.870 GB, Optimal	
Sets the Snapshot Properties	
✓ Take snapshot on reboot	
Selecting this option will take a snapshot of the VD on boot after every successful shutdown. This feature is take snapshot of boot VDs to allow restoring the OS on the VD in case of corruption. Before selecting take s on the VD, please ensure that you have copied all data to the VD	
✓ Enable auto deletion of snapshot	
Selecting this option would enable auto deletion of old snapshots and allows to create a new snapshots.	
OK Cancel	

Figure 113. Set MegaRAID Recovery Properties

21. Follow these steps to Disable MegaRAID Recovery:

Click the **Logical** view on the main menu screen; Click the **Snapshot Base** virtual drive in the left frame; Click **Go To** -> **Virtual Drive** -> **Disable MegaRAID Recovery** on the menu bar.

Manage	Go To Log Tools	Help									
	Controller 🕨	000									
1575	Drive Group Physical Drive		-		Desig Quarte						
	Virtual Drive 🕨	Rename Virtual Drive		e	: 2						(intel)
A LA	BBU 🕨	Set Virtual Drive Properties									
		Disable MegaRAID Recovery				51596Z J // 40 ⁴⁴			Welcome: adm	inistrator	Log
Dashboar	d Physical Logical	Set MegaRAID Recovery Prop	ertie	s hS					The come to dan		<u></u>
r	CQ0TKHM59XZ -	Clear Snapshots			Snapshots						
	itel (R) RAID Control	Start Locating Virtual Drive		Ē		apshot in the snapshot		Snapshot on Rebo	ot	Disabled	
	Drive Group: 0, R/	Stop Locating Virtual Drive		lin	ne. Once it is reache	d the maximum support		Auto Deletion of o	ldest Snapshot	Enabled	
	Virtual Drive(s	Start Consistency Check		ht,	Create snapshot b	utton will be disabled.		OS disk name		Disk 1	
	- Shapshot Ba	ase: v, vu_v, 20.070 GD, Opu									
		252), Slot: 0, SSD (SATA), 29.	Ιſ	· ·	ots time line						
		252), Slot: 1, SSD (SATA), 29.		8:Marc	ch,31,2010:15:26:3	0					
	Drive Group: 1, RAI										
		epository: 1, VD_1, 28.870 GE		Oldest	:						
Ē	Drives:				1	1	1	1	1	1	
		252), Slot: 2, SSD (SATA), 29.		0	1	2	3	4	5	6	7
	Backplane (252), Slot: 3, SSD (SATA), 29.		De	lete Snapshot	Create View	Delete Vie	ew			

Figure 114. Disable MegaRAID Recovery

22. A confirmation dialog box appears. It warns that any snapshot-related data that is on the associated Snapshot Repository virtual drives will be lost if you disable snapshots; Check the box next to the **Confirm** field and click **Yes**. The snapshots are disabled.

Confirm	Disable Snapshots			×	
<u>^</u>	If you disable snapshots on this virtual drive, you will lose any snapshot-related data that is currently stored on its associated snapshot repository and you will not be able to create any new snapshots.				
	Are you sure you want t	to disable snapshot	s on Virtual Dr	ive: 0 VD_0 ?	
	Confirm	Yes	No		

Figure 115. Confirm Disable Snapshots

- 23. After snapshots are successfully created (in step 12, Figure 111), following steps roll back to a snapshot at a previous Point in Time (PiT).
 - *Note:* If the operating system is installed on a Snapshot Base, and snapshots are created for it and stored in Snapshot Repository, the rolling back steps can help recover the operating system into a previous status.
- 24. Reboot the server system and press <**Ctrl**> + <**G**> to start the RAID BIOS Console 2 Utility. When you see the screen below, press **Start**.

Adapter Selection					
Adapter No.	Bus No.	Device No.	Туре	Firmware Version	
0. 💿	3	0	Intel (R) RAID Controller RS2BL080DE	2.70.03-0862	
(<u>Start</u>)					

Figure 116. Adapter Selection

25. In the home page, from the **Logical View** in the right panel, click the **Snapshot Base** which has the operating system installed.

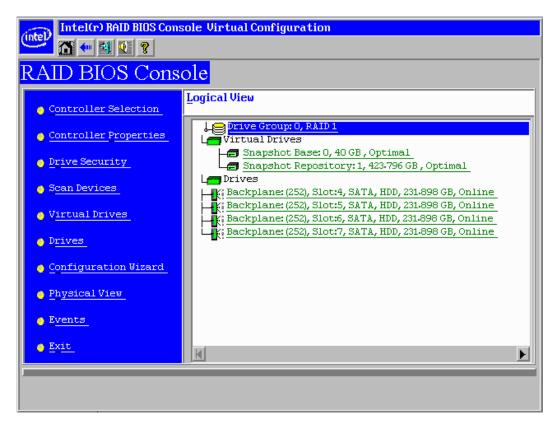


Figure 117. Selecting Snapshot Base

26. In the new screen, select **Adv Opers** (which means Advanced Operations), and click **Go**.

Intel(r) RAI	ID BIOS Console Virtual Drive 0	
(intel ² 🔂 🛨 🚮	¥ ?	
Properties		
RAID Level: 1	Status: Optimal	Strip Size: 256 KB
Capacity: 40 GB	Secured: No	Snapshot Settings
Policies		
Access RW	▼ Read Adaptive	👿 🇟 Disk Cache 🛛 NoChange 🔽
I/O Direct	▼ Disable BGI No ▼	
Defa <u>u</u> lt Write:	Always Write Back 🛛 🗸 Current Wr	ite: Write Back
		🖡 Cha <u>n</u> ge
Operations		
C Locate		
o ⊆⊂	O Ady Opers O Disable MegaRAI	D Recovery O Show Snapshots
	Go	
A Home		the Back

Figure 118. Selecting Advanced Operations

27. In the Advanced Operations screen, select Rollback.

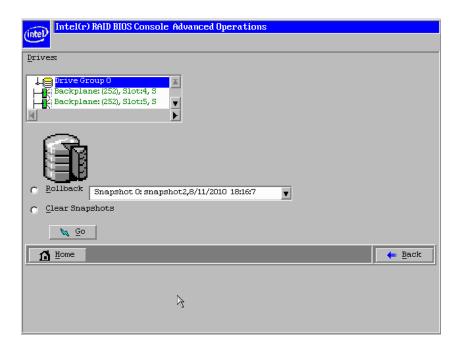


Figure 119. Selecting Rollback

28. From the drop-down menu, select a previous created snapshot, and then click Go.

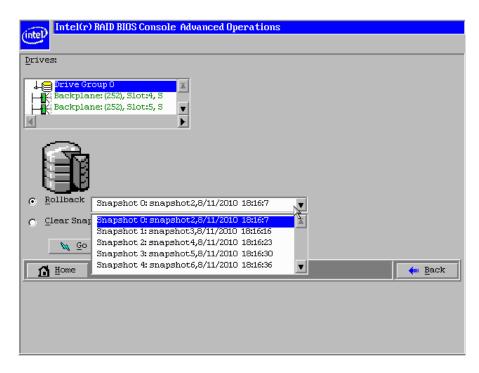


Figure 120. Selecting a snapshot

29. A Confirm Page should appear. Please read carefully the warning message. "You have chosen to restore a previous snapshot time line. Doing so will rollback to the snapshot to its state at the date and time you selected. You may lose any changes you have made subsequent to that date and time. Are you sure you want to restore snapshot <snapshot name> <date> <time>?". When confirmed, click Yes.

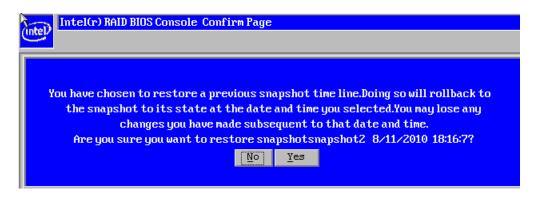


Figure 121. Confirm Page

30. The screen should go back to the display below. Click Home to go back to home page. Then exit the RAID BIOS Console 2 Utility and reboot the server system. You should be able to enter the operating system into a selected previous status.

Intel(r) RAID BIOS Console Advanced Operations	
(intel)	
Drives:	
Drive Group 0	
Clear Snapshots	
N Go	
1 Home	<u>B</u> ack

Figure 122. Rollback operation is done

Enabling Super Sized Cache

This feature is supported by Intel[®] RAID Premium Feature Key AXXRPFKSSD or AXXRPFKSSD2 installed. Refer to *Intel[®] RAID Premium Feature Key AXXRPFKSSD, AXXRPFKDE, and AXXRPFKSNSH Installation Guide* (E88588-00x), or *Intel[®] RAID Premium Feature Keys AXXRPFKSSD2, AXXRPFKDE2, and AXXRPFKSNSH2 Installation Guide* (G29824-00x) for physical installation of the Premium Feature Key.

Super Size Cache (SSC) using Solid State Devices (SSD) as controller cache allows for very large data sets to be present in that cache to improve overall application performance. SSC anticipate up to a five times performance improvement in READ-intensive applications and provide maximum IOPs.

This solution is ideal for cost sensitive server environments, by offering a high-performance upgrade that requires only a small investment in SSD technology. This solution also reduces the need to invest expensive IT cycles to hand-tune applications running on hard drive-only disk arrays.

Detailed Configuration steps are as below:

1. Select the **Dashboard** view. Click **Create super sized cache (SSC)** in the **Actions** tab; Or right click the **RAID Controller** and select **Create SSCD** (Super Sized Cache Drive).

Intel [®] R	AID Web Con	sole 2		(intel)
Dashboard Physical Logic	al D Controller RS2MB044 (Bus 10,Dev	0)		Welcome: administrator Log C
Properties		Usage		Background Operations
A Status:	📀 Optimal			Virtual drive operations in progress: 0
i Endosures:	0	25%	Total capacity:	
III Backplanes:	1		115.480 GB	
⊘ Drives:	4		Configured Capacity: 28.870 GB	Drive operations in progress: 0
Drive groups:	1		Unconfigured Capacity: 86.610 GB	
Virtual Drive(s):	1	75%	₩ 86.610 GB	
View server profile				More details
Features		Actions		Help
🗊 Alarm:	Enabled	Create virtual drive		How to use MSM?
MegaRAID RECOVERY	Enabled	Create super sized ca	ache (SSC)	How to create virtual drive?
Super sized cache:	Enabled	Load configuration		How to enable premium feature?
Drive security:	Disabled	Update firmware		Glossary
Unconfigured good spin	down: Disabled	Silence alarm		

Figure 123. Create SSC from Dashboard

2. The Create Super Sized Cache Drive group screen appears. Select the unconfigured SSD drive. Click Add > -> Create SSC Drive Group -> Next.

Create Super Sized Cache	Drive group			×
Intel [®] RAID Web	Console 2			(intel)
Select unconfigured SSD drives	5:		SSC Drive groups:	
Drive	Type Capacity		Intel (R) RAID Controller RS2	MB044 (Bus 10,De
Backplane (252), Slot: 0			SSC Drive Group0	
Backplane (252), Slot: 1				
Backplane (252), Slot: 2 Backplane (252), Slot: 3				
4		Add > < Remove	4	
			Create SSC Drive Gr	roup ext Help

Figure 124. Create SSC Drive Group

3. The **Create Super Sized Cache Drive** screen appears. Click **Create** to create a SSC drive group. Click **Next**.

Create Super Sized Cache Drive	X
Intel [®] RAID Web Console 2	inter
Specify parameters for the new SSCD.	SSC Drive groups:
	Intel (R) RAID Controller RS2MB044 (Bus 10 SSC Drive Group0: Available Capacity28
SSCD name: SSCD_0	
Capacity: 28.87 - Units: GB -	
	◀
	Create
	Cancel Back Next Help

Figure 125. Create SSCD name

4. Create Super Sized Cache screen appears. Click **Finish** to confirm the information and create the Super Sized Cache Disk (SSCD).

Intel [®] RAID Web Console a	2 (intel)
Review the summary and go back if you need to mak	ce corrections. The SSCD(s) will be created when you click finish.
Summary:	
SSC Drive group name:	Drive Group0
Number of drives used:	1
Total capacity:	28.870 GB
Free capacity:	0 Bytes
SSCD 1 name:	SSCD_0
Capacity:	28.870 GB
	Cancel Back Finish He

Figure 126. SSC Summary

5. You can see Super Sized Cache Drive Group in the logical view.

Intel [®] RAID Web Con	sole 2		(intel)
Dashboard Physical Logical		Welco	ne: administrator Log Off
WIN-CQ0TKHM59XZ	Properties		
Kntel (R) RAID Controller RS2MB044 (Bus 10,Dev 0) Super Sized Cache Drive Group: 0 SCD: 0, SSCD 0, 28.870 GB, Optimal	General:		
Drives: Backplane (252), Slot: 0, SSD (SATA), 29.	SSCD Name	SSCD_0	
Goldpaint (222), Side 0, SSD (SATA), 23. Goldpaint (222), Side 0, SSD (SATA), 29.802 Goldpaint (222), Side 0, SSD (SATA), 29.802	Size	28.870 GB	
 Backplane (252), Slot: 1, SD (SATA), 29.802 Backplane (252), Slot: 2, SSD (SATA), 29.802 Backplane (252), Slot: 3, SSD (SATA), 29.802 			

Figure 127. SSCD status shown

6. Following steps delete a Super Sized Cache disk:

Click the **Logical** view tab on the main menu screen; Click the **SSCD virtual drive** in the left frame; Click **Go To** -> **Virtual Drive** -> **Delete Virtual Drive** on the menu bar.

Manage (Go To Log Tools	Help				
	Controller 🕨					
ive all	Drive Group 🕨					and the second s
1000	Physical Drive 🕨		AND STATISTICS			
	Virtual Drive 🕨	Rename Virtual Drive	sole 2			(Intel)
	BBU 🕨	Delete Virtual Drive	Artiface State			
The Second Second		Start Locating Virtual Drive	Deletes the specified virtual disk		Welcome: administrator	Log Off
Dashboard	Physical Logica	Stop Locating Virtual Drive			welcome, aunimistrator	Log On
	Q0TKHM59XZ	<u> </u>	Properties			
		er RS2MB044 (Bus 10,Dev 0)				
	Super Sized Cache I	Drive Group: 0 0, 28.870 GB, Optimal	General:			
	Drives:	_0, 20.070 00, Opunda	SSCD Name	SSCD 0		
	Backplane ((252), Slot: 0, SSD (SATA), 29.		<u>-</u>		
	Unconfigured Drive		Size	28.870 GB		
Backplane (252), Slot: 1, SSD (SATA), 29.802						
Backplane (252), Slot: 2, SSD (SATA), 29.802 Backplane (252), Slot: 3, SSD (SATA), 29.802						
	Dauxplane (252)	J, SIUC 3, SSD (SATA), 29.802				

Figure 128. Delete SSCD

7. A confirmation dialog box appears. Check the box next to the **Confirm** field and click **Yes**. The SSCD is deleted.

Appendix A: Creating a Virtual Drive Using Advanced Configuration

The advanced configuration procedure provides an easy way to create a new storage configuration. Advanced configuration gives you greater flexibility than simple configuration because you can select the drives and the virtual drive parameters when you create a virtual drive. In addition, you can use the advanced configuration procedure to create spanned drive groups.

Note: Depending on different versions of utility, the steps in screenshots may change, and below sections are for reference purpose.

Follow these steps to create a new storage configuration in the advanced configuration mode. In this example, we will create a spanned drive group.

- 1. Perform either of the following steps:
 - Right click on the controller node in the device tree in the left frame of the Intel[®] RAID Web Console 2 window and select Create Virtual Drive
 - Select the controller node and select Operations->Create Virtual Drive in the menu bar, as shown in Figure 129

ile Op	perations Group Operations Log Tools H	elp						
jerv hys	Disable Alarm Sfence Alarm Start Patrol Rgad Change Drive Security Create Virtual Drive	Con	sole 2		Ú.	tel		
i C	Scan For Foreign Configuration		Properties Operations					
⊜⊶∢ ⊨−₁	Manage Preserved Cache 80 (Bus 11)		General:		Firmware Build Time	Jun 2:		
	Slot: 0, SATA, 232.886 GB, Unconfigure Slot: 1, SATA, 232.886 GB, Unconfigure	ed Goc	Product Name	Intel Server RAID Controller RS2BL080	Backend SAS Address 0	0×4433		
	Slot: 2, SATA, 232.886 GB, Unconfigure Slot: 3, SATA, 232.886 GB, Unconfigure	ed Goc	Serial No	SR91700301	Backend SAS Address 1	0×5000		
	Slot: 4, SATA, 232.886 GB, Unconfigure		Vendor ID	0×1000	Backend SAS Address 2	0×4433		
P-I	SCAH5BPM1 (18), Connector: Port 4 - 7 Slot: 0, SATA, 232.886 GB, Unconfigure	ed Goc	SubVendor ID	0×8086	Backend SAS Address 3	0×4433		
	Slot: 1, SATA, 232,886 GB, Unconfigure Slot: 2, SATA, 232,886 GB, Unconfigure		Device ID	0x79	Backend SAS Address 4	0x4433		
	Slot: 4, SATA, 232.886 GB, Unconfigure Battery Backup Unit	ed Goc	Device Port Count	8	Backend SAS Address 5	0x4433		
	,,		Host Interface	PCIE	Backend SAS Address 6	0×4433		
			Host Port Count	0	Backend SAS Address 7	0×0		
			FRU		Correctable ErrorCount	0		
			Alarm Present	Yes	Memory uncorrectable count	0		
			Alarm Enabled	Yes	Cluster Enable	No		
			4			F		
•								
ID	Error Level Date / Time			Description				
512	[Information 2009-06-23, 17:25:42		er ID: 0 Unexpected sense: PD	= Port 4 - 7:1:4 - Low power condition on, CDB				
511	[Information 2009-06-23, 17:25:42		er ID: 0 Unexpected sense: PD	= Port 4 - 7:1:2 - Low power condition on, CDB				
510	[Information 2009-06-23, 17:25:42		er ID: 0 Unexpected sense: PD	= Port 4 - 7:1:1 - Low power condition on, CDB				
509	[Information 2009-06-23, 17:25:42		er ID: 0 Unexpected sense: PD	= Port 4 - 7:1:0 - Low power condition on, CDB				
508	[Information 2009-06-23, 17:25:42		er ID: 0 Unexpected sense: PD	=:-:5 - Low power condition on, CDB = 0x		Sense =		
507	[Information 2009-06-23, 17:25:42		er ID: 0 Unexpected sense: PD	=::4 - Low power condition on, CDB = 0x strator, Client: 10.239.56.198, Access Mode: Fu		Sense =		
506 505	[Information 2009-06-23, 17:23:38 [Information 2009-06-23, 17:22:55			ver on: Time 2009-06-23.17:23:04 176 Secon				

Figure 129. Virtual Drive Creation Menu

The dialog box shown in Figure 130 appears.

RAID Web Console 2 - 3.0 File Operations Group Operat	
Servers	Par Tene Tele
Intel [®] RA	Web Console 2
Ereate Virtual Drive - Choo	mode
Intel [®] RA	Web Console 2
	This wizard will help you quickly create virtual drives.
	Choose how to create the virtual drive:
	C Simple Specify a limited number of settings and have the system pick drives for you. This is the easiest way to create a virtual drive.
	r <u>advanced</u> Choose additional settings and customize virtual drive creation. This option provides greater flexibility when creating virtual drives for your specific requirements.
	Cancel Next > Help
2599 [Information 2009-0	
2598 [Information 2009-0	
2597 [Information 2009-0	
2596 [Information 2009-0	
2595 [Information 2009-0	
2594 [Information 2009-0	
2593 [Information 2009-0 2592 [Information 2009-0	
Displaying log from server	, 17 mag Controller 10 of anticipation complete on VD o

Figure 130. Virtual Drive Creation Mode

2. Click Advanced and press Next.

The Create Drive Group Settings screen appears, as shown in Figure 131.

RAID Web Console 2 - 3.04.0500 Fle Operations group Operations Log Tools Help	_8×
Servers	
Intel® RAID Web Console 2	(intel)
Create Drive Group - Drive Group Settings	×
Intel® RAID Web Console 2	(intel)
Create the drive group by specifying the RAID level and Drive security method.	
RAID level: RAID 50 — Spanned drive group	
Drive security will make the virtual drive secure by applying encryption logic to underlying data in the drive.	
Select ynconfigured drives: Drive Type Capa Backplane (21), Slot: 0 SATA 232.84 Backplane (21), Slot: 3 SATA 232.84 Backplane (21), Slot: 3 SATA 232.84 Capacity State (21), Slot: 3 SATA 232.84	
<u>C</u> reate Drive Group Create Span	
Cancel <back< td=""><td>Next > Help</td></back<>	Next > Help
2599 [Information 2009-06-23, 18:00:55 [Controller ID: 0 Time established since power on: Time 2009-06-23, 18:00:55 2456 Seconds	
2598 [Information 2009-06-23, 17:47:50 Controller ID: 0 State change: PD =:-:3 Previous = Online Current = Unconfigured Good	
2597 [Information 2009-06-23, 17:47:50 Controller ID: 0 State change: PD =::1 Previous = Online Current = Unconfigured Good	
2596 [Information 2009-06-23, 17:47:50 Controller ID: 0 State change: PD =::0 Previous = Online Current = Unconfigured Good	
2595 [Information 2009-06-23, 17:47:50 Controller ID: 0 State change: PD =:-:2 Previous = Online Current = Unconfigured Good	
2594 [Information 2009-06-23, 17:47:50 Controller ID: 0 Configuration cleared	
2593 [Information 2009-06-23, 17:47:38 Controller ID: 0 Initialization complete on VD 1	
2592 [Information 2009-06-23, 17:47:38 Controller ID: 0 Initialization complete on VD 0	v
Displaying log from server	

Figure 131. Create Drive Group Settings Screen

- 3. Select the following items on the Create Drive Group Settings screen:
 - a. Select the RAID level desired for the drive group from the drop-down menu. To make a spanned drive, select **RAID 10**, **RAID 50**, or **RAID 60** in the **RAID level** field.

Drive Group 0 and **Span 0** appear in the **Drive groups** field when you select RAID 10, 50, or 60.

The RAID controller supports RAID levels 1, 5, 6, 10, 50, and 60. In addition, it supports independent drives (configured as RAID 0 and RAID 00). The screen text gives a brief description of the RAID level you select. RAID levels you can choose depend on the number of drives available. To learn more about RAID levels, see Chapter 2, "RAID Levels" on page 9.

b. Select unconfigured drives from the list of drives and click Add> to add them to the drive group.

The selected drives appear under **Span 0** below **Drive Group 0**, as shown in Figure 132

_	Web Console 2 - 3.04.0500 المحافظ
Servers	and a set of the set o
	ntel® RAID Web Console 2
Creat	e Drive Group - Drive Group Settings
	ntel® RAID Web Console 2
	Create the drive group by specifying the RAID level and Drive security method.
	BAID level: Combines the straight block-level striping of RAID 0 with distributed parity of RAID 5.
	Drive security method: Select Drive security will make the virtual drive secure by applying encrypion logic to underlying data in the drive.
	Select unconfigured drives: Drive Type Capa Backplane (21), Slot: 4 SATA 232.8i Add Hgz Spare > Enclosure: SCAHSBPM1 SATA 232.8i Add Hgz Spare > Enclosure: SCAHSBPM1 SATA 232.8i Add Hgz Spare >
	Greate Drive Group Create Span
	Cancel < Back Next Help
2599	Linformation 2009-06-23, 18:00:55 Controller ID: 0 Time established since power on: Time 2009-06-23,18:00:55 2456 Seconds
2598	[Information2009-06-23, 17:47:50 Controller ID: 0 State change: PD =:-:3 Previous = Online Current = Unconfigured Good
2597 2596	[Information] 2009-06-23, 17:47:50 Controller ID: 0 State change: PD = -+:-1 Previous = Online Current = Unconfigured Good Information
2595	Information. 2009-06-23 1747:30 Controller D: 0 State Grange: PD =2 Previous = Online Current = Unconfigured Good
2594	Information 2009-06-23 17:47:50 Controller Die 0 Configuration clared
2593	[Information 2009-06-23, 17:47:38 Controller ID: 0 Initialization complete on VD 1
2592	fInformation 2009-06-23, 17:47:38 Controller ID: 0 Initialization complete on VD 0
Displayin	g log from server

Figure 132. Span 0 of Drive Group 0

- c. Click Create Span to create a second span in the drive group.
- d. Select *unconfigured* drives from the list of drives and click Add> to add them to the drive group.
- e. The selected drives appear under **Span 1** below **Drive Group 0**, as shown in Figure 133

RAID Web Console 2 - 3.04.0500 Fle Operations Group Operations Log Tools Help	
Servers	
Intel® RAID Web Console 2	(inte ⁾
Create Drive Group - Drive Group Settings	<u>x</u>
Intel [®] RAID Web Console 2	intel
Create the drive group by specifying the RAID level and Drive security method. RAID level: RAID 50 – Spanned drive group	with
Drive security method: Select Unive security will make the virtual drive secure by a underlying data in the drive.	pplying encrypion logic to
Endosure: SCAHSBPM1 SATA 232.88 Endosure: SCAHSBPM1 SATA 232.88 Add > Add >	Backplane (21), Slot: 2: SATA: 2 Backplane (21), Slot: 3: SATA: 2 Backplane (21), Slot: 4: SATA: 2 ≠ Backplane (21), Slot: 4: SATA: 2 ≠
<u>C</u> reate Driv	
	Cancel < Back Mext > Help
2599 [Information 2009-06-23, 18:00:55 Controller ID: 0 Time established since power on: Time 2009-06-23, 18:00:55 2598 [Information 2009-06-23, 17:47:50 Controller ID: 0 State change: PD = -:-:-3 Previous = Online Currer	2456 Seconds
2596 [Information 2009-06-23, 17:47:50 Controller ID: 0 State change: PD = -:-:1 Previous = Online Curren	
2596 [Information 2009-06-23, 17:47:50 Controller ID: 0 State change: PD =::0 Previous = Online Curren	
2595 [Information 2009-06-23, 17:47:50 Controller ID: 0 State change: PD =::2 Previous = Online Curren	
2594 [Information 2009-06-23, 17:47:50 Controller ID: 0 Configuration cleared	
2593 [Information 2009-06-23, 17:47:38 Controller ID: 0 Initialization complete on VD 1 2592 [Information 2009-06-23, 17:47:38 Controller ID: 0 Initialization complete on VD 0	

Figure 133. Span 0 and Span 1 of Drive Group 0

- f. Click Create Drive Group to make a drive group with the spans.
- g. Click Next to complete this step.

The Virtual drive settings window appears, as shown in Figure 134. The drive group and the default virtual drive settings appear. The options to update the virtual drive or remove the virtual drive are grayed out until you create the virtual drive.

🗧 RAID Web Console 2 - 3.04.0500	
Ele Operations Group Operations Log	Iools Help
≦ervers	
Intel [®] RAID W	
Intel [®] RAID W	
Spe	cify parameters for the new virtual drive. Drive groups:
Vi	irtual drive name: VD_0
a	apacity: 1.362 Hunts: TB 💌
Ĩu	ittialization state: No Initialization
st	tripe size: 64 KB 💌
Rg	gad policy: No Read Ahead 💌
w	/rite policy: Write Through
1/c	O golcy: Cached IO -
Ac	ccess policy: Read Write 💌
k ₽	isk cache policy: Unchanged 💌
	Update Virtual Drive Remove Virtual Drive
	Cancel < Back Mext > Help
2597 [Information 2009-06-23, 17:47:	150 Controller ID: 0 State change: PD =::1 Previous = Online Current = Unconfigured Good
2596 [Information 2009-06-23, 17:47:	
2595 [Information 2009-06-23, 17:47:	
2594 [Information 2009-06-23, 17:47:	:50 Controller ID: 0 Configuration cleared
2593 [Information 2009-06-23, 17:47:	
2592 [Information 2009-06-23, 17:47: Direlating log from center	:38 Controller ID: 0 Initialization complete on VD 0

Figure 134. Virtual Drive Settings Window

- 4. Change any virtual drive settings, if desired.
- 5. Click Create Virtual Drive.

The new virtual drive appears under the drive group, as shown in Figure 135. The options **Update Virtual Drive** and **Remove Virtual Drive** are now available. **Update Virtual Drive** allows you to change the virtual drive settings and **Remove Virtual Drive** allows you to delete the virtual drive.

	ID Web Console 2 - 3.04.0500	_ <u>8</u> ×
-	Deerations Group Operations Log Iools Help	
Servers	s	
	Intel [®] RAID Web Console 2	rintel
Lrea	ate virtual Drive - virtual urive settings	×
20	Intel [®] RAID Web Console 2	(intel)
	Inter IAAD web console E	
	Specify parameters for the new virtual drive.	Drive groups:
	Virtual drive name: VD_0	Antel Server RAID Controller RS2BL080 (Bus 11,Dev 0)
		Group 0: RAID 50: Available Capacity 0 Bytes
	Capacit <u>y</u> : 1.362 🔆 Units: TB	
	Initialization state: No Initialization 💌	
	Stripe size: 64 KB 🔻	
	Read policy: No Read Ahead 💌	
\$	Write policy: Write Through	
	I/O policy: Cached IO 💌	
	Access policy: Read Write 🔻	
	Disk cache policy: Unchanged 💌	
	Update Virtual Drive Greate Virtual Dri	Ve Remove Virtual Drive
	,	Cancel < Back Next > Help
2597	[Information 2009-06-23, 17:47:50 Controller ID: 0 State change: F	
2597	[Information 2009-06-23, 17:47:50 Controller ID: 0 State change: F [Information 2009-06-23, 17:47:50 Controller ID: 0 State change: F	
2595	[Information 2009-06-23, 17:47:50 Controller ID: 0 State change: P	
2594	[Information 2009-06-23, 17:47:50 Controller ID: 0 Configuration cle	
2593	[Information 2009-06-23, 17:47:38 Controller ID: 0 Initialization comp	
2592 Displayer	[Information 2009-06-23, 17:47:38 Controller ID: 0 Initialization comp	olete on VD 0

Figure 135. New Virtual Drive 0

6. Click Next.

The **Create Virtual Drive - Summary** window appears, as shown in Figure 136. This window shows the selections you made for advanced configuration.

Review the summary and go back if you need to make Summary:	corrections. The virtual drive(s) will be created when you click finish.	
Drive group name:	Drive Group O	
RAID level:	RAID 50	
Number of drives per span:	4	
Number of spans:	2	
Drive security method:	No Encryption	
Hot spare	No	
Total capacity:	1.362 TB	
Free capacity:	0 Bytes	
Virtual drive 1 name:	VD 0	
Capacity:	1.362 TB	

Figure 136. Create Virtual Drive Summary Window

7. Click **Back** to return to the previous screen to change any selections or click **Finish** to accept and complete the configuration.

The new storage configuration will be created and initialized.

- *Note:* If you create a large configuration using drives that are in powersave mode, it could take several minutes to spin up the drives. A progress bar appears as the drives spin up. If any of the selected unconfigured drives fail to spin up, a box appears to identify the drive or drives.
- 8. After the configuration is completed, a dialog box notifies you that the virtual drives were created successfully, as shown in Figure 137. If more drive capacity exists, the dialog box asks whether you want to create more virtual drives. If no more drive capacity exists, you are prompted to close the configuration session.

?	The virtual drives were created successfully. Do you want to create more virtual drives?				
		1			

Figure 137. Option to Create Additional Virtual Drives

9. Select Yes or No to indicate whether you want to create additional virtual drives.

If you select **Yes**, the system takes you to the **Create Virtual Drive** screen, as shown in Figure 50. If you select **No**, the utility asks whether you want to close the wizard, as Figure 138.

10. If you selected **No** in <hyperactive>step 8, select Yes or No to indicate whether you want to close the wizard.

If you select **Yes**, the configuration procedure closes. If you select **No**, the dialog box closes and you remain on the same page.

Create	virtual Drive - Co	onfirmation	×
?	Do you want to (close this wizard	7
	<u>Y</u> es	No	

Figure 138. Option to Close the Configuration Wizard

This appendix lists the Intel[®] RAID Web Console 2 events that may display in the event log.

The Intel[®] RAID Web Console 2 monitors the activity and performance of all controllers in the server and the devices attached to them. When an "event" such as the completion of a consistency check or the removal of a physical drive occurs, an event message is displayed in the log displayed at the bottom of the Intel[®] RAID Web Console 2 screen. The messages are also logged in the Microsoft Windows* Application log (Event Viewer). Error event levels are:

- Progress: This is a progress posting event. Progress events are not saved in NVRAM.
- Info: Informational message. No user action is necessary.
- Warning: Some component may be close to a failure point.
- Critical: A component has failed, but the system has not lost data.
- Fatal: A component has failed, and data loss has occurred or will occur.
- **Dead**: A catastrophic error has occurred and the controller has died. This is seen only after the controller has been restarted.

The following table lists all of the Intel[®] RAID Web Console 2 event messages.

Table 14. MFI Messages

Number	Туре	Description
0	Info	Firmware initialization started (PCI ID %04x/%04x/%04x/%04x)
1	Info	Firmware version %s
2	Fatal	Unable to recover cache data from TBBU
3	Info	Cache data recovered from TBBU successfully
4	Info	Configuration cleared
5	Warning	Cluster down; communication with peer lost
6	Info	Virtual drive %s ownership changed from %02x to %02x
7	Info	Alarm disabled by user
8	Info	Alarm enabled by user
9	Info	Background initialization rate changed to %d%%
10	Fatal	Controller cache discarded due to memory/battery problems
11	Fatal	Unable to recover cache data due to configuration mismatch
12	Info	Cache data recovered successfully
13	Fatal	Controller cache discarded due to firmware version incompatibility
14	Info	Consistency Check rate changed to %d%%
15	Dead	Fatal firmware error: %s
16	Info	Factory defaults restored
17	Info	Flash downloaded image corrupt
18	Critical	Flash erase error
19	Critical	Flash timeout during erase
20	Critical	Flash error
21	Info	Flashing image: %s
22	Info	Flash of new firmware image(s) complete
23	Critical	Flash programming error
24	Critical	Flash timeout during programming
25	Critical	Flash chip type unknown
26	Critical	Flash command set unknown
27	Critical	Flash verify failure
28	Info	Flush rate changed to %d seconds
29	Info	Hibernate command received from host
30	Info	Event log cleared
31	Info	Event log wrapped

Number	Туре	Description
32	Dead	Multi-bit ECC error: ECAR=%x
33	Warning	Single-bit ECC error: ECAR=%x
34	Dead	Not enough controller memory
35	Info	Patrol Read complete
36	Info	Patrol Read paused
37	Info	Patrol Read Rate changed to %d%%
38	Info	Patrol Read resumed
39	Info	Patrol Read started
40	Info	Rebuild rate changed to %d%%
41	Info	Reconstruction rate changed to %d%%
42	Info	Shutdown command received from host
43	Info	Test event: '%s'
44	Info	Time established as %s; (%d seconds since power on)
45	Info	User entered firmware debugger
46	Warning	Background Initialization aborted on %s
47	Warning	Background Initialization corrected medium error (%s at %lx
48	Info	Background Initialization completed on %s
49	Fatal	Background Initialization completed with uncorrectable errors on %s
50	Fatal	Background Initialization detected uncorrectable double medium errors (%s at %lx on %s)
51	Critical	Background Initialization failed on %s
52	Progress	Background Initialization progress on %s is %s
53	Info	Background Initialization started on %s
54	Info	Policy change due to BBU on %s from %s to %s
55	Info	Policy change due to user on %s from %s to %s
56	Warning	Consistency Check aborted on %s
57	Warning	Consistency Check corrected medium error (%s at %lx
58	Info	Consistency Check done on %s
59	Info	Consistency Check done with corrections on %s
60	Fatal	Consistency Check detected uncorrectable double medium errors (%s at %lx on %s)
61	Critical	Consistency Check failed on %s
62	Fatal	Consistency Check failed with uncorrectable data on %s
63	Warning	Consistency Check found inconsistent parity on %s at strip %lx

Number	Туре	Description
64	Warning	Consistency Check inconsistency logging disabled on %s (too many inconsistencies)
65	Progress	Consistency Check progress on %s is %s
66	Info	Consistency Check started on %s
67	Warning	Initialization aborted on %s
68	Critical	Initialization failed on %s
69	Progress	Initialization progress on %s is %s
70	Info	Fast initialization started on %s
71	Info	Full initialization started on %s
72	Info	Initialization complete on %s
73	Info	LD Properties updated to %s (form %s)
74	Info	Reconstruction complete on %s
75	Fatal	Reconstruction of %s stopped due to unrecoverable errors
76	Fatal	Reconstruct detected uncorrectable double medium errors (%s at %lx on %s at %lx)
77	Progress	Reconstruction progress on %s is %s
78	Info	Reconstruction resumed on %s
79	Fatal	Reconstruction resume of %s failed due to configuration mismatch
80	Info	Reconstructing started on %s
81	Info	State change on %s from %s to %s
82	Info	PD Clear aborted on %s
83	Critical	PD Clear failed on %s (Error %02x)
84	Progress	PD Clear progress on %s is %s
85	Info	PD Clear started on %s
86	Info	PD Clear completed on %s
87	Warning	Error on %s (Error %02x)
88	Info	Format complete on %s
89	Info	Format started on %s
90	Critical	Hot Spare SMART polling failed on %s (Error %02x)
91	Info	PD inserted: %s
92	Warning	PD %s is not supported
93	Warning	Patrol Read corrected medium error on %s at %lx
94	Progress	Patrol Read progress on %s is %s
95	Fatal	Patrol Read found an uncorrectable medium error on %s at %lx

Number	Туре	Description
96	Critical	Predictive failure: CDB: %s
97	Fatal	Patrol Read puncturing bad block on %s at %lx
98	Info	Rebuild aborted by user on %s
99	Info	Rebuild complete on %s
100	Info	Rebuild complete on %s
101	Critical	Rebuild failed on %s due to source drive error
102	Critical	Rebuild failed on %s due to target drive error
103	Progress	Rebuild progress on %s is %s
104	Info	Rebuild resumed on %s
105	Info	Rebuild started on %s
106	Info	Rebuild automatically started on %s
107	Critical	Rebuild stopped on %s due to loss of cluster ownership
108	Fatal	Reassign write operation failed on %s at %lx
109	Fatal	Unrecoverable medium error during rebuild on %s at %lx
110	Info	Corrected medium error during recovery on %s at %lx
111	Fatal	Unrecoverable medium error during recovery on %s at %lx
112	Info	PD removed: %s
113	Warning	CDB: %s
114	Info	State change on %s from %s to %s
115	Info	State change by user on %s from %s to %s
116	Warning	Redundant path to %s broken
117	Info	Redundant path to %s restored
118	Info	Dedicated Hot Spare PD %s no longer useful due to deleted array
119	Critical	SAS topology error: Loop detected
120	Critical	SAS topology error: Unaddressable device
121	Critical	SAS topology error: Multiple ports to the same SAS address
122	Critical	SAS topology error: Expander error
123	Critical	SAS topology error: SMP timeout
124	Critical	SAS topology error: Out of route entries
125	Critical	SAS topology error: Index not found
126	Critical	SAS topology error: SMP function failed
127	Critical	SAS topology error: SMP CRC error
128	Critical	SAS topology error: Multiple subtractive

Number	Туре	Description
129	Critical	SAS topology error: Table to table
130	Critical	SAS topology error: Multiple paths
131	Fatal	Unable to access device %s
132	Info	Dedicated Hot Spare created on %s (%s)
133	Info	Dedicated Hot Spare %s disabled
134	Critical	Dedicated Hot Spare %s no longer useful for all arrays
135	Info	Global Hot Spare created on %s (%s)
136	Info	Global Hot Spare %s disabled
137	Critical	Global Hot Spare does not cover all arrays
138	Info	Created %s}
139	Info	Deleted %s}
140	Info	Marking LD %s inconsistent due to active writes at shutdown
141	Info	Battery Present
142	Warning	Battery Not Present
143	Info	New Battery Detected
144	Info	Battery has been replaced
145	Critical	Battery temperature is high
146	Warning	Battery voltage low
147	Info	Battery is charging
148	Info	Battery is discharging
149	Info	Battery voltage is normal
150	Fatal	Battery needs to be replacement
151	Info	Battery relearn started
152	Info	Battery relearn in progress
153	Info	Battery relearn completed
154	Critical	Battery relearn timed out
155	Info	Battery relearn pending: Battery is under charge
156	Info	Battery relearn postponed
157	Info	Battery relearn will start in 4 days
158	Info	Battery relearn will start in 2 day
159	Info	Battery relearn will start in 1 day
160	Info	Battery relearn will start in 5 hours
161	Info	Battery removed

Number	Туре	Description
162	Info	Current capacity of the battery is below threshold
163	Info	Current capacity of the battery is above threshold
164	Info	Enclosure (SES) discovered on %s
165	Info	Enclosure (SAF-TE) discovered on %s
166	Critical	Enclosure %s communication lost
167	Info	Enclosure %s communication restored
168	Critical	Enclosure %s fan %d failed
169	Info	Enclosure %s fan %d inserted
170	Critical	Enclosure %s fan %d removed
171	Critical	Enclosure %s power supply %d failed
172	Info	Enclosure %s power supply %d inserted
173	Critical	Enclosure %s power supply %d removed
174	Critical	Enclosure %s SIM %d failed
175	Info	Enclosure %s SIM %d inserted
176	Critical	Enclosure %s SIM %d removed
177	Warning	Enclosure %s temperature sensor %d below warning threshold
178	Critical	Enclosure %s temperature sensor %d below error threshold
179	Warning	Enclosure %s temperature sensor %d above warning threshold
180	Critical	Enclosure %s temperature sensor %d above error threshold
181	Critical	Enclosure %s shutdown
182	Warning	Enclosure %s not supported; too many enclosures connected to port
183	Critical	Enclosure %s firmware mismatch
184	Warning	Enclosure %s sensor %d bad
185	Critical	Enclosure %s phy %d bad
186	Critical	Enclosure %s is unstable
187	Critical	Enclosure %s hardware error
188	Critical	Enclosure %s not responding
189	Info	SAS/SATA mixing not supported in enclosure; PD %s disabled
190	Info	Enclosure (SES) hotplug on %s was detected, but is not supported
191	Info	Clustering enabled
192	Info	Clustering disabled
193	Info	PD too small to be used for auto-rebuild on %s
194	Info	BBU enabled; changing WT virtual disks to WB

Number	Туре	Description
195	Warning	BBU disabled; changing WB virtual disks to WT
196	Warning	Bad block table on PD %s is 80% full
197	Fatal	Bad block table on PD %s is full; unable to log block %lx
198	Info	Consistency Check Aborted Due to Ownership Loss on %s
199	Info	Background Initialization (BGI) Aborted Due to Ownership Loss on %s
200	Critical	Battery/charger problems detected; SOH Bad
201	Warning	Single-bit ECC error: ECAR=%x, ELOG=%x, (%s); warning threshold exceeded
202	Critical	Single-bit ECC error: ECAR=%x, ELOG=%x, (%s); critical threshold exceeded
203	Critical	Single-bit ECC error: ECAR=%x, ELOG=%x, (%s); further reporting disabled
204	Critical	Enclosure %s Power supply %d switched off
205	Info	Enclosure %s Power supply %d switched on
206	Critical	Enclosure %s Power supply %d cable removed
207	Info	Enclosure %s Power supply %d cable inserted
208	Info	Enclosure %s Fan %d returned to normal
209	Info	BBU Retention test was initiated on previous boot
210	Info	BBU Retention test passed
211	Critical	BBU Retention test failed!
212	Info	NVRAM Retention test was initiated on previous boot
213	Info	NVRAM Retention test passed
214	Critical	NVRAM Retention test failed!
215	Info	%s test completed %d passes successfully
216	Critical	%s test FAILED on %d pass. Fail data: errorOffset=%x goodData=%x badData=%x
217	Info	Self check diagnostics completed
218	Info	Foreign Configuration Detected
219	Info	Foreign Configuration Imported
220	Info	Foreign Configuration Cleared
221	Warning	NVRAM is corrupt; reinitializing
222	Warning	NVRAM mismatch occurred
223	Warning	SAS wide port %d lost link on PHY %d
224	Info	SAS wide port %d restored link on PHY %d
225	Warning	SAS port %d, PHY %d has exceeded the allowed error rate

Number	Туре	Description
226	Warning	Bad block reassigned on %s at %lx to %lx
227	Info	Controller Hot Plug detected
228	Warning	Enclosure %s temperature sensor %d differential detected
229	Info	Drive test cannot start. No qualifying drives found
230	Info	Time duration provided by host is not sufficient for self check
231	Info	Marked Missing for %s on drive group %d row %d
232	Info	Replaced Missing as %s on drive group %d row %d
233	Info	Enclosure %s Temperature %d returned to normal
234	Info	Enclosure %s Firmware download in progress
235	Warning	Enclosure %s Firmware download failed
236	Warning	%s is not a certified drive
237	Info	Dirty cache data discarded by user
238	Info	Drives missing from configuration at boot
239	Info	Virtual drives (VDs) missing drives and will go offline at boot: %s
240	Info	VDs missing at boot: %s
241	Info	Previous configuration completely missing at boot
242	Info	Battery charge complete
243	Info	Enclosure %s fan %d speed changed
244	Info	Dedicated spare %s imported as global due to missing arrays
245	Info	%s rebuild not possible as SAS/SATA is not supported in an array
246	Info	SEP %s has been rebooted as a part of enclosure firmware download. SEP will be unavailable until this process completes.
247	Info	Inserted PD: %s Info: %s
248	Info	Removed PD: %s Info: %s
249	Info	VD %s is now OPTIMAL
250	Warning	VD %s is now PARTIALLY DEGRADED
251	Critical	VD %s is now DEGRADED
252	Fatal	VD %s is now OFFLINE
253	Warning	Battery requires reconditioning; please initiate a LEARN cycle
254	Warning	VD %s disabled because RAID-5 is not supported by this RAID key
255	Warning	VD %s disabled because RAID-6 is not supported by this controller

Number	Туре	Description
256	Warning	VD %s disabled because SAS drives are not supported by this RAID key
257	Warning	PD missing: %s
258	Warning	Puncturing of LBAs enabled
259	Warning	Puncturing of LBAs disabled
260	Critical	Enclosure %s EMM %d not installed
261	Info	Package version %s
262	Warning	Global affinity Hot Spare %s commissioned in a different enclosure
263	Warning	Foreign configuration table overflow
264	Warning	Partial foreign configuration imported, PDs not imported:%s
265	Info	Connector %s is active
266	Info	Board Revision %s
267	Warning	Command timeout on PD %s, CDB:%s
268	Warning	PD %s reset (Type %02x)
269	Warning	VD bad block table on %s is 80% full
270	Fatal	VD bad block table on %s is full; unable to log block %lx (on %s at %lx)
271	Fatal	Uncorrectable medium error logged for %s at %lx (on %s at %lx)
272	Info	VD medium error corrected on %s at %lx
273	Warning	Bad block table on PD %s is 100% full
274	Warning	VD bad block table on PD %s is 100% full
275	Fatal	Controller needs replacement, IOP is faulty
276	Info	CopyBack started on PD %s from PD %s
277	Info	CopyBack aborted on PD %s and src is PD %s
278	Info	CopyBack complete on PD %s from PD %s
279	Progress	CopyBack progress on PD %s is %s
280	Info	CopyBack resumed on PD %s from %s
281	Info	CopyBack automatically started on PD %s from %s
282	Critical	CopyBack failed on PD %s due to source %s error
283	Warning	Early Power off warning was unsuccessful
284	Info	BBU FRU is %s
285	Info	%s FRU is %s
286	Info	Controller hardware revision ID %s

Number	Туре	Description
287	Warning	Foreign import shall result in a backward incompatible upgrade of configuration metadata
288	Info	Redundant path restored for PD %s
289	Warning	Redundant path broken for PD %s
290	Info	Redundant enclosure EMM %s inserted for EMM %s
291	Info	Redundant enclosure EMM %s removed for EMM %s
292	Warning	Patrol Read can't be started, as PDs are either not ONLINE, or are in a VD with an active process, or are in an excluded VD
293	Info	Copyback aborted by user on PD %s and src is PD %s
294	Critical	Copyback aborted on hot spare %s from %s, as hot spare needed for rebuild
295	Warning	Copyback aborted on PD %s from PD %s, as rebuild required in the array
296	Fatal	Controller cache discarded for missing or offline VD %s When a VD with cached data goes offline or missing during runtime, the cache for the VD is discarded. Because the VD is offline, the cache cannot be saved.
297	Info	Copyback cannot be started as PD %s is too small for src PD %s
298	Info	Copyback cannot be started on PD %s from PD %s, as SAS/SATA is not supported in an array
299	Info	Microcode update started on PD %s
300	Info	Microcode update completed on PD %s
301	Warning	Microcode update timeout on PD %s
302	Warning	Microcode update failed on PD %s
303	Info	Controller properties changed
304	Info	Patrol Read properties changed
305	Info	CC Schedule properties changed
306	Info	Battery properties changed
307	Warning	Periodic Battery Relearn is pending. Please initiate manual learn cycle as Automatic learn is not enabled
308	Info	Drive security key created
309	Info	Drive security key backed up
310	Info	Drive security key from escrow, verified
311	Info	Drive security key changed
312	Warning	Drive security key, re-key operation failed

Number	Туре	Description
313	Warning	Drive security key is invalid
314	Info	Drive security key destroyed
315	Warning	Drive security key from escrow is invalid
316	Info	VD %s is now secured
317	Warning	VD %s is partially secured
318	Info	PD %s security activated
319	Info	PD %s security disabled
320	Info	PD %s is reprovisioned
321	Info	PD %s security key changed
322	Fatal	Security subsystem problems detected for PD %s
323	Fatal	Controller cache pinned for missing or offline VD %s
324	Fatal	Controller cache pinned for missing or offline VDs: %s
325	Info	Controller cache discarded by user for VDs: %s
326	Info	Controller cache destaged for VD %s
327	Warning	Consistency Check started on an inconsistent VD %s
328	Warning	Drive security key failure, cannot access secured configuration
329	Warning	Drive security password from user is invalid
330	Warning	Detected error with the remote battery connector cable
331	Info	Power state change on PD %s from %s to %s
332	Info	Enclosure %s element (SES code 0x%x) status changed
333	Info	PD %s rebuild not possible as HDD/CacheCade software mix is not supported in a drive group
334	Info	Copyback cannot be started on PD %s from %s, as HDD/CacheCade software mix is not supported in a drive group
335	Info	VD bad block table on %s is cleared
336	Caution	SAS topology error: 0x%lx
337	Info	VD cluster of medium errors corrected for %s at %lx (on %s at %lx)
338	Info	Controller requests a host bus rescan
339	Info	Controller repurposed and factory defaults restored
340	Info	Drive security key binding updated
341	Critical	Controller encountered a fatal error and was reset
342	Info	Snapshots enabled on %s (Repository %s)

Number	Туре	Description
343	Info	Snapshots disabled on %s (Repository %s) by the user
344	Critical	Snapshots disabled on %s (Repository %s), due to a fatal error
345	Info	Snapshot created on %s at %s
346	Info	Snapshot deleted on %s at %s
347	Info	View created at %s to a snapshot at %s for %s
348	Info	View at %s is deleted, to snapshot at %s for %s
349	Info	Snapshot rollback started on %s from snapshot at %s
350	Fatal	Snapshot rollback on %s internally aborted for snapshot at %s
351	Info	Snapshot rollback on %s completed for snapshot at %s
352	Info	Snapshot rollback progress for snapshot at %s, on %s is %s
353	Warning	Snapshot space for %s in snapshot repository %s, is 80%% full
354	Critical	Snapshot space for %s in snapshot repository %s, is full
355	Warning	View at %s to snapshot at %s, is 80%% full on snapshot repository %s
356	Critical	View at %s to snapshot at %s, is full on snapshot repository %s
357	Critical	Snapshot repository lost for %s
358	Warning	Snaphot repository restored for %s
359	Critical	Snapshot encountered an unexpected internal error: 0x%lx
360	Info	Auto Snapshot enabled on %s (snapshot repository %s)
361	Info	Auto Snapshot disabled on %s (snapshot repository %s)
362	Critical	Configuration command could not be committed to disk, please retry
363	Info	COD on %s updated as it was stale
364	Warning	Power state change failed on %s (from %s to %s)
365	Warning	%s is not available
366	Info	%s is available
367	Info	%s is used for CacheCade with capacity 0x%lx logical blocks
368	Info	%s is using CacheCade %s
369	Info	%s is no longer using CacheCade %s
370	Critical	Snapshot deleted due to resource constraints for %s in snapshot repository %s
371	Warning	Auto Snapshot failed for %s in snapshot repository %s
372	Warning	Controller reset on-board expander

Number	Туре	Description
373	Warning	CacheCade (%s) capacity changed and is now 0x%lx logical blocks
374	Warning	Battery cannot initiate transparent learn cycles
375	Info	Premium feature %s key was applied for - %s
376	Info	Snapshot schedule properties changed on %s
377	Info	Snapshot scheduled action is due on %s
378	Info	Performance Metrics: collection command 0x%lx
379	Info	Premium feature %s key was transferred - %s
380	Info	Premium feature serial number %s
381	Warning	Premium feature serial number mismatched. Key-vault serial num - %s
382	Warning	Battery cannot support data retention for more than %d hours. Please replace the battery
383	Info	%s power policy changed to %s (from %s)
384	Warning	%s cannot transition to max power savings
385	Info	Host driver is loaded and operational
386	Info	%s mirror broken
387	Info	%s mirror joined
388	Warning	%s link %d failure in wide port
389	Info	%s link %d restored in wide port
390	Info	Memory module FRU is %s
391	Warning	Cache-vault power pack is sub-optimal. Please replace the pack
392	Warning	Foreign configuration auto-import did not import any drives
393	Warning	Cache-vault microcode update required
394	Warning	CacheCade (%s) capacity exceeds maximum allowed size, extra capacity is not used
395	Warning	LD (%s) protection Info lost
396	Info	Diagnostics passed for %s
397	Critical	Diagnostics failed for %s
398	Info	Server Power capability Diagnostic Test Started
399	Info	Drive Cache settings enabled during rebuild for %s
400	Info	Drive Cache settings restored after rebuild for %s
401	Info	Drive %s commissioned as Emergency spare

Number	Туре	Description
402	Warning	Reminder: Potential non-optimal configuration due to drive %s commissioned as emergency spare
403	Info	Consistency Check suspended on %s
404	Info	Consistency Check resumed on %s
405	Info	Background Initialization suspended on %s
406	Info	Background Initialization resumed on %
407	Info	Reconstruction suspended on %s
408	Info	Rebuild suspended on %
409	Info	Copyback suspended on %s
410	Info	Reminder: Consistency Check suspended on %
411	Info	Reminder: Background Initialization suspended on %s
412	Info	Reminder: Reconstruction suspended on %s
413	Info	Reminder: Rebuild suspended on %s
414	Info	Reminder: Copyback suspended on %s
415	Info	Reminder: Patrol Read suspended
416	Info	Erase aborted on %s
417	Critical	Erase failed on %s (Error %02x)
418	Progress	Erase progress on %s is %s
419	Info	Erase started on %s
420	Info	Erase completed on %s
421	Info	Erase aborted on %s
422	Critical	Erase failed on %s
423	Progress	Erase progress on %s is %s
424	Info	Erase started on %s
425	Info	Erase complete on %s
426	Warning	Potential leakage during erase on %s
427	Warning	Battery charging was suspended due to high battery temperature
428	Info	NVCache firmware update was successful
429	Warning	NVCache firmware update failed
430	Fatal	%s access blocked as cached data in CacheCade is unavailable
431	Info	CacheCade disassociate started on %s

Number	Туре	Description
432	Info	CacheCade disassociate completed on %s
433	Critical	CacheCade disassociate failed on %s
434	Progress	CacheCade disassociate progress on %s is %s
435	Info	CacheCade disassociate aborted by user on %s
436	Info	Link speed changed on SAS port %d and PHY %d
437	Warning	Advanced Software Options was deactivated for - %s
438	Info	%s is now accessible
439	Info	%s is using CacheCade
440	Info	%s is no longer using CacheCade
441	Info	Patrol Read aborted on %s
61440	Info	Monitor has shutdown successfully
61441	Fatal	No controllers detected
61442	Info	Testing the Email Configuration
61443	Fatal	Incompatible Controller
61444	Info	Successful log on to the server
10000	Info	Successful log out from the server
10001	Warning	Full access denied on the server
10002	Info	Server log cleared
65529	Critical	Temperature has exceeded Critical level on Sensor
65530	Warning	Temperature has exceeded Warning level on Sensor
65531	Critical	The Backup Rail Monitor has failed
65532	Critical	SSD Life is exhausted on Slot
65533	Warning	SSD Life is at warning level on Slot
65534	Info	SSD throttling is now removed on Slot
65535	Info	SSD is being throttled on Slot