Software User's Guide

For Intel® RAID Products:

- **Intel® RAID Controller SRCS16**
- **Intel® RAID Controller SRCS28X**
- **Intel® RAID Controller SRCU41L**
- **Intel® RAID Controller SRCU42E**
- **Intel® RAID Controller SRCU42X**
- **Intel® RAID Controller SRCZCRX**
- **Intel® RAID Controller SROMBU42E**

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Overview

The software described in this document is designated as Software Stack 2 and is designed for use with the following Intel® RAID products:

- Intel® RAID Controller SRCS16

- Intel® RAID Controller SRCS28X

- Intel® RAID Controller SRCU41L

- Intel® RAID Controller SRCU42E

- Intel® RAID Controller SRCU42X

- Intel® RAID Controller SRCZCRX

- Intel® RAID Controller SROMBU42E (Intel® Server Board SE7520AF2, Intel® Server Platform SR6850HW4, and Intel® Server Platform SR4850HW4)

Unless otherwise specified in this document, the phrase "Intel RAID products" refers to features and instructions that apply to all of the above products. If a feature or instruction applies to only a specific subset of these products, it will be noted. This document describes the RAID controller configuration, drive and array configuration, management utility operation, and drive installation for these Intel RAID products.

Software Stack 2, used for the list of Intel RAID products listed above, is not backward compatible with Software Stack 1. Software Stack 2 is also not compatible with controllers designed for use with Software Stack 1, including the Intel® RAID Controller SRCU31A, SRCU31LA, SRCU41L, SRCU32, SRCS14L, and SRCZCR. It is not possible to "Roam" drives or automatically migrate controllers between these two software stacks. In this document the phrase "Intel RAID products" does NOT refer to any of the products supported by Software Stack 1.

Some levels of RAID are designed to increase the availability of data contained on the logical drives associated with the RAID controller. Installing a RAID controller in a server or workstation is not a substitute for a reliable backup strategy. It is highly recommended that all data be backed up regularly via a tape drive or other backup strategy to guard against data loss. It is especially important to backup all data prior to working on any system components and prior to installing or upgrading the RAID controller, or making any changes to its configuration.

Software described in this document includes Intel RAID product and hard drive management utilities, and operating system driver usage and installation. This software stack provides for the same set of utilities and drivers to be used on each of the supported RAID products; however, the firmware image contained on each controller is unique to that controller.

1.1   Adapter Options Configuration

The Intel RAID products supported by software described in this document provide a cost-effective intelligent RAID solution. They are developed to provide system integrators with a flexible storage solution that offers a full-featured intelligent RAID I/O subsystem for their server platforms. Intel RAID products include a high-performance Intel® I/O processor, a high-speed data bus interconnect to hard disk drives, and support RAID levels 0, 1, 5, 10, and 50. Intel RAID products also include the following features:

- Support for ECC SDRAM memory
- Hot-swappable drive support
- Fault-tolerant disk subsystem management
- Variable stripe size
- Instant logical drive availability
- Auto resume during array reconstruction
- Background initialization for quick RAID 5 setup
- Support for non-hard disk drive devices
- SAF-TE intelligent enclosure support
- Ease of management and monitoring using Intel® RAID management utilities

1.1.1   General Adapter Features

- Intel® RAID adapters support online capacity expansion (OCE). This added capacity can be added to the logical drive and may be presented to the operating system (OS) as additional space for the OS to partition as an additional drive, or may be added to an OS drive, depending upon the capability of the OS.
- Online RAID level migration allows for the upgrading of a RAID level (for example, RAID 1 to RAID5), but may require online capacity expansion as part of the process (see Table 1-1).
  a. You cannot migrate or perform OCE on a spanned RAID array (RAID 10 or RAID50).
  b. You cannot migrate to a smaller capacity configuration.
  c. You cannot perform OCE when there is more than one logical drive on a logical array.

Table 1-1   RAID Level Migration Matrix

	0	1	5
0 ->	N/A	Yes, though OCE	Yes, through OCE
1 ->	Yes	N/A	Yes, through OCE
5 ->	Yes	No	N/A

- 30 logical drives are allowed per controller.
- 32 physical drives are allowed per logical array. No more than 2TBytes are allowed per logical drive.

- Current firmware and utilities do not allow Random Deletion of logical drives. Logical drives must be removed in reverse order of creation.

- The total capacity of a configured drive array must be used by one or more logical drives before additional drive arrays can be configured.

- Smart Initialization automatically checks consistency of logical drives when five or more disks are configured in a RAID 5 logical drive. This allows performance optimization by enabling read modify write mode of operation with five or more disks in a RAID 5 array. Peer read mode of operation is used when the RAID 5 array contains three or four physical drives.

- The initialization or rebuild process will automatically resume on the next boot if the system shuts down. Auto resume must be enabled prior to logical drive creation.

- Stripe size is user definable on a per drive basis and can be 2, 4, 8, 16, 32, 64, or 128 KB in size. The default is 64 KB, which has been found to be optimal for many data access types.

- Hot spares can be set as global or dedicated. A global hot spare will automatically come online to replace the first drive to fail on any array on the controller. A dedicated hot spare is assigned to a specific array and will only come online to rebuild a failed drive in that array. A hot spare will only come 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. A hot spare can be used across channels on the same RAID controllers. If a drive is removed (and marked as failed) within a logical drive, the hot spare will automatically come 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 that are connected and then force the larger drives to use only the amount of space available on the smallest drive. Drive coercion as implemented in these RAID controllers also allows an option to map out a reserved space to compensate for slightly smaller drive sizes that may be added later. The coercion algorithm options are:

    ◊ None: The software does not coerce the drive capacity.

    ◊ 128M: The software rounds the drive capacity down to the next 128-MB boundary. Then, the software rounds the drive capacity to the nearest 10-MB boundary. If the resulting capacity is larger than the real drive size, the coerced capacity is rounded down to the next 10-MB boundary.

    ◊ 1G: The software rounds the drive capacity down to the next 1-GB boundary. The software rounds the drive capacity down to the next 1-MB boundary. The 1-GB boundary correlates with the terms most drive manufacturers use.

- A pulled drive will go to a not responding state if there is no I/O. Not responding is a virtual state, not a persistent state. It is the state that applications will report when management I/O to the drive fails.

1.1.2   Fault Tolerant Features

- Array 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 drive automatically occurs using hot spare drives.

- Support for SAF-TE enabled enclosures allows enhanced drive failure and rebuild reporting via enclosure LEDs; support also includes hot swapping of hard drives.

- Battery backup for cache memory is available as an option for some controllers. 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. When low, the battery is first given a fast charge to replenish the charge and is then given a trickle charge to keep the battery 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, this LED signals that this operation needs to be completed. Upon reboot, the data in memory can then be written out to disk.

- Battery life is expected to be about three years. Battery health should be monitored and the battery replaced when needed.

- SMART technology is also supported, which provides a higher level of predictive failure analysis of the hard disk drives by the RAID controller.

1.1.3   Cache Options and Settings

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

- Cache Write Policy

    a. Write Through - I/O completion is signaled only after the data is written to hard disk.

    b. Write Back - I/O completion is signaled when data is transferred to cache.

- Cache Policy

    a. Direct I/O - When possible, no cache is involved for both reads and writes. The data transfers will be directly from host to disk and from disk to host.

    b. Cached I/O - All reads will first look at cache. If a cache hit occurs, the data will be read from cache; if not, the data will be read from disk and the read data will be buffered into cache. All writes to drive are also written to cache.

- Read Policy

    a. No Read Ahead - Provides no read ahead for the logical drive having this option turned on.

    b. Read Ahead - Additional consecutive stripes/lines are read and buffered into cache.

    c. Adaptive - The read-ahead will be automatically turned on and off depending upon whether the disk is accessed for sequential reads or random reads.

1.1.4   Background Tasks

- Rebuilding a failed drive is performed in the background. The rebuild rate is tunable from 0-100%.

    a. The rebuild rate controls the amount of system resources allocated to the rebuild process.

    b. It is not recommended to increase the rebuild rate over 50% as a higher rebuild rate can result in the operating system requests not being serviced in a timely fashion and causing an OS panic.

- A consistency check validates parity or mirror integrity and can fix a parity or mirror error, if necessary. Consistency checks use the same rate as a rebuild.

- 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 will start again in five minutes or less. Background initialization is only performed on redundant volumes.

- RAID level migration and online capacity expansion are also completed in the background.

- Patrol Read is a user definable option available in the RAID Web Console that performs drive reads in the background and maps out any bad areas of the drive.

1.1.5   Cluster Management

- Cluster functionality must be enabled in the Cluster enable options of the BIOS Console on controllers that support this feature. This option is disabled by default.

- Cluster implementation will map SCSI reserve/release commands to a logical drive and coordinate logical drive reservations.

- Controller to controller communication is done using SCSI channels with READ_BUFFER and WRITE_BUFFER commands used for low-volume back channel communication to maintain consistent configuration between controllers.

1.1.6   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. OS-based errors are viewable from the event viewer in Web Console.

- 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 OS 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) of the Intel motherboard. In addition, access errors may be reported by the operating system. Depending on the RAID controller and drive enclosure, the error may be evident via the color of LEDs, the flashing of LEDs, or audible alarms.

1.1.6.1 Decoding an Audible Alarm

- The following list of beep tones is used on Intel RAID products using Software Stack 2. These beeps usually indicate that a drive has failed.

    1. Degraded Array - Short tone, 1 second on, 1 second off

    2. Failed Array - Long tone, 3 seconds on, 1 second off

    3. Hot Spare Commissioned - Short tone, 1 second on, 3 seconds off

- The tone alarm will stay on during rebuild. After rebuild completes, an alarm with a different tone will sound.

- The disable alarm option in either the BIOS Console or Web Console management utilities will hold the alarm disabled after a power cycle. The enable alarm option must be used to re-enable the alarm.

- The silence alarm option in either the BIOS Console or Web Console management utilities will silence the alarm until a power cycle or another event occurs.

1.2 Levels of RAID

1.2.1 RAID 0 - Data Striping

In RAID 0, data blocks are split into stripes based on the adjusted stripe size (for example, 128 KB) and the number of hard disks. Each stripe is stored on a separate hard disk. Significant improvement of the data throughput is achieved using this RAID level, especially with sequential read and write. RAID 0 includes no redundancy. When one hard disk fails, all data is lost. A single drive can be chosen as a RAID 0 drive as a method to pass a single drive through to the operating system; however, RAID 0 usually denotes two or more drives.

RAID 0

ABCDEF

RAID Adapter

Available Capacity
N=# disks
C = Disk Capacity
Available Capacity = N*C

A
C
E

B
D
F

Data Striping
RAID 0
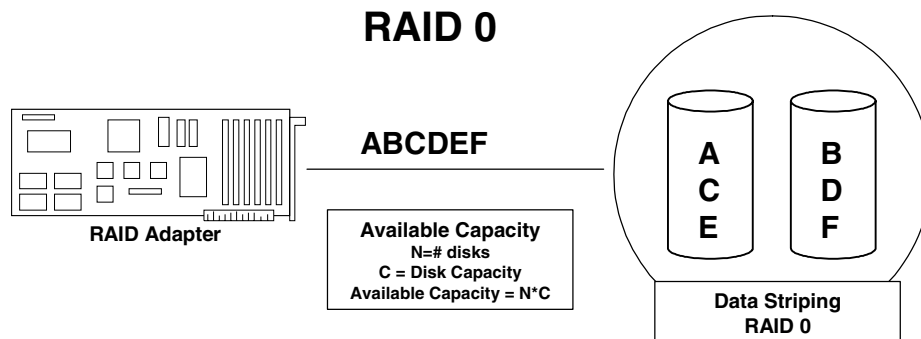
1.2.2   RAID 1 - Disk Mirroring/Disk Duplexing

All data is stored twice, once each on two identical hard disks making one drive a "mirror" image of the other. When one hard disk fails, all data is immediately available on the other without any impact on performance and data integrity.

With Disk Mirroring, two hard disks are mirrored on one I/O channel. If each hard disk is connected to a separate I/O channel, it is called Disk Duplexing.

RAID 1 represents an easy and highly efficient solution for data security and system availability. It is especially suitable for installations that are not too large (the available capacity is only half of the installed capacity). Disk mirroring requires two drives and each mirrored set is limited to two drives.

RAID 1

ABC

RAID Adapter

Available Capacity
N=# disks
C = Disk Capacity
Available Capacity =
(N*C) /2

A
B
C

A
B
C

**Disk Mirroring
RAID 1**
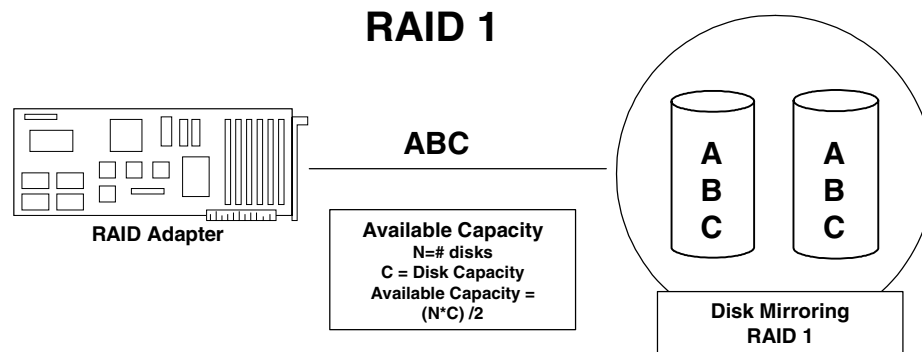
1.2.3   RAID 5 - Data Striping with Striped Parity

RAID 5 works in the same way as RAID 0. The data is striped across the hard disks and the controller calculates redundancy data (parity information) that is striped across all hard disks. Should one hard disk fail, all data remains fully available. Missing data is recalculated from existing data and parity information. The RAID 5 disk array delivers a balanced throughput. Even with small data blocks, which are very likely in a multi-tasking and multi-user environment, the response time is very good. RAID 5 is particularly suitable for systems with medium to large capacity requirements, due to the efficient ratio of installed and available capacity. RAID 5 requires a minimum of three drives in the configuration but can expand to the physical drive capacity of the controller.

RAID 5

ABCDEF

RAID Adapter

Available Capacity
N=# disks
C = Disk Capacity
Available Capacity =
(N*C)(N-1) /N

A
C
P3

B
P2
E

P1
D
F

**Data Striping &
Striped Parity
RAID 5**
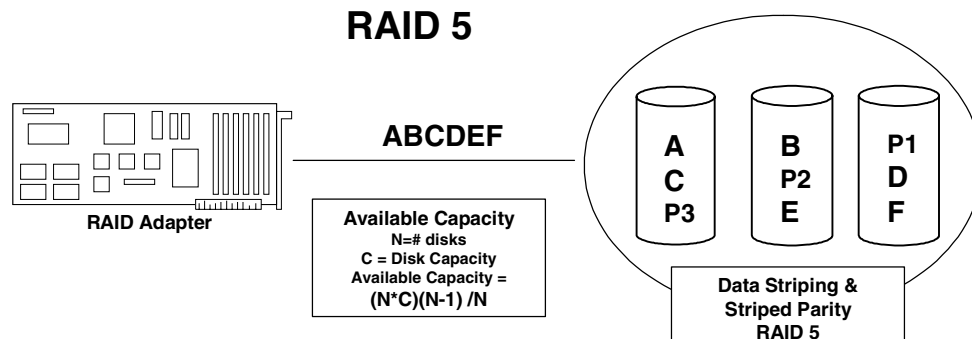
1.2.4 RAID 10 - Combination of RAID 1 and RAID 0

RAID 10 is a combination of RAID 0 (performance) and RAID 1 (data security). Unlike RAID 5, there is no need to calculate parity information. RAID 10 disk arrays offer good performance and data security. As in RAID 0, optimum performance is achieved in highly sequential load situations. Identical to RAID 1, 50% of the installed capacity is lost through redundancy. RAID 10 will tolerate a drive failure of one drive per stripe. RAID 10 also requires a minimum of four drives and is set up by spanning two or more RAID 1 arrays. Up to eight RAID 1 arrays can be spanned in a RAID 10 configuration.

RAID 10

Mirror Set

ABCDEF

RAID Adapter

Available Capacity
N=# disks
C = Disk Capacity
Available Capacity =
(N*C) /2

A
C
E

A
C
E

B
D
F

B
D
F

Stripe Set

Disk Mirror
&
Data Striping
RAID 10
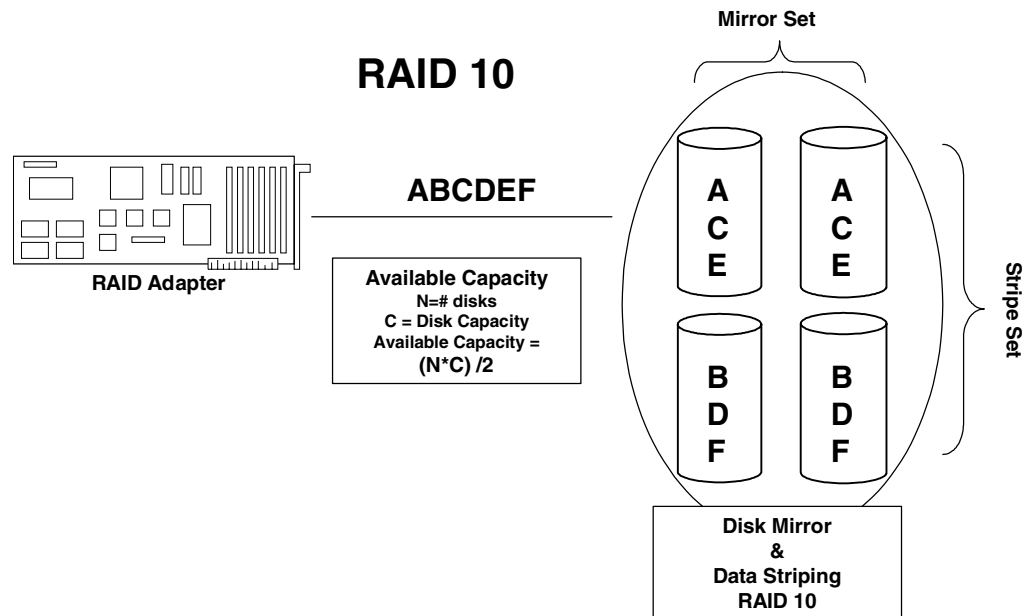
1.2.5   RAID 50 - Combination of RAID 5 and RAID 0

Like RAID 10, RAID 50 is created by first creating multiple RAID 5 arrays and spanning a logical drive across them. RAID 50 arrays provide the excellent performance of RAID 5 with added data security. RAID 50 requires a minimum of six drives and can span a maximum of eight RAID 5 arrays. RAID 50 will tolerate a single drive failure per stripe.

RAID 50

ABCDEFGHIJK

Available Capacity
N=# disks
C = Disk Capacity
Available Capacity =
(N*C)(N-1) /N

RAID Adapter

RAID 5 Set

A
E
P(I+K)

C
P(E+G)
I

P1(A+C)
G
K

B
F
P(J+L)

D
P(F+H)
J

P1(B+D)
H
L

Stripe Set

RAID 5
&
Data Striping
RAID 50
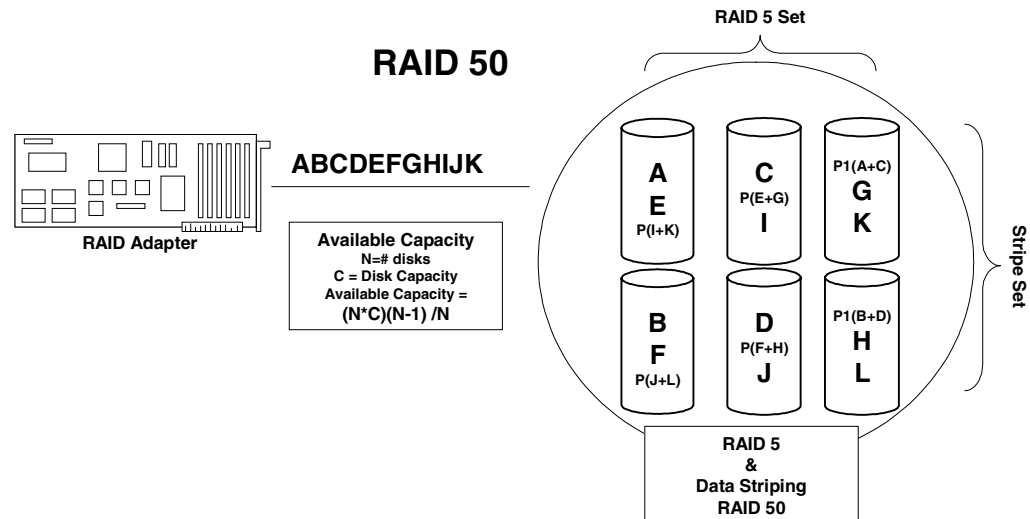
1.2.6   Levels of Drive Hierarchy within the Intel® Integrated RAID Firmware

The Intel Integrated RAID firmware is based on three fundamental levels of hierarchy. Logical drives are created from drive arrays that are in turn created from physical drives.

1.2.6.1   Level 1

Physical drives are hard drives and removable hard disks. Physical drives are the basic components of logical drives. Before they can be used by the firmware, these hard disks must be added to an array. This process identifies a drive by its physical ID and maps it to a logical address. For reasons of data coherency, this information is extremely important for any logical drive construction consisting of more than one physical drive.

1.2.6.2   Level 2

On this level of hierarchy, the firmware forms the array drives. An array drive can be any of the following:

- Single drives or multiple disks
- Chaining sets (concatenation of several hard disks)
- RAID 0 array drives
- RAID 1 array drives
- RAID 5 array drives
- RAID 10 array drives
- RAID 50 array drives

1.2.6.3 Level 3

On level 3, the firmware forms logical drives. Only these drives can be accessed by the host operating system of the computer. Drives C, D, etc., under MS-DOS*, etc., are always referred to as logical drives by the firmware. The same applies to Novell NetWare* and UNIX/Linux drives. The firmware automatically transforms each newly installed drive array into a logical drive by using one or more drive arrays. A single drive array can be used to create a RAID 0, RAID 1, or RAID 5 logical drive, provided there are enough drives in the array for the desired RAID level. Multiple drive arrays can be spanned to create RAID 10 or RAID 50 logical drives. With this option, the data stripe is written across multiple drive arrays.

1.2.6.4 Non-Direct Access Devices

A device that is not a hard disk or a removable hard disk, or that does not behave like one, is called a Non-Direct Access Device. Such a device (for example, a CD-ROM, DAT or tape) is not configured with the management utilities and does not become part of a drive array or a logical drive. Devices of this kind are either operated through the Advanced SCSI programming interface (MS-DOS* or Novell NetWare*) or are directly accessed from the operating system (UNIX).

1.3 Intel® RAID Tool and Driver Description

Intel® RAID products provide a powerful set of software tools for configuring and managing RAID systems. The following subsections provide a summary description of each tool.

You can install the Intel® RAID Controller SRCU41L or SRCS16 in any IBM* AT compatible computer that has a PCI local bus. The controller can run under MS-DOS* or any DOS-compatible operating system using the standard AT BIOS INT 13 hard disk drive interface.

You can install the Intel® RAID Controller SRCS28X or SRCU42X into a PCI-X slot.

You can install the Intel® RAID Controller SRCU42E into a PCI Express slot.

You can install the Intel® RAID Controller SRCZCRX into an MROMB-enabled PCI-X slot. This RAID controller is designed to work with the SCSI controller on the server board.

The Intel® Server Board SE7520AF2, the Intel® Server Platform SR6850HW4, and the Intel® Server Platform SR4850HW4, include the RAID and SCSI controllers on the server board. The optional RAID Key accessory kit is used to activate them.

After the card or server board RAID is installed, you must install the appropriate driver for your operating system. You can then use any of the listed utilities to configure your RAID system. Or, you can configure your RAID system with one utility and update it later with a different utility. All Intel RAID tools provide a full set of RAID array configuration and monitoring features.

1.3.1   Intel® RAID Controller Drivers

Intel provides software drivers for the following operating systems:

- MS-DOS* version 6.xx or later
- Microsoft* Windows* 2000, XP, and 2003
- Novell* NetWare* 5.1 and 6.x
- Red Hat* Linux 8.0 and 9.0, and Red Hat* Enterprise Linux AS 2.1 and 3.0
- SCO OpenServer* Release 5.0.7
- SCO UnixWare* 7.1.3
- SUSE Linux 9.0 and 9.1
- SUSE Enterprise Linux 9.0

This manual provides installation instructions to install the drivers for each of the above operating systems.

> Caution: Not all drivers have been tested on all RAID controllers, and the OS and its associated driver may not have been tested for compatibility with the server board you have chosen to use. Please check the supported OS list for both your chosen RAID controller and your server board to verify OS support compatibility. Intel will only provide full support for Intel® RAID Controllers on Intel® Server Boards for which the OS is listed as tested in both the RAID controller and server board *Tested Hardware and Operating System List*.

In addition, the Intel RAID Controller SRCU42X include 64-bit EFI support as well as 64-bit versions of OS drivers and utilities for the following operating systems:

- Microsoft* Windows* Enterprise Server 2003
- Red Hat* Linux Enterprise Server 3.0
- SuSE* Linux Enterprise Server 8.0

Driver versions may have changed since publication of this document. In addition, new drives may have been made available. Please check for updates at http://support.intel.com.

1.3.2   Intel® RAID BIOS Console Configuration Utility

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

- Select an Intel RAID product
- Choose a configuration method for physical arrays and logical disks
- Create drive arrays
- Define logical drives
- Initialize logical drives
- Access controllers, logical drives, and physical arrays to display their properties
- Create hot spare drives
- Rebuild failed drives
- Verify data redundancy in RAID 1, 5, 10, or 50 logical drives

1.3.3 Intel® RAID Web Console

Web Console is an operating system based object-oriented GUI utility that configures and monitors RAID systems locally or over a network. Web Console runs on Microsoft* Windows* XP, Microsoft* Windows* 2000, Microsoft* Windows* Server 2003, Novell NetWare* 6.x, Red Hat* Linux 8.0 and 9.0, Red Hat* Enterprise Linux AS 2.1 and 3.0, and SuSE* Linux 9.0 and 9.1.

With Web Console, you can perform the same tasks as you can with the BIOS Console. However, the Intel RAID Web Console provides on-the-fly RAID migration, creating almost limitless adaptability and expansion of any logical drive while the system remains operational.

Web Console allows you to:
- Create and manage logical drives
- Add a drive to a RAID logical drive
- Convert from a RAID 0 configuration to a RAID 1 or 5 configuration by adding a physical drive
- Change a degraded redundant logical drive to an optimal RAID 0 logical drive
- Remove physical drives from a logical drive
- Convert a RAID 1 or 5 logical drive to a RAID 0 drive.

Chapter 2
Intel RAID Drivers

2.1   Intel RAID Driver Description

The drivers that Intel provides for the Intel RAID products discussed in this manual are not compatible with RAID controllers that use Software Stack 1. The driver set for the Intel RAID products discussed in this manual:

- supports multiple RAID storage adapters
- provides the ability to see newly configured logical drives in the Disk Administrator without rebooting the system
- allows the deletion of the last logical drive created, using Web Console
- supports the use of the remaining array capacity with Web Console

Use the latest updates provided by the operating system manufacturer. Because Intel regularly updates device drivers, there might be a feature added to your driver that is not included in the most recent manual publication. If you have a question about a feature, consult the readme file that accompanied your driver, or contact your Intel support representative.

2.2   Driver Names

Table 2-1 lists the device driver files. These driver files are available on the *Resource CD* that accompanies the Intel RAID controllers and on the *Intel Server Deployment Toolkit CD* that accompanies the Intel® Server Board SE7520AF2, the Intel® Server Platform SR6850HW4, and the Intel® Server Platform SR4850HW4. Intel updates the RAID device drivers frequently; to ensure you have the current version of this driver, download the driver from the Intel web site: http://support.intel.com/support/motherboards/server/. See the readme file that accompanies the driver for any updated information.

To make the driver diskette, copy the files from the *Resource CD* or the *Intel Server Deployment Toolkit CD* to an empty floppy diskette, or download the driver files from the Intel webpage and copy them to an empty floppy diskette. Label the diskette as the Intel RAID Controller driver diskette for the given operating system.

Table 2-1   Intel RAID Product Device Driver Files

Operating System	SCSI Driver File Names	Installation Reference
DOS	`MEGASPI.SYS`	—
Windows 2000	`MRAID2K.sys, NODEV.INF, OEMSETUP.INF, TXTSETUP.OEM`	Section 2.4
Windows XP	`Mraid35x.sys, NODEV.INF, OEMSETUP.INF, TXTSETUP.OEM`	Section 2.5
Windows 2003	`Mraid35x.sys, NODEV.INF, OEMSETUP.INF, RELEASE.TXT, TXTSETUP.OEM`	Section 2.5
Novell NetWare*	`MEGA4_XX.DDI, MEGA4_XX.HAM, MEGAMGR.NLM, MEGAMMIO.NLM, MEGAMON.NLM, Readme.txt`	Section 2.6
Red Hat* Linux	`MEGARAID.0`	Section 2.7
SUSE Linux	`MEGARAID 2.0`	Section 2.8

2.3   Windows 2003 System Driver Installation

2.3.1   New Windows 2003 System Installation

This procedure installs the RAID device driver on a new Windows 2003 system that contains an Intel RAID product. Windows 2003 automatically adds the driver to the registry and copies the driver to the appropriate directory.

1) Start the Windows 2003 installation by booting from the Windows 2003 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.

2) Press <F6> to install when the screen displays:

    "Press F6 if you need to install..."

    Note: You must press <F6> for the system to recognize the new driver.

3) 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 <F6> key press was not seen by the setup program. Reboot the system and return to step 2.

    The system prompts for the manufacturer-supplied hardware support disk.

4) Insert the Windows 2003 driver diskette and press <Enter>.

5) Select the appropriate Windows 2003 driver from the menu by highlighting it. Press <Enter> to proceed.

6) Continue with the Windows 2003 installation procedure.

2.3.2   Existing Windows 2003 System Installation

This procedure installs or upgrades the RAID device driver on an existing Windows 2003 system into which an Intel RAID product has been installed.

1) Boot Windows 2003. The Found New Hardware Wizard appears. The information on the first page of this window identifies the SCSI controller and requests the driver diskette.

2) Insert the Windows 2003 driver diskette into the floppy drive.

3) Choose the option for **Install Software Automatically**.

4) Click **Next** button. In some cases, a message displays saying that this driver is not digitally signed. This message informs you that a nonsigned driver is being installed. Click **Continue Anyway**.

5) The system loads the driver from the Windows 2003 driver diskette and copies the driver to the system disk. The Found New Hardware Wizard screen appears and displays the message:

   "The wizard has finished..."

6) Click on the **Finish** button to complete the driver upgrade.

7) Repeat this process all the channels on your RAID controller.

2.4   Windows 2000 System Driver Installation

2.4.1   New Windows 2000 System Driver Installation

This procedure installs the Intel RAID device driver on a new Windows 2000 system that contains an Intel RAID product. Windows 2000 automatically adds the driver to the registry and copies the driver to the appropriate directory.

1) Start the Windows 2000 installation by booting from the Windows 2000 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.

2) Press <F6> when the screen displays:

   "Press F6 if you need..."

   Note:You must press <F6> for the system to recognize the new driver.

3) Choose <S> to specify an additional device when the screen displays:

   "Setup could not determine the type of one or more mass storage devices..."

   Note:If this screen is not displayed as the first user input, then pressing <F6> was not seen by the setup program. Reboot the system, and return to step 2.

4) The system prompts for the manufacturer-supplied hardware support disk. Insert the driver diskette containing the Windows 2000 device driver, and press <Enter>.

5) Select the Windows 2000 device driver from the menu by highlighting it and press <Enter>.

6) Press <Enter> again to proceed. Return to the Windows 2000 Setup screen.

7) Windows displays a "Welcome to Setup" window. Press <Enter> to proceed.

8) Follow the Microsoft Windows 2000 installation procedure by pressing "C" to continue.

9) Repeat this process for each channel on your system.

2.4.2   Existing Windows 2000 System Driver Installation

This procedure installs or updates the Intel RAID Controller device driver on an existing Windows 2000 system containing an Intel RAID product.

1) Boot Windows 2000. The Found New Hardware Wizard begins.

2) Click the **Next** button.

3) Insert the Windows 2000 driver diskette into the A:\ drive.

4) Click the **Search for a Suitable Driver...** button and click **Next**.

5) Click the **Next** button.

6) Check the **Specify Location** box, uncheck all other boxes, and click the **Next** button.

7) Type A:\ and click the **OK** button.

8) Click the **Next** button on the Driver Files Search Results window.

9) Click the **Finish** button to complete the driver installation.

10) Repeat this process for all the channels on your controller.

2.5   Windows XP System Driver Installation

2.5.1   New Windows XP System Driver Installation

This procedure installs the Intel RAID Controller driver on a new Windows XP system. Windows XP automatically adds the driver to the registry and copies the driver to the appropriate directory.

1) Start the Windows XP installation by booting from the Windows XP 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.

2) Press <F6> when the screen displays:

        "Press F6 if you need to install..."

    Note: You must press <F6> for the system to recognize the new driver.

3) 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 <F6> key press was not seen by the setup program. Reboot the system, and return to step 2.

    The system prompts for the manufacturer-supplied hardware support disk.

4) Insert the Window XP driver diskette and press <Enter>.

5) Select the appropriate Windows XP driver from the menu by highlighting it, and press <Enter> to proceed.

6) Continue with the Windows XP installation procedure.

2.5.2   Existing Windows XP System Driver Installation

This procedure installs or upgrades the RAID driver on an existing Window XP system.

1) Boot Windows XP. The Found New Hardware Wizard appears. The information on the first page of this window identifies the controller and requests the driver diskette.

2) Insert the Windows XP driver diskette into the floppy drive.

3) Choose the **Install Software Automatically** option.

4) Click the **Next** button. In some cases, a message displays saying that this driver is not digitally signed. This message informs you that a nonsigned driver is being installed. Click **Continue Anyway**.

5) The system loads the driver from the Windows XP driver diskette and copies the driver to the system disk. The Found New Hardware Wizard screen appears and displays the message:

    "The wizard has finished..."

6) Click the **Finish** button to complete the driver upgrade.

7) Repeat this process for the second channel, if one is present.

2.6   NetWare Driver Files Installation

2.6.1   NetWare Driver Files Description

The RAID Novell NetWare driver and utilities support logical drives configured on the Intel RAID product. This driver supports up to 12 Intel RAID controllers, as well as Hot Plug PCI.

Important: The logical drives configured on the host adapter are registered with the operating system as separate logical units.

Table 2.2 describes the Intel RAID Novell NetWare driver files.

Table 2.2   Intel RAID Novell NetWare Driver File Description

FIlename	Description
MEGA4_XX.HAM	This file is the Intel RAID host adapter module (HAM). This driver supports the NPA Diagnostics option by using the NWDIAG flag, which is specified on the command line when the driver loads. The driver is a re-entrant module. It registers one adapter when you issue the NetWare LOAD command to load the driver.
MEGA4XX.DDI	This file is the device driver installation file. It is needed to install the Intel RAID host adapter module driver.
MEGAMMIO.NLM	This file is the Media Manager Interface module for the MEGA4_XX.HAM driver.

All utilities and ASPI drivers expect the Intel RAID driver to pass the requests to the adapter. You must load the .HAM driver files first, so that it can load the .NLM files.

2.6.2   New Novell NetWare System Driver Installation

Follow the instructions in the *Novell NetWare Installation Guide* to install NetWare on the server. Follow these steps to install Novell NetWare using the Intel RAID product as a primary adapter:

1) Create a DOS partition with the CD-ROM driver.

2) Bring up the NetWare CD-ROM drive at the command prompt.

3) At the command prompt, type:

   ```
   Install
   ```

   Press <Enter>.

4) Follow the instructions on the screen until you reach the Storage Driver Support screen. This screen lets you modify drivers.

5) Select the **Storage Adapters** option on the Storage Driver Support screen.

6) Delete any existing Intel RAID adapter listings.

7) Press <Insert> to add unlisted drivers.

8) Press <Insert> again. A path displays.

9) Insert the driver diskette into the floppy drive, and press <Enter>.

10) The system finds the .HAM driver. Press <Enter>.

11) Return to the Driver Summary screen.

12) Continue with the Novell NetWare installation procedure.

2.6.3   Existing Novell NetWare System Driver Installation

Follow these steps to add the NetWare driver to an existing installation.

1) For NetWare 5.1 and higher, type at the root prompt:

   ```
   nwconfig
   ```

   Press <Enter>. The Configuration Options screen is displayed.

2) Select **Drive Options** and press <Enter>. A window displays.

3) Select **Configure Disk and Storage Device Options** and press <Enter>.

4) Select one of the following options display in the window:

   – **Discover and load an additional driver**

   – **Select an additional driver**

5) If you select **Discover and load an additional driver**, the system discovers the extra unit. The system prompts you to select a driver from the list. Press <Insert> to insert the driver. This completes the procedure.

   If you select **Select an additional driver**, the **Select a Driver** screen displays. Press <Insert>. Read and follow the instructions that appear.

6) Insert a floppy disk into the floppy drive and press <Enter>. The system finds the driver and installs it.

2.7   Red Hat Linux Driver Installation

This section describes the installation of the device driver on new Red Hat Linux 8.0 or 9.0 systems. Refer to the release notes that accompanied the driver for information on updating the Red Hat Linux driver on an existing Red Hat Linux system.

1) Boot to CD-ROM with Disk 1. Type:

```
linux dd
```

2) Press <Enter> at the boot prompt on the Welcome screen.

3) Copy the Linux driver image from the Universal Driver Suite CD to diskette.

4) Insert the diskette 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.

8) Reboot the system.

2.8   SuSE Linux Driver Installation

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

1) Insert CD1 into the CD-ROM drive and the RAID controller driver diskette in the floppy drive; boot to the CD.

2) The OS will load a minimal OS from the CD onto a RAM disk. Any driver module found in the floppy drive will also be loaded.

3) At the "Welcome to YaST2" screen, select your language and click on "Accept".

4) At the "Installation Settings" screen, verify that the partitioning meets your needs, If not, click on "Partitioning" and select "Base partition setup on this proposal". On the following screen, delete, edit and create partitions as desired and follow the natural button path back to the "Installation Settings" page.

5) Continue with the SuSE Linux installation procedure.

2.9   OpenServer 7.1.3 Driver Installation

This section describes the installation of the OpenServer* 7 driver.

2.9.1   Creating the Driver Diskette

You must prepare a driver diskette for installation of the RAID driver. Extraction of the driver requires the use of `rawrite` or the use of the `dd` extraction process in the operating system. This section describes the process of extracting the driver using the `rawrite` utility.

1) Use `rawrite` to extract the driver to a floppy disk or use the Linux `dd` process to extract the file. (`rawrite` is available with most versions of Linux.)

2) Run `rawrite` and follow the prompts, as shown below:

   `Enter name of image file: osramird.rwi`

   `Enter the drive letter (for example, a:)`

2.9.2   OpenServer System Driver Installation

Use the following procedure to install the RAID device driver on a new OpenServer system:

1) Set the BIOS to boot from a CD-ROM, and then boot your system from the OpenServer CD.

2) At the boot prompt, type the word "link":

   `boot:link`

   You will be prompted for the name of the packages to be loaded or <q> for quit.

   Type `amird` and then press `Enter`.

3) Insert the driver disk into the A: drive and follow the screen prompts. Accept the default options. The screen will report that the SCSI driver is currently being installed.

4) After the driver is successfully loaded, you will be prompted for the following:

   Select a keyboard type; default is "US English".

   Select licence option. Enter your product and license code.

   Select the install mode. Select "FRESH" install.

   Create the `root` user password. You must type the password twice as prompted.

   Select the peripheral device setting. Choose the correct NIC/video adapter/mouse.

   Select the packages you want to install.

   Select the hard drive partition.

5) The system will start the install automatically. You will be prompted to reboot the server.

   Note: The mouse may not be automatically recognized by OpenServer during installation. In this situation, you must change to the text mode by using the `Alt+Ctrl+F4` option. The system will then start the install automatically and you will be prompted to reboot the server.

   Note: You may use `madev mouse` to reconfigure your mouse manually.

2.10 SCO UnixWare 7.1.3 Driver Installation

This section describes the installation of the SCO UnixWare 7 driver.

2.10.1 Creating the Driver Diskette

You must prepare a driver diskette for installation of the RAID driver. Extraction of the driver requires the use of `rawrite` or the use of the `dd` extraction process in the operating system. This section describes the process of extracting the driver using the `rawrite` utility.

1) Copy the `rawrite.exe` and `unxmega.img` files into the same directory.

2) Run `rawrite` and follow the prompts, as shown below:

   ```
   Enter name of image file: unxmega.img

   Enter the drive letter (for example, a:)
   ```

2.10.2 Driver Installation on a New SCO UnixWare System

The following procedure installs the RAID device driver on a new UnixWare system:

1) Boot from the UnixWare CD-ROM.

   You will be prompted whether you want to install from an HBA (Host Board Adapter) disk.

   Note: The system BIOS must support booting from a CD-ROM drive. BIOS setting changes may be required; see your system documentation.

2) When prompted, select `proceed with installation in English` and press `Enter`.

3) At the Welcome screen, press `F10` to continue.

4) Choose `Americas` (default) to select zone, then press `F10`.

5) Choose locale `C (English)` (default), then press `F10`.

6) Choose `United States` (default) keyboard, then press `F10`.

7) Enter your license information. (This information can be acquired from your Caldera UnixWare representative.) Press `F10`.

8) Insert the driver disk.

   In you need to load additional storage drivers:

   a. Insert the first HBA diskette and press the up-arrow key to select `install HBA diskette`. Press `F10`.

   b. The driver will load, and you will be prompted to load additional HBA diskettes. To load additional drivers, repeat the previous steps until all the necessary drivers are loaded. When all the drivers are loaded, press `F10` to `proceed with installation`.

9) The driver packages load to system memory.

   After the kernel loads, but before it runs, the installation process prompts you to insert the appropriate floppy diskette for each BTLD package (`mega`) you specified.

10) Insert the driver diskette into the A: drive to link the driver to the kernel. Proceed with the normal installation.

2.10.3 Driver Installation on an Existing SCO UnixWare System

Perform the following procedure if you are currently running UnixWare and would like to access drives or arrays attached to the RAID controller:

1) Insert the floppy diskette into the A: drive and type:

    ```
    #pkgadd -d diskette1
    ```
    You will be prompted for the name of the package(s) to load.

    Select the package(s) you wish to process (type `all` to process all packages).

2) Type `Mega` and press `Enter`.

    `Mega` is the name of the BTLD packages to be linked into the loaded system kernel. A message will confirm that the installation was successful.

    After the driver package is installed, the driver needs to be linked to the kernel.

3) Enter the following command:

    ```
    # /etc/conf/bin/idbuild
    ```

4) Select `Y` (yes) at the following prompts:

    ```
    Do you want this kernel to boot by default? (y/n)
    ```

    ```
    Do you want the kernel environment rebuilt? (y/n)
    ```

5) Reboot the server.

Chapter 3
Intel® RAID BIOS Console Configuration Utility

3.1 General Description

The BIOS Console Configuration Utility provides a GUI utility to configure and manage RAID volumes. The utility configures disk arrays and logical drives. The operation of the utility is independent of the operating system because the utility resides in the controller firmware.

The BIOS Console utility:

- Selects adapters
- Displays adapter properties
- Scans devices
- Displays the physical properties of devices
- Configures physical drives
- Defines logical drives
- Displays logical drive properties
- Initializes logical drives
- Checks data for consistency

The BIOS Console utility provides a configuration wizard to guide you through the configuration of logical drives and physical arrays.

3.2 Quick Configuration Steps

This section provides the steps to configure arrays and logical drives using the BIOS Console utility. The following sections describe how to perform each action using the BIOS Console utility. The steps are:

1) Power-on the system.

2) Start the BIOS Console utility by pressing <Ctrl>-<G>.

3) Start the Configuration Wizard.

4) Choose a configuration method.

5) Create arrays using the available physical drives.

6) Define the logical drive(s) using the space in the arrays.

7) Initialize the new logical drives.

3.3   Starting the BIOS Console Utility on the Host Computer

When the host computer boots, hold the <Ctrl> key and press the <G> key when the following appears:

    Press <Ctrl>-<G> for BIOS Console

After you press <Ctrl>-<G>, the Adapter Selection screen displays. Select an adapter and press the Start button 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 the subsection entitled "Configuration Mismatch Screen" on page 39.

3.4   Screen and Option Descriptions

This section describes the various BIOS Console screens and options as shown in the following figure.
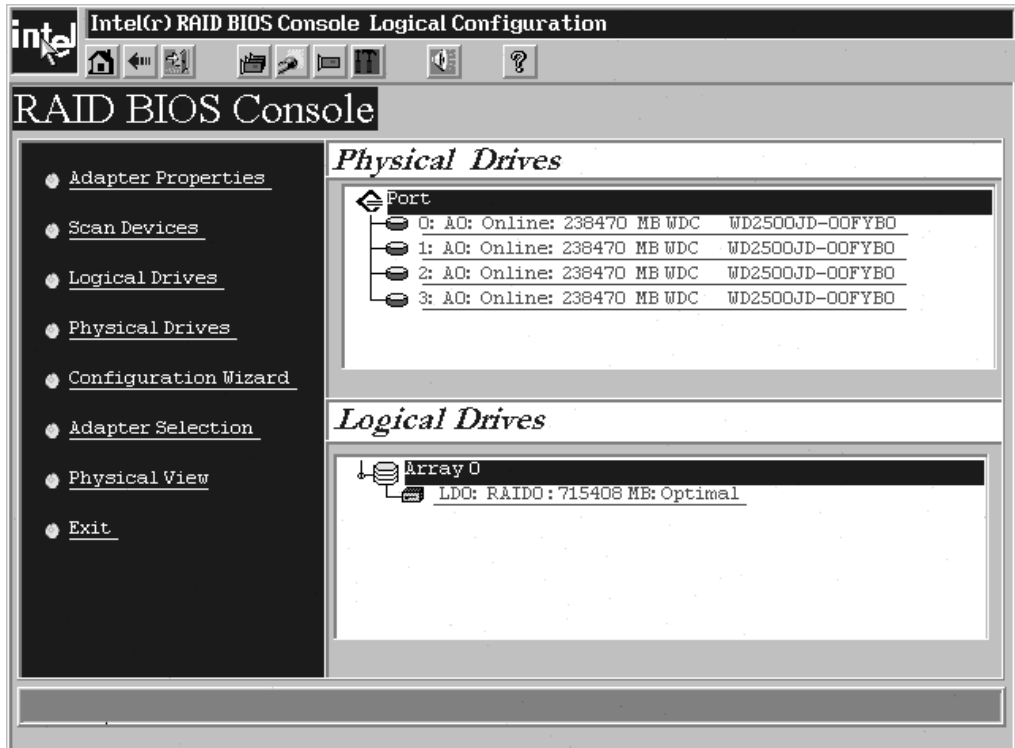
3.4.1 Toolbar Options

Table 3-1 describes the BIOS Console toolbar icons.

Table 3-1   BIOS Console Toolbar Icon Descriptions

Icon	Description
	Click on this icon to return to the main screen.
	Click on this icon to return to the page you accessed immediately before the current page.
	Click on this icon to exit the BIOS Console program.
	Click on this icon to display the adapters that you can select.
	Click on this icon to scan for adapters connected to your system.
	Click on this icon to display the properties of the adapter, such as the firmware version, BIOS version, RAM size, and initiator ID.
	Click on the icon to access the Configuration Wizard so that you can configure the arrays and logical drives.
	Click on this icon to silence the sound on the alarm.

3.4.2 Main Screen

When you press <Ctrl>-<G> on the host computer, the configuration utility displays the main screen (see previous figure). From the main screen you can scan the devices connected to the controller, select an Intel RAID adapter (if multiple adapters are in the system), and alternate between the physical devices view and the logical devices view. The main screen also provides access to the following screens: Adapter Properties, Physical Devices, Logical Devices, and Configuration Wizard.

3.4.2.1 Adapter Properties Screen

When you select the Adapter Selection option on the main screen, BIOS Console displays a list of the Intel RAID adapters in the system.

The Adapter Properties screen allows you to view and configure the software and hardware of the selected adapter. You access the Adapter Properties screen from the BIOS Console main screen. Table 3-2 describes the Adapter Properties menu options.

Table 3-2   Adapter Properties Menu Options

Option	Description
Firmware Version	This option displays the firmware version number.
BIOS Version	This option displays the BIOS version number.
Battery Backup	This option displays if the optional battery backup unit is installed.
RAM Size	This option displays the amount of RAM on the RAID adapter.
Cluster Mode	This option enables cluster mode.
Initiator ID	This option configures the initiator ID for cluster mode.
Rebuild Rate	This option sets the rebuild rate.
Alarm Control	This option disables or silences the alarm.
Coercion Algorithm	This option sets the size of the drive for the coercion operation
BIOS Stops on Error	This option sets if the adapter POST stops if an error occurs.
BIOS Echoes Messages	This option sets if the adapter POST echoes error messages.
BIOS Config Auto Selection	This option sets the action for NVRAM mismatched correction.
Spin Up Parameters	This option sets the hard disk drive spin up delay timing
FlexRAID PowerFail	This option enables the FlexRAID PowerFail feature, which allows drive reconstruction to continue when the system restarts after a power failure. Reserves 2 MB for rebuild and Online Capacity Expansion (OCE). Recommend that this option be enabled.
Fast Initialization	This option sets the span of the logical drive initialization.
PCI Delay Transfer	This option enables PCI delay transfers.
Adapter BIOS	This option enables the adapter BIOS.
Set Factory Defaults	This option loads the default Intel RAID BIOS Console CU settings.
Auto Rebuild	This option automatically rebuilds drives when they fail.
Class Emulation Mode	This option is preset for Mass Storage as class emulation mode.

3.4.2.2 Scan Devices Option

When you select the Scan Devices option on the Main screen, BIOS Console checks the physical and logical drives for any changes of the drive status. BIOS Console displays the results of the scan in the physical and logical drive descriptions.

3.4.2.3 SCSI (or SATA) Channel Properties

When you select this option, properties of the SCSI or SATA channel can be viewed. Depending on the I/O bus properties, options available may include bus speed selection and termination configuration.

3.4.2.4 Logical Drives Screen

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

- Initialize the logical drives
- Check consistency
- Display the logical drive properties
- Boot from a logical drive

Press **Go** to perform the selected action. Press **Reset** to delete any changes.

Initialization – The Initialize option initializes the selected logical drive by writing zeroes to the entire volume. You should initialize each new logical drive that you configure.

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

Check Consistency – This option verifies the correctness of the redundancy data and is available for arrays using RAID 1, 5, 10, or 50. If a difference in the data is found, BIOS Console assumes that the data is accurate and automatically corrects the parity value.

Properties – Through the Properties option you can:

- Display the logical drive properties (such as RAID level, logical drive size, and stripe size)
- Display the read, write, and I/O policies
- Change the read, write, and I/O policies
- Start initialization
- Start a consistency check

3.4.2.5 Physical Drives Screen

This screen displays the physical drives for each channel or port. From this screen, you can rebuild the physical arrays or view the properties for the physical drive you select. Press **Reset** to return to the configuration that existed before you made any changes.

3.4.2.6 Configuration Wizard Option

This option enables you to clear a configuration, create a new configuration, or add a configuration. Section 3.5, "Detailed Configuration Instructions," provides detailed steps for using the Configuration Wizard.

3.4.2.7 Adapter Selection

This option allows you to choose an Intel RAID adapter installed in the system.

3.4.2.8 Physical View/Logical View Option

This option toggles between Physical View and Logical View.

3.4.2.9 Exit

This option allows you to exit and reboot the system.

3.4.3 Configuration Mismatch Screen

A configuration mismatch occurs when the data in the NVRAM and the hard disk drives are different. It will be automatically displayed 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

3.5   Detailed Configuration Instructions

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

3.5.1   Configuration Wizard

- Start the Configuration Wizard by selecting the **Configuration Wizard** icon on the BIOS Console main screen.
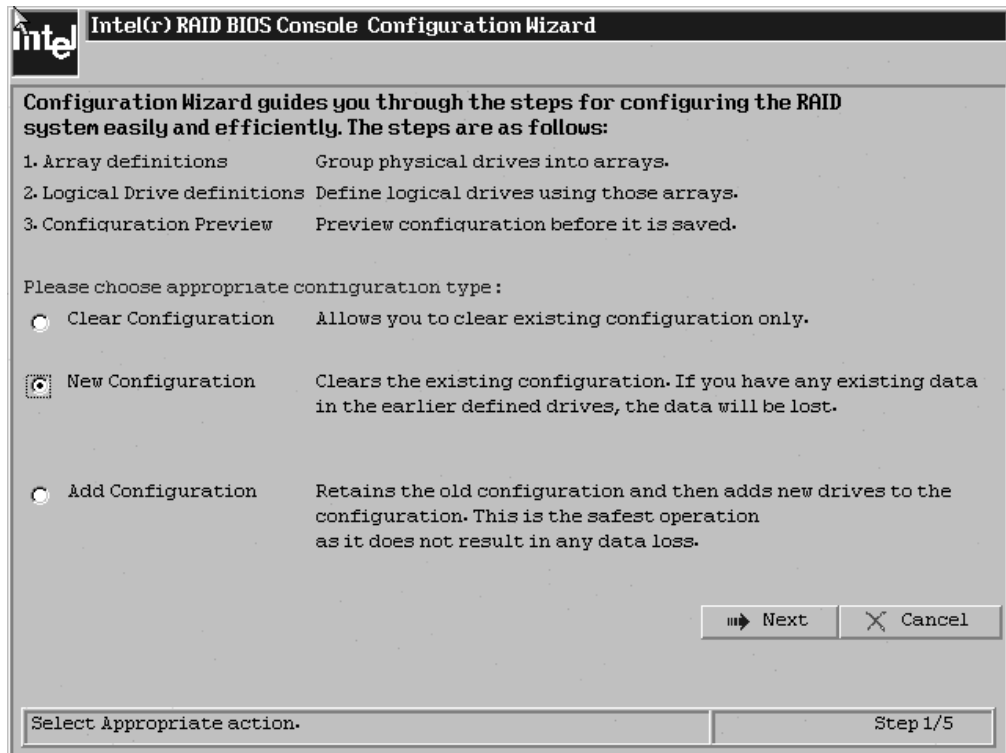
- Select the configuration method.

Select Auto configuration with redundancy, Auto configuration without redundancy, or Custom configuration. These options are described below.

3.5.1.1   Auto Configuration with Redundancy

This option configures RAID 1 for systems with 2 drives or RAID 5 for systems with 3 or more drives. All available physical drives will be included in the logical drive using all available capacity on the disks.

Note: Hot spare drives must be designated before starting auto configuration using all available capacity on the disks.

3.5.1.2   Auto Configuration without Redundancy

Configures all available drives as a RAID 0 logical drive.

3.5.1.3 Custom Configuration

Choose Custom Configuration and select **Next**.

- Define the drive arrays.

At the array definition screen, hold down the CTRL key and click each drive you want included in the array. To undo the changes, press the **Reclaim** button.

Click **Accept Array** and **Next**.

- Configure the logical drive.

  The logical drive parameters are the RAID level, stripe size, and read-ahead policy.
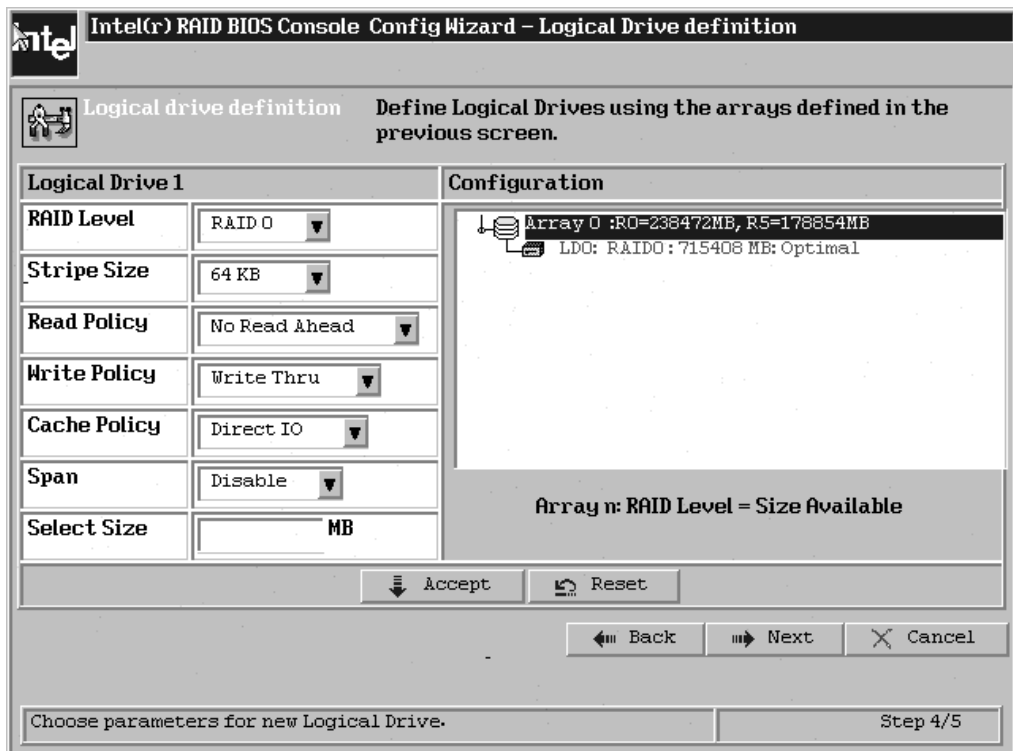
RAID Level – Choose the RAID level.

Stripe Size – Specify the size of the segment written to each disk in a RAID configuration. You can set the stripe size to 4, 8, 16, 32, 64, or 128 Kbytes. The default is 64 Kbytes.

Read Policy – Enables the read-ahead feature for the logical drive. You can set this parameter to Normal, Read-ahead, or Adaptive. Normal specifies that the controller does not use read-ahead for the current logical drive. Read-ahead specifies that additional consecutive stripes are Read and Buffered into Cache. This option will improve performance for sequential reads. Adaptive specifies that the controller begins using read-ahead if the two most recent disk accesses occurred in sequential sectors. Read-ahead is the default setting.

Write Policy – Use this screen to select the write and cache policies. The write policy parameter specifies the cache write policy. You can set the write policy to Write-back or Write-through. In Write-back caching, the controller sends a data transfer completion signal to the host when the controller cache receives all the data in a transaction. In 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 is the default setting. Write-through caching has a data security advantage over write-back caching. 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.

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

Cache Policy – The cache policy applies to I/O on a specific logical drive. It does not affect the read ahead cache. The options are Cached I/O or Direct I/O. Cached I/O buffers all reads in cache memory. Direct I/O does not buffer reads in cache memory. When possible, Direct I/O does not override the cache policy settings. Direct I/O transfers data to cache and the host concurrently. If the same data block is read again, the host reads it from cache memory.

Span – Enable or disable the spanning mode for the current logical drive. If spanning is enabled, the logical drive can occupy space in more than one array. If spanning is disabled, the logical drive can occupy space in only one array.

For two arrays to be spannable, they must have the same stripe width and must be consecutively numbered. If these criteria are not met, the utility ignores the Span setting.

Spanning allows the logical drive to stripe across multiple arrays. Using this option enables the use of RAID 10 and RAID 50.

> RAID 10: To configure a RAID 10 array, create multiple RAID 1 drive arrays (minimum of two) and enable the span option, then choose the size of the logical drive. It is possible to span up to eight arrays in a logical drive. When looking at the logical drive, you will not see a "RAID 10" label, but you will see multiple arrays in the logical drive representing a RAID 10 configuration.

> RAID 50: To configure a RAID 50 array, create multiple RAID 5 drive arrays (minimum of two) and enable the span option, then choose the size of the logical drive. It is possible to span up to 8 arrays in a logical drive. When looking at the logical drive, you will not see a "RAID 50" label, but you will see multiple arrays in the logical drive representing a RAID 50 configuration.

Select Size – Set the size of the logical drive in Mbytes. The right pane of the logical drive configuration window will list the maximum capacity that can be selected, depending on the RAID level chosen.

- Accept the changes.

  Click on the **Accept** button to accept the changes, or click on the **Reset** button to delete the changes and return to the previous settings.

- Check the configuration preview.

  The BIOS Console Configuration Utility displays a preview of the configuration. Click on **Accept** to save the configuration, or click on **Back** to return to the previous screens and change the configuration.

3.5.1.4 Finish Configuration

- Click on the **Next** button and then the **Accept** button to complete the selection.
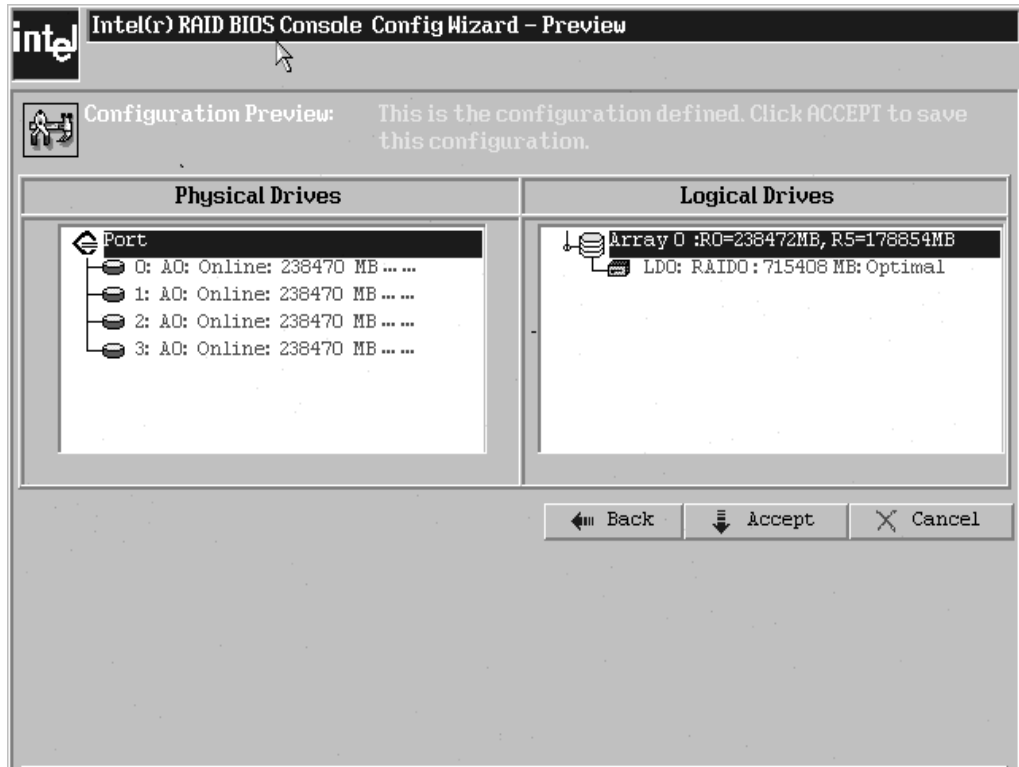
- Choose **Accept** to accept the configuration. You are prompted to save the configuration and then to initialize the logical drive.
- Choose **Yes** to initialize the local drive.

3.5.1.5 Initialize the Drive

- Click Initialize to begin the initialization process.

  If fast initialization is selected as the default for the adapter properties, a preliminary initialization will complete within seconds and full initialization will run in the background after the operating system is booted.

  If fast initialization is not selected as the default for the adapter properties, the initialization may take up to two hours to complete.
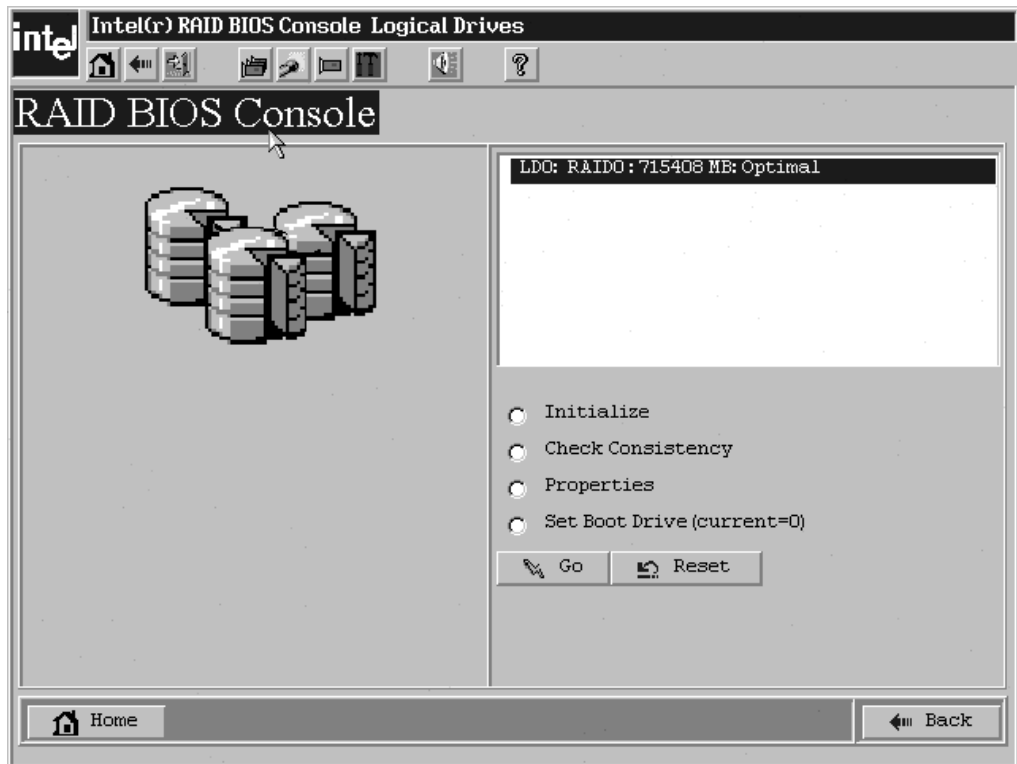
- Click the Home button to return to the main configuration screen. Select an additional logical drive to configure or exit the BIOS Console Configuration Utility and reboot the server system.

Chapter 4
Configuring RAID Drives Using the RAID BIOS Console

This section describes how to setup different RAID configurations using RAID BIOS Console. The examples use a system with at least 6 available drives to illustrate how to setup the various RAID configurations. The steps to create a RAID level on a logical drive are:

1) Perform the necessary steps to prepare for a Custom Configuration option before configuring the appropriate RAID level for your application. These steps are covered in the next section

2) After the custom configuration option has been selected refer to one of the appropriate sections that follow to setup a RAID 0, RAID 1, RAID 5, RAID 10 or RAID 50.

4.1   Generating a Custom Configuration

At the POST screen press <CTRL> <G> to enter the RAID BIOS Console.

Figure 4.0   Generating a Custom Configuration


```
RAID Controller BIOS Version G401 (Build Jun 22, 2004)

[ PCI 2/3 ] Self-tests OK, IRQ 11
[ PCI 2/3 ] Intel(R) RAID Controller SRCU41L Firmware Version 314G
[ PCI 2/3 ] DRAM =64MB (SDRAM)
[ PCI 2/3 ]   Channel-0 ID-0 -- SEAGATE   ST336753LC        (320MB/s)
[ PCI 2/3 ]   Channel-0 ID-1 -- SEAGATE   ST336753LC        (320MB/s)
[ PCI 2/3 ]   Channel-0 ID-2 -- SEAGATE   ST336753LC        (320MB/s)
[ PCI 2/3 ]   Channel-0 ID-3 -- SEAGATE   ST336753LC        (320MB/s)
[ PCI 2/3 ]   Channel-0 ID-4 -- SEAGATE   ST336753LC        (320MB/s)
[ PCI 2/3 ]   Channel-0 ID-5 -- SEAGATE   ST336753LC        (320MB/s)
[ PCI 2/3 ]   Channel-0 ID-8 -- ESG-SHV SCA HSBP M27
[ PCI 2/3 ] 1 Logical Drive(s) found on the host adapter.
1 Logical Drive(s) handled by BIOS
_

>>>>>>  Press <Ctrl><G> to enter the RAID BIOS Console  <<<<<<
Copyright (c) 2004 LSI Logic Corp.        All rights reserved !
```

When the BIOS Console Starts select the "Configuration Wizard" option on the left hand menu.
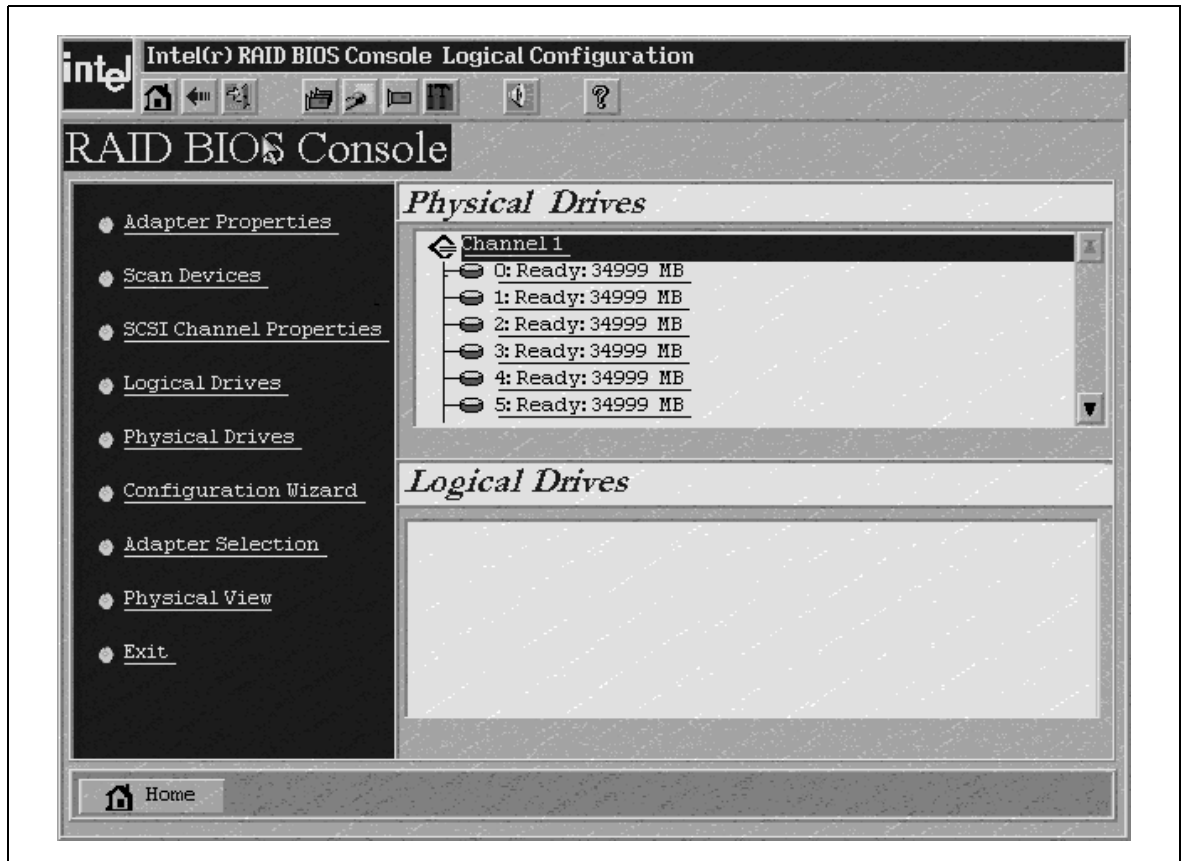
At the Configuration Selection Screen, choose "New Configuration" and click the <Next> button.

Intel(r) RAID BIOS Console Configuration Wizard

Configuration Wizard guides you through the steps for configuring the RAID system easily and efficiently. The steps are as follows:

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 configuration type:

○ Clear Configuration — Allows you to clear existing configuration only.

◉ New Configuration — Clears the existing configuration. If you have any existing data 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   ✕ Cancel

Select Appropriate action.   Step 1/5

At the Console configuration Screen select "Custom Configuration" and click the <Next> button.

```
┌─────────────────────────────────────────────────────────────────────┐
│ ┌────┐ Intel(r) RAID BIOS Console Configuration Wizard               │
│ │intel│                                                              │
│ └────┘                                                               │
│ Wizard can define the most efficient configuration for your system(Auto Configuration), │
│ or if you are an experienced user, Wizard can take you through the steps │
│ (Custom Configuration).                                             │
│                                                                     │
│  ⊙  Custom Configuration:              Allows you to define all aspects of the │
│                                        configuration, arrays, logical drives, and │
│                                        their parameters.            │
│                                                                     │
│  ○  Auto Configuration:  With Redundancy  Automatically creates redundant arrays and │
│     (Recommended)                      logical drives, where possible, and sets their │
│                                        parameters.                  │
│                                                                     │
│  ○  Auto Configuration:  Without Redundancy  Automatically creates non-redundant arrays │
│                                        and logical drives, and sets their parameters. │
│                                                                     │
│                                                                     │
│                                                                     │
│                                                                     │
│                                                                     │
│                            ┌────────────┬─────────────┬──────────────┐ │
│                            │ ◄▥ Back    │ ▥► Next     │ ✕ Cancel     │ │
│                            └────────────┴─────────────┴──────────────┘ │
│                                                                     │
│ ┌──────────────────────────────────────────────┬──────────────────┐ │
│ │ Select Appropriate configuration type.        │      Step 2/5    │ │
│ └──────────────────────────────────────────────┴──────────────────┘ │
└─────────────────────────────────────────────────────────────────────┘
```

6. The RAID BIOS Console will now display the array definition screen. This screen defines the arrays of logical drives needed for your RAID configuration. Jump to the appropriate section that follow to setup a RAID 0, 1, 5, 10 or 50 based on your application needs.

4.2   RAID 0 Configuration Using BIOS Console

RAID 0 splits striped data across a number of hard disks. This improves performance for video streaming and high speed applications since data is stored and retrieved across multiple drives. RAID 0 has no redundancy; therefore hot spare drives in this configuration have no use. A RAID 0 logical drive can consist of up to 40 physical drives with data striped across them; although limited to the physical capabilities of the controller. For example, the Intel® SRCS16 RAID controller can accommodate up to 6 SATA drives and the Intel® SRCU42X RAID controller can accommodate up to 30 SCSI drives. Because RAID 0 is not redundant, if one physical drive member is lost, all data on the logical drive is lost; therefore, this configuration is not suitable for critical data.

The steps for setting up a RAID 0 with 2 drives are listed below:

1) In the array definition screen, select the drives to be included in the RAID 0 array by holding down the <CTRL> key and clicking on each individual drive icon using your mouse until the target drives are highlighted.

2) Select the accept button and the defined array will show up in the right pane.
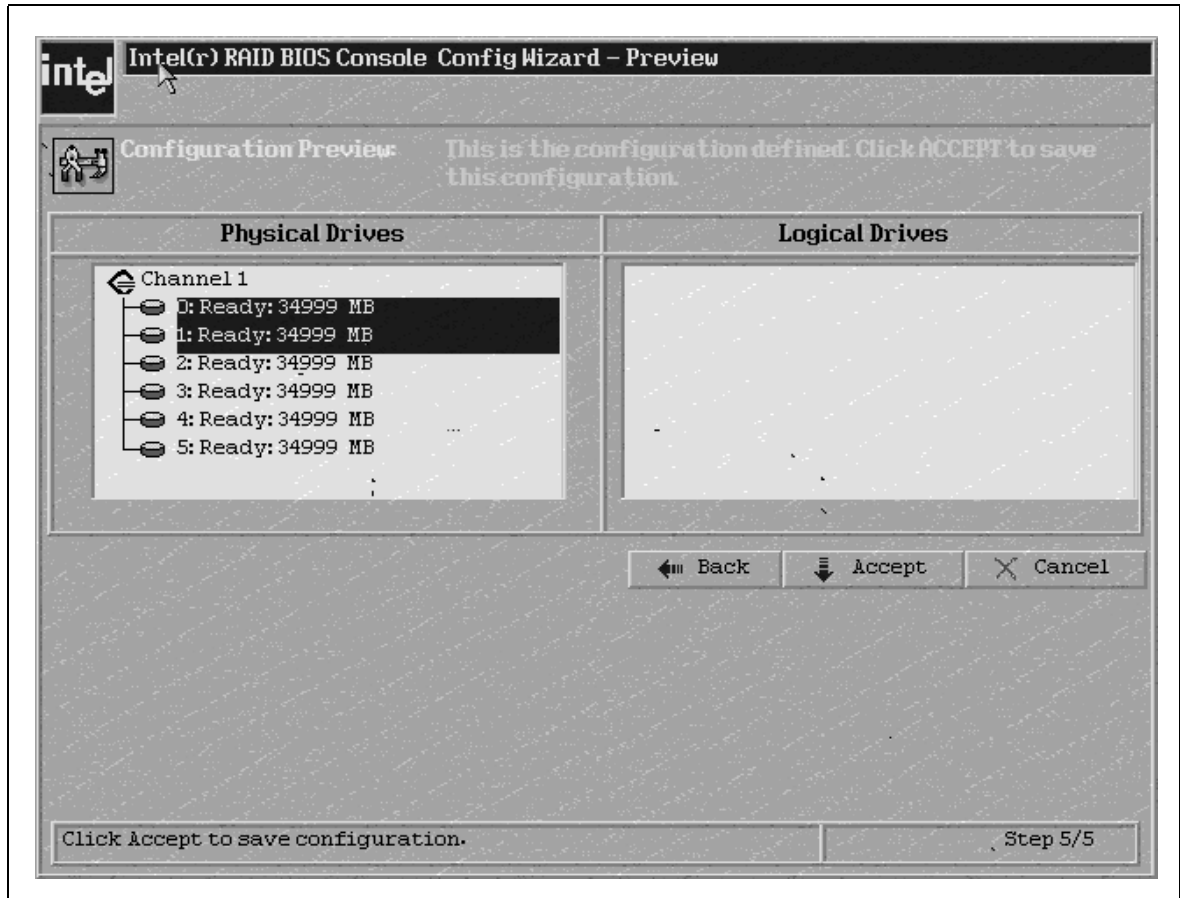
3) Click the <Accept Array> button and then the <Next> button to accept the array.

```
┌──────────────────────────────────────────────────────────────────────────────┐
│ intel  Intel(r) RAID BIOS Console  Config Wizard – Array definition            │
├──────────────────────────────────────────────────────────────────────────────┤
│ ┌───┐ Array Definition:    To add drives to an Array, hold Control key while    │
│ │   │                      selecting Ready drives and click on Accept Array.    │
│ └───┘                      Drive addition can be undone by selecting the        │
│                            Reclaim button.                                      │
│                                                                                 │
│        Physical Drives                            Arrays                        │
│   ┌─────────────────────────┐         ┌─────────────────────────────────────┐  │
│   │ Channel 1               │         │ Array 1 :R0=69998MB, R1=34999MB    │  │
│   │   0: Online: 34999 MB   │         │    Ch1  ID0: Online: 34999MB       │  │
│   │   1: Online: 34999 MB   │         │    Ch1  ID1: Online: 34999MB       │  │
│   │   2: Ready: 34999 MB    │         │                                     │  │
│   │   3: Ready: 34999 MB    │         │                                     │  │
│   │   4: Ready: 34999 MB    │         │                                     │  │
│   │   5: Ready: 34999 MB    │         │                                     │  │
│   └─────────────────────────┘         └─────────────────────────────────────┘  │
│   ┌─────────────────────────┐    ┌──────────────────┐  ┌──────────────┐        │
│   │      Reset              │    │   Accept Array   │  │   Reclaim    │        │
│   └─────────────────────────┘    └──────────────────┘  └──────────────┘        │
│                                  ┌────────┐ ┌────────┐ ┌──────────┐             │
│                                  │  Back  │ │  Next  │ │  Cancel  │             │
│                                  └────────┘ └────────┘ └──────────┘             │
│                                                                                 │
│  Select Ready drives and add to array.                          Step 3/5       │
└──────────────────────────────────────────────────────────────────────────────┘
```
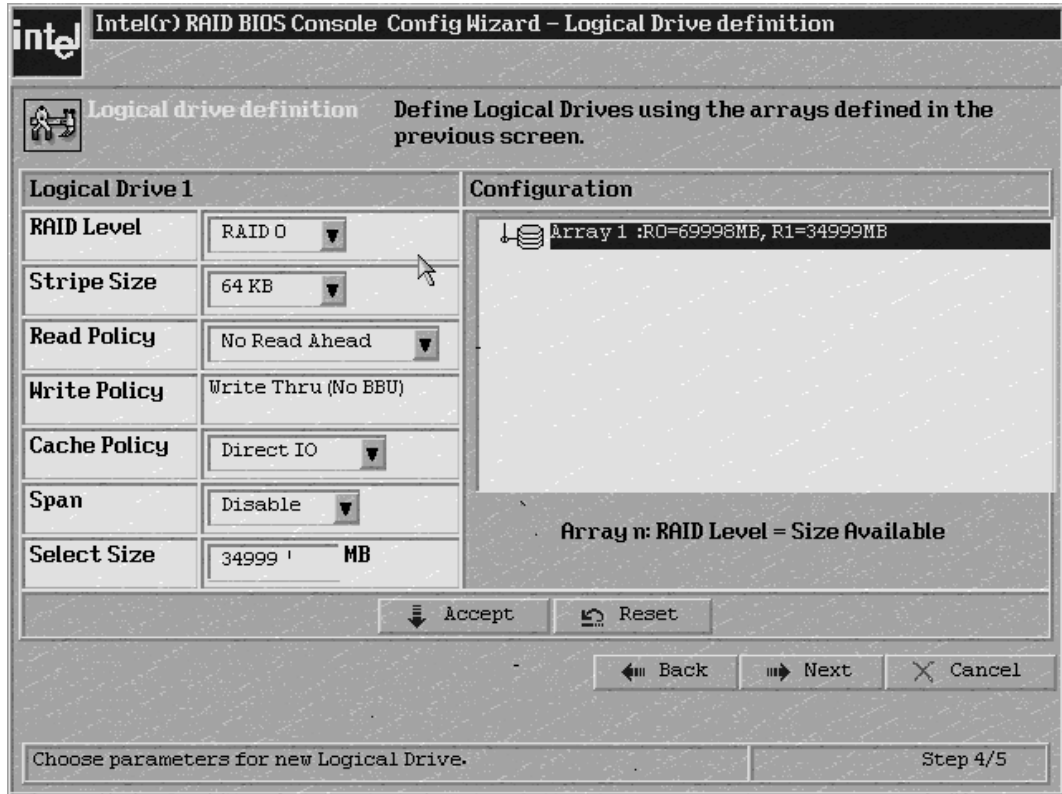
4) At logical drive definition window, select raid level 0, and then select the appropriate
    parameters for your application. Enter the size of the logical drives. The size of the drive
    is shown for both RAID 0 and RAID 1 next to the array definition. In this case, the size
    of the drive should be set to 69998 MB to maximize the size for a RAID 0. See the
    section "Setting Logical Drive Parameters", for setting up the remaining parameters.
    After the parameters have been selected, hit the <Next> key to accept the settings.

Intel(r) RAID BIOS Console Config Wizard – Logical Drive definition

Logical drive definition — Define Logical Drives using the arrays defined in the previous screen.

Logical Drive 1		Configuration
RAID Level	RAID 0 ▼	Array 1 :R0=69998MB, R1=34999MB
Stripe Size	64 KB ▼	
Read Policy	No Read Ahead ▼	
Write Policy	Write Thru (No BBU)	
Cache Policy	Direct IO ▼	
Span	Disable ▼	
Select Size	34999 MB	Array n: RAID Level = Size Available

↓ Accept   ↺ Reset

◄ Back   ► Next   ✕ Cancel

Choose parameters for new Logical Drive.   Step 4/5

5) Hit the <Accept> button to create the array. The logical drive should be defined as a RAID 0 as shown below. Hit the <Next> Button to preview the configuration.

Intel(r) RAID BIOS Console Config Wizard – Logical Drive definition

Logical drive definition — Define Logical Drives using the arrays defined in the previous screen.

Logical Drive 2

RAID Level	RAID 0 ▼
Stripe Size	64 KB ▼
Read Policy	No Read Ahead ▼
Write Policy	Write Thru (No BBU)
Cache Policy	Direct IO ▼
Span	Disable ▼
Select Size	MB

Configuration

Array 1 :R0=34998MB, R1=17499MB
  LD1: RAID0 : 34999 MB: Optimal

Array n: RAID Level = Size Available

⬇ Accept   ↺ Reset

◀ Back   ▶ Next   ✕ Cancel

Choose parameters for new Logical Drive.   Step 4/5

6) The configuration preview screen displays the configured RAID 0 logical drive. Hit the <Accept> button to save the configuration.

Intel(r) RAID BIOS Console Config Wizard – Preview

Configuration Preview   This is the configuration defined. Click ACCEPT to save this configuration.

Physical Drives

Channel 1
  0: A1: Online: 34999 MB … …
  1: A1: Online: 34999 MB … …
  2: Ready: 34999 MB
  3: Ready: 34999 MB
  4: Ready: 34999 ME
  5: Ready: 34999 ME

Logical Drives

Array 1 :R0=34998MB, R1=17499MB
  LD1: RAID0 : 34999 MB: Optimal

◀ Back   ⬇ Accept   ✕ Cancel

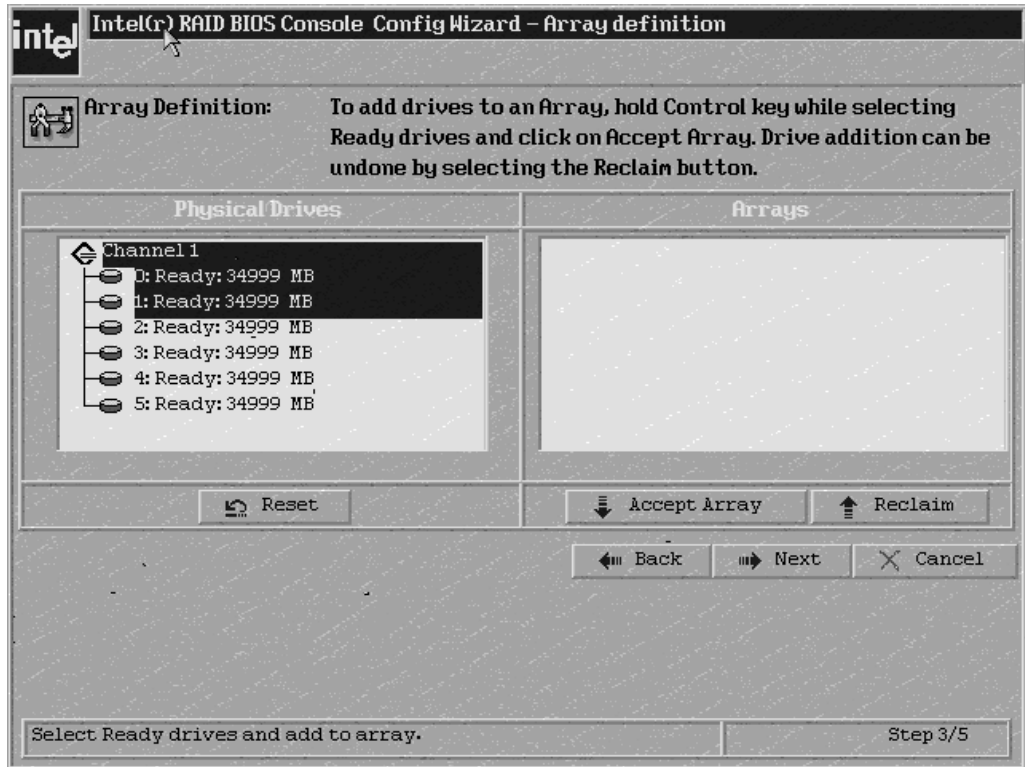Click Accept to save configuration.   Step 5/5
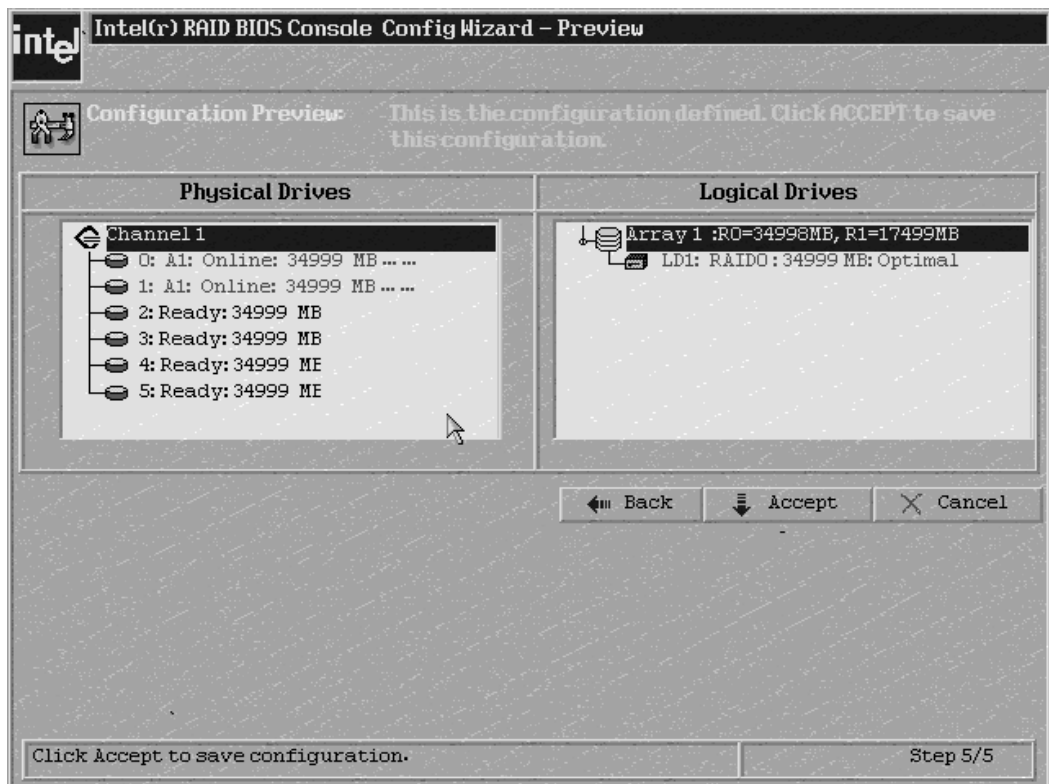
7) Select the <Yes> button when asked to Save the configuration. This stores the RAID 0 configuration in the raid controller.

8) Select the <Yes> button when asked to initialize the drive. The drives initialize based on the RAID settings.

9) Select the <home> button at the BIOS Console screen to return to the main screen.

10) The setup of the RAID 0 configuration is now complete.

4.3   RAID 1 Configuration Using BIOS Console

A RAID 1 configuration does not support more than two drives in an array or an odd number of drives. The RAID 1 configuration option is not presented at the array configuration window if more than 2 drives are selected for an array. In a RAID one configuration, the data is "mirrored" on the second drive. Raid 1 is ideal for any applications that require fault tolerance such as the operating system drive or databases. In the event of a single drive failure, data for that drive can be rebuilt from data information that is held on the other drive member. This configuration requires two drives to store the data. In this configuration, a hot spare drive has great value. If one of the drives fails in the array, the data will automatically be rebuilt with the hot spare. Hot spare drive creation is described in section "Creating a Hot Drive Spare".

In the array definition screen, select two drives by holding the <CTRL> key and selecting the two drives with your mouse that are to be used in the RAID 1 array. See the figure below.

With the drives highlighted, click the <Accept Array> button. The proposed drive array will show up in the right pane.
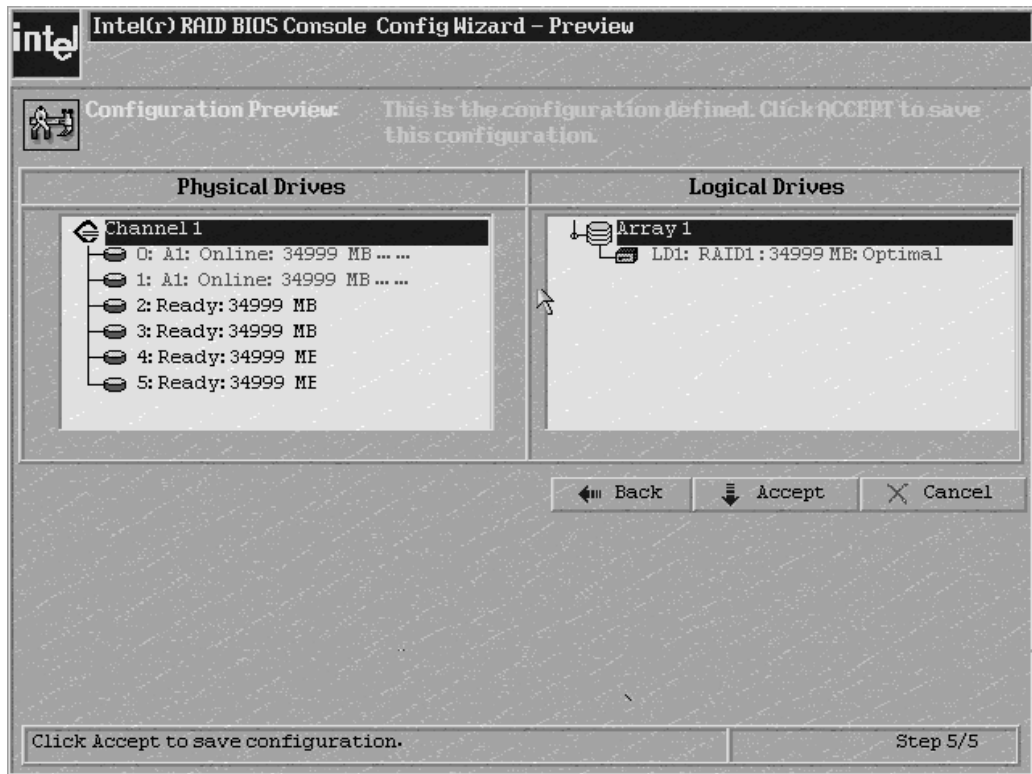
1.) Hit the <Accept Array> button and then <Next> to accept the array.

Configuring RAID Drives Using the RAID BIOS Console
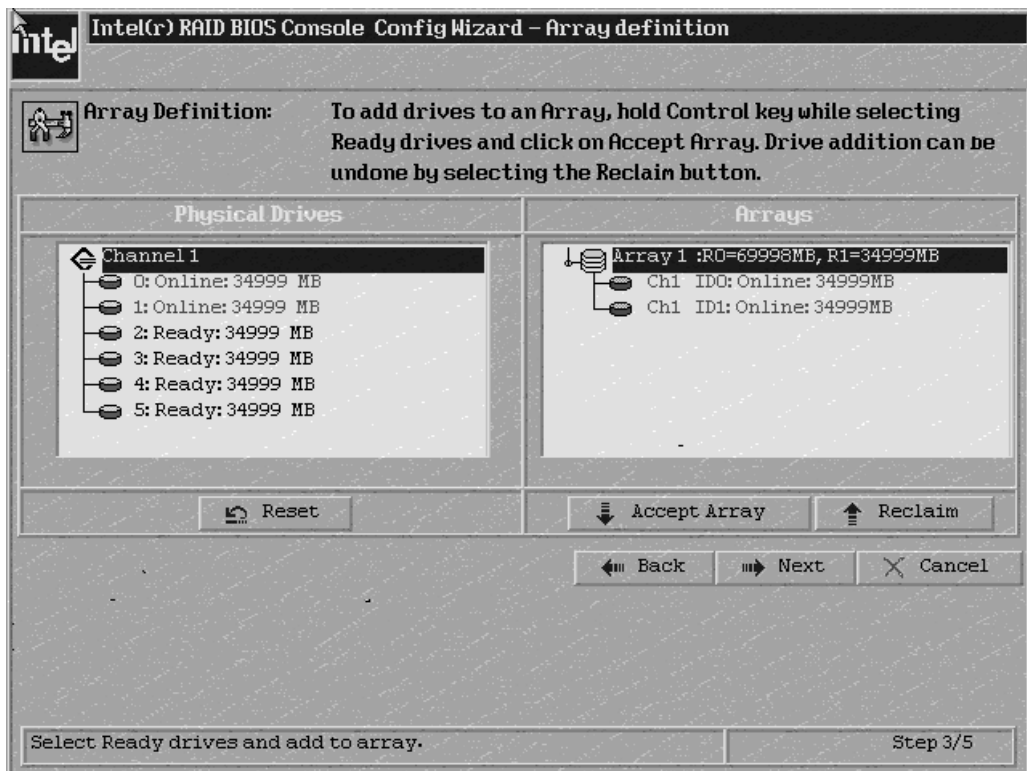
2.) At logical drive definition window, select raid level 1, set the size of the drive to 34999MB and then select the appropriate parameters for your application. See the section "Setting Logical Drive Parameters" to configure the rest of the parameters. Once they have been set, hit the <accept> button to define the RAID 1 logical drive.
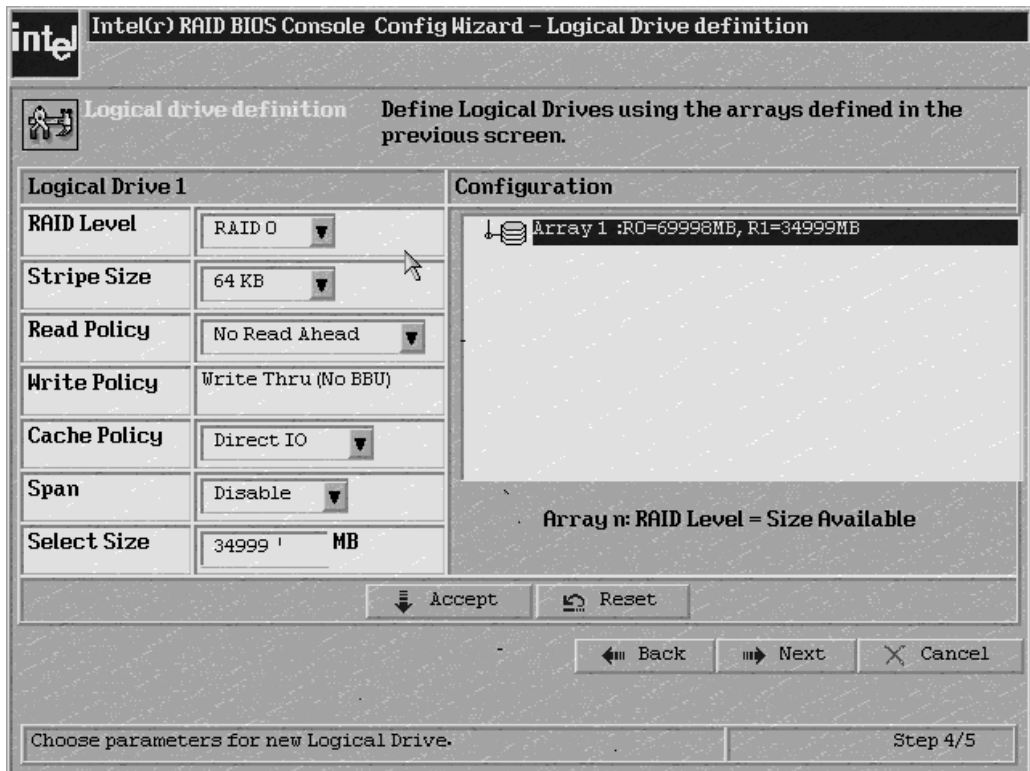
3.) At the configuration preview screen, verify that the logical drive has been created as a RAID 1 and hit the <Accept> button.
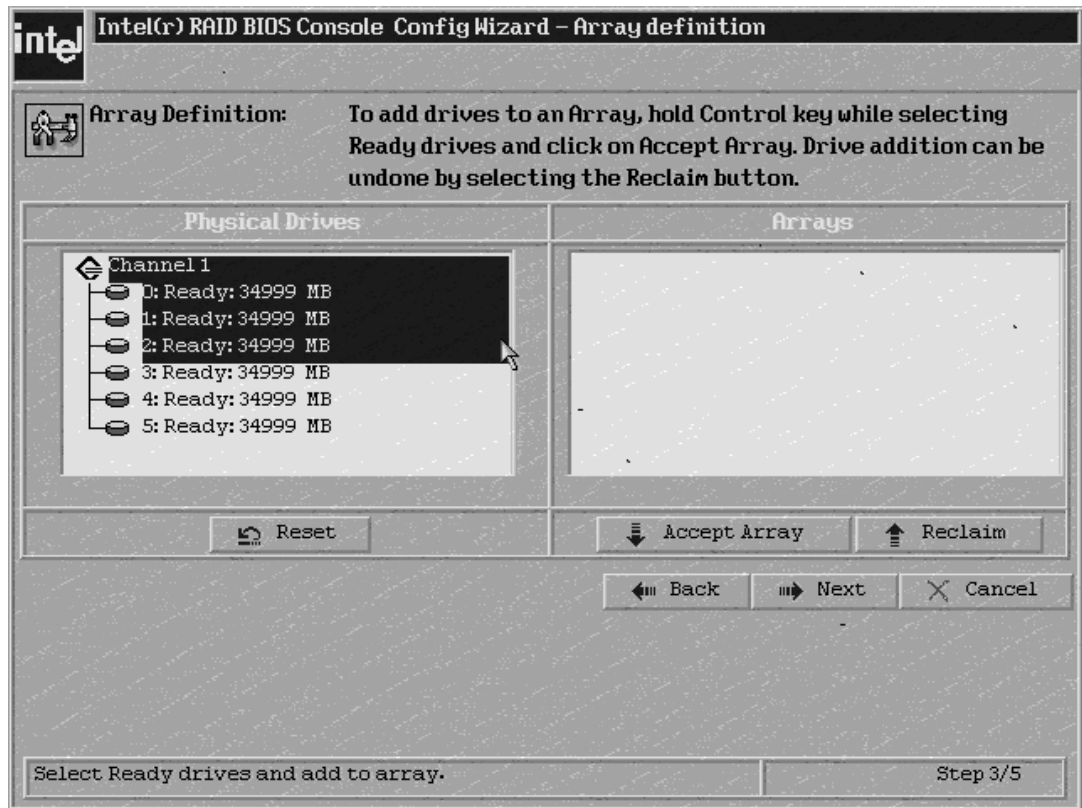
Intel(r) RAID BIOS Console Config Wizard – Preview

Configuration Preview: This is the configuration defined. Click ACCEPT to save this configuration.

Physical Drives

Channel 1
- 0: A1: Online: 34999 MB ... ...
- 1: A1: Online: 34999 MB ... ...
- 2: Ready: 34999 MB
- 3: Ready: 34999 MB
- 4: Ready: 34999 ME
- 5: Ready: 34999 ME

Logical Drives

Array 1
- LD1: RAID1 : 34999 MB: Optimal

◀ Back   ↧ Accept   ✕ Cancel

Click Accept to save configuration.   Step 5/5

4.) Select the <Yes> button when asked to Save the configuration. This will store the RAID 1 configuration in the raid controller.

5.) Select the <Yes> button when asked to initialize the drive. The drives will initialize based on the RAID settings.

6.) Select the <Home> button at the BIOS Console screen to return to the main screen.
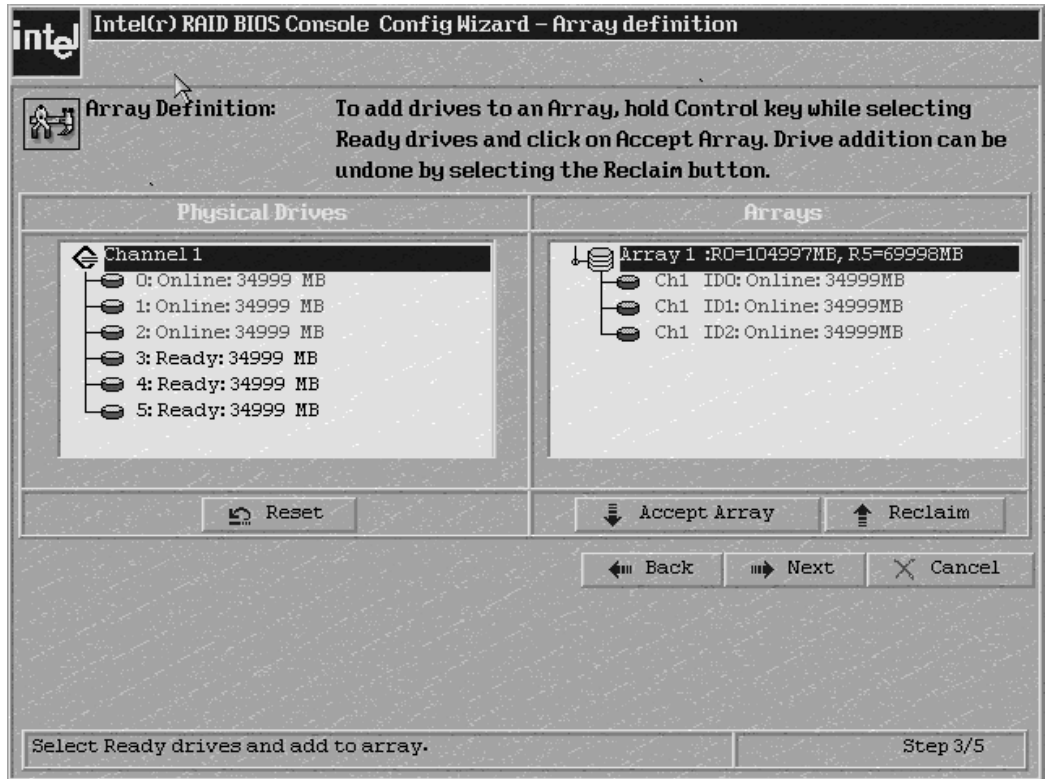
4.4   RAID 5 Creation Using BIOS Console

A RAID 5 logical drive consists of up to 40 physical drives with data striped across them. The number of drives is limited to the physical capabilities of the controller. For example, the SRCS16 controller can accommodate up to 6 SATA drives and an SRCU42X controller can accommodate up to 30 SCSI drives. In addition to data, parity is also striped across the drives. In the event of a single drive failure, data for that drive can be rebuilt from parity information that is held on the other logical drive members. RAID 5 provides the benefits of RAID 0 performance as well as RAID 1 data redundancy. In this configuration, hot spare drives have great value. For hot spare configuration, see the section "Creating a Hot Spare Drive"
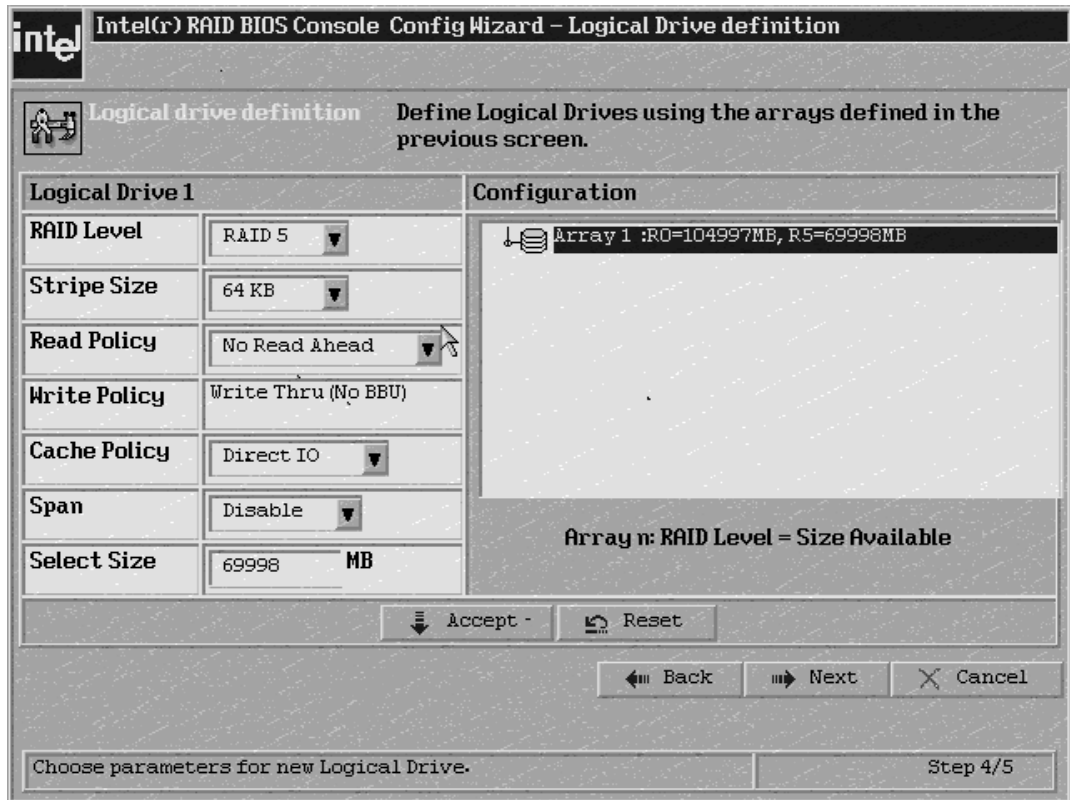
1.) In the array definition window, select three drives by holding the <CTRL> key and click on the each drive icon so that the target drives are highlighted. At least three drives must be selected in order to support a RAID 5 Logical Drive.

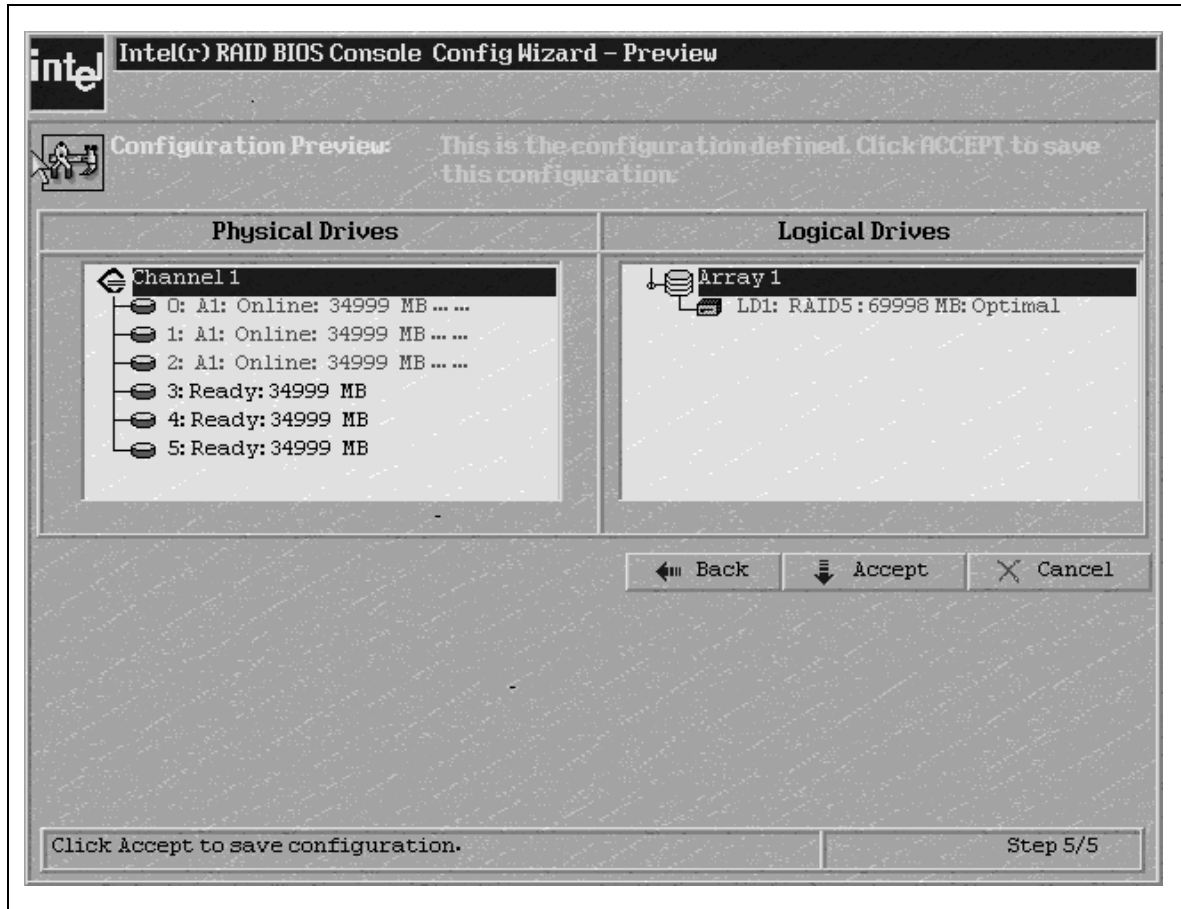2.) Click the <Accept Array> button and the proposed array will show up in the right pane.

Intel(r) RAID BIOS Console Config Wizard – Array definition

intel

Array Definition: To add drives to an Array, hold Control key while selecting
Ready drives and click on Accept Array. Drive addition can be
undone by selecting the Reclaim button.

Physical Drives   **Arrays**

Channel 1
    0: Ready: 34999 MB
    1: Ready: 34999 MB
    2: Ready: 34999 MB
    3: Ready: 34999 MB
    4: Ready: 34999 MB
    5: Ready: 34999 MB

Reset   Accept Array   Reclaim

Back   Next   Cancel

Select Ready drives and add to array.   Step 3/5

3.) Select the <Next> button to move on to the define logical drive screen

```
┌─────────────────────────────────────────────────────────────────────────┐
│ intel  Intel(r) RAID BIOS Console  Config Wizard – Array definition       │
│ ┌──────┐                                                                   │
│ │ 井 │ Array Definition:    To add drives to an Array, hold Control key while selecting │
│ └──────┘                    Ready drives and click on Accept Array. Drive addition can be │
│                             undone by selecting the Reclaim button.        │
│                                                                            │
│        Physical Drives                           Arrays                    │
│  ┌─────────────────────────────┐    ┌─────────────────────────────────┐   │
│  │ ⬦ Channel 1                 │    │ 🗄 Array 1 :R0=104997MB, R5=69998MB │ │
│  │  ├─ 0: Online: 34999  MB    │    │   ├─ Ch1  ID0: Online: 34999MB   │   │
│  │  ├─ 1: Online: 34999  MB    │    │   ├─ Ch1  ID1: Online: 34999MB   │   │
│  │  ├─ 2: Online: 34999  MB    │    │   └─ Ch1  ID2: Online: 34999MB   │   │
│  │  ├─ 3: Ready: 34999  MB     │    │                                  │   │
│  │  ├─ 4: Ready: 34999  MB     │    │                                  │   │
│  │  └─ 5: Ready: 34999  MB     │    │                                  │   │
│  └─────────────────────────────┘    └─────────────────────────────────┘   │
│  ┌─────────────────────────────┐    ┌──────────────────┬────────────────┐ │
│  │        ↺ Reset              │    │  ⬇ Accept Array  │   ⬆ Reclaim    │ │
│  └─────────────────────────────┘    └──────────────────┴────────────────┘ │
│                              ┌──────────┬──────────┬──────────┐            │
│                              │ ⬅ Back   │ ➡ Next   │ ✕ Cancel │            │
│                              └──────────┴──────────┴──────────┘            │
│                                                                            │
│  Select Ready drives and add to array.                        Step 3/5    │
└─────────────────────────────────────────────────────────────────────────┘
```

4.) At logical drive definition window select RAID 5 as the RAID level then enter the rest of the parameters based on your applications needs. See the section "Setting Logical Drive Parameters" for information on setting additional RAID parameters. After they are set, hit the <Accept> button.

Intel(r) RAID BIOS Console Config Wizard – Logical Drive definition

Logical drive definition — Define Logical Drives using the arrays defined in the previous screen.

Logical Drive 1		Configuration
RAID Level	RAID 5 ▼	Array 1 :R0=104997MB, R5=69998MB
Stripe Size	64 KB ▼	
Read Policy	No Read Ahead ▼	
Write Policy	Write Thru (No BBU)	
Cache Policy	Direct IO ▼	
Span	Disable ▼	
Select Size	69998 MB	Array n: RAID Level = Size Available

⬇ Accept -   ↩ Reset

◀▥ Back   ▥▶ Next   ✕ Cancel

Choose parameters for new Logical Drive.   Step 4/5

5.) Hit the <Next> button. The configuration preview windows displays the defined the RAID 5 logical Drive. Verify that the logical drive is defined correctly and then hit accept.

Intel(r) RAID BIOS Console Config Wizard – Preview

Configuration Preview: This is the configuration defined. Click ACCEPT to save this configuration.

Physical Drives	Logical Drives
Channel 1	Array 1
0: A1: Online: 34999 MB … …	LD1: RAID5:69998 MB:Optimal
1: A1: Online: 34999 MB … …	
2: A1: Online: 34999 MB … …	
3: Ready: 34999 MB	
4: Ready: 34999 MB	
5: Ready: 34999 MB	

⬅ Back   ⬇ Accept   ✕ Cancel

Click Accept to save configuration.   Step 5/5

6.) Select the <Yes> button when asked to Save the configuration. This will store the RAID configuration.

7.) Select the <Yes> button when asked to initialize the drive. The drives will initialize based on the RAID settings.

8.) Select the <Home> button at the BIOS Console screen to return to the main screen.

4.5   RAID 10 Creation Using BIOS Console

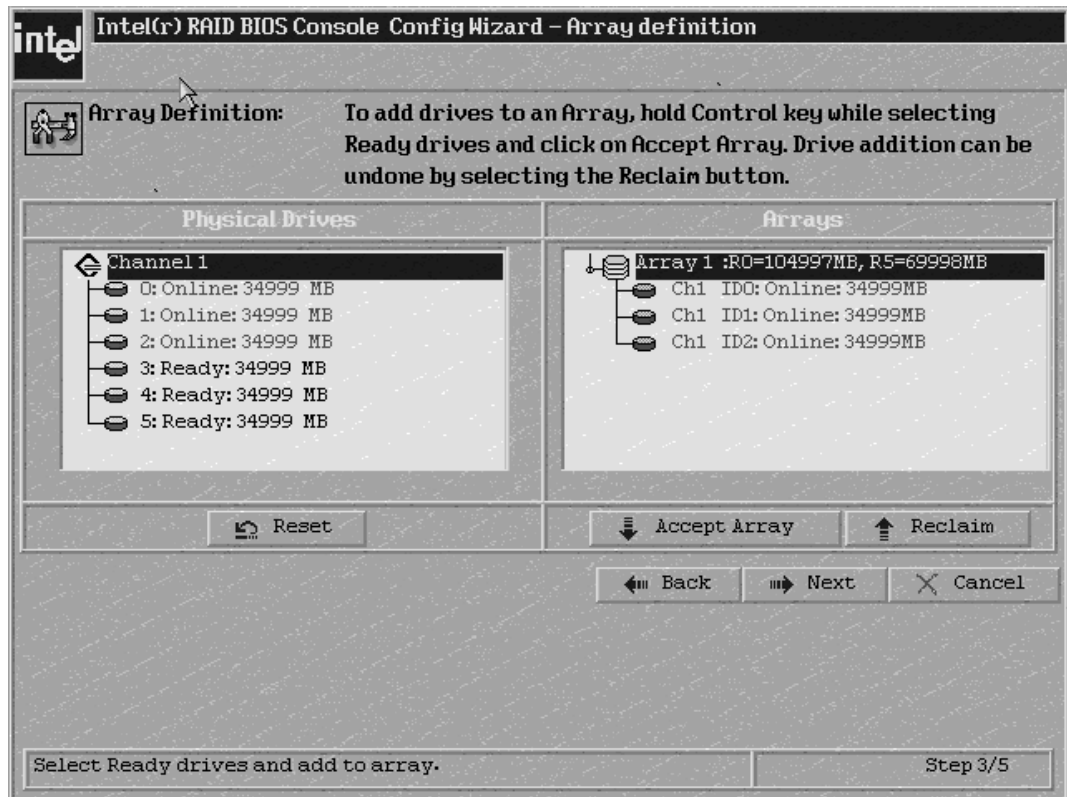RAID 10 configurations do not support more than two drives in an array or an odd number of drives. A RAID 10 logical drive consists of at least two or up to eight spanned RAID 1 arrays with data striped across them. The logical drive can consist of up to 40 physical drives; although the number is limited to the physical capabilities of the controller. For example, an SRCS16 controller can accommodate up to 6 SATA drives and an SRCU42X controller can accommodate up to 30 SCSI drives. In the event of a single drive failure, data for that drive can be rebuilt from redundant information that is held on the other logical drive members. The advantage of RAID 10 is that in some conditions two members can be lost and data rebuilt. The condition is that only one drive per stripe can be lost. In this configuration, hot spare drives have great value. Hot spare drive creation is described in Section 4.8, "Creating a Hot Spare".

RAID 10 is a special case where two or more drives are selected and added to the right array pane by clicking accept array. Additional drive arrays are then selected and added to the right pane as well. Select two drives for the RAID 10 by holding the <CTRL> key and clicking on the drive icons with your mouse until the target drives are highlighted. Hit the <Accept Array> button to create the first array. Create an additional array by holding the <CTRL> key and clicking on the target drives, and then click on <Accept Array>. This method creates two arrays in the right pane that can then be spanned to create a raid 50 logical drive. Additional arrays can be created and added to the right pane by selecting additional drive. However, each array must consist of the same number and size of drives in order to be spanned. Up to eight arrays can be added to the Array pane and spanned to create a RAID 10 logical drive. The detailed steps are listed below.
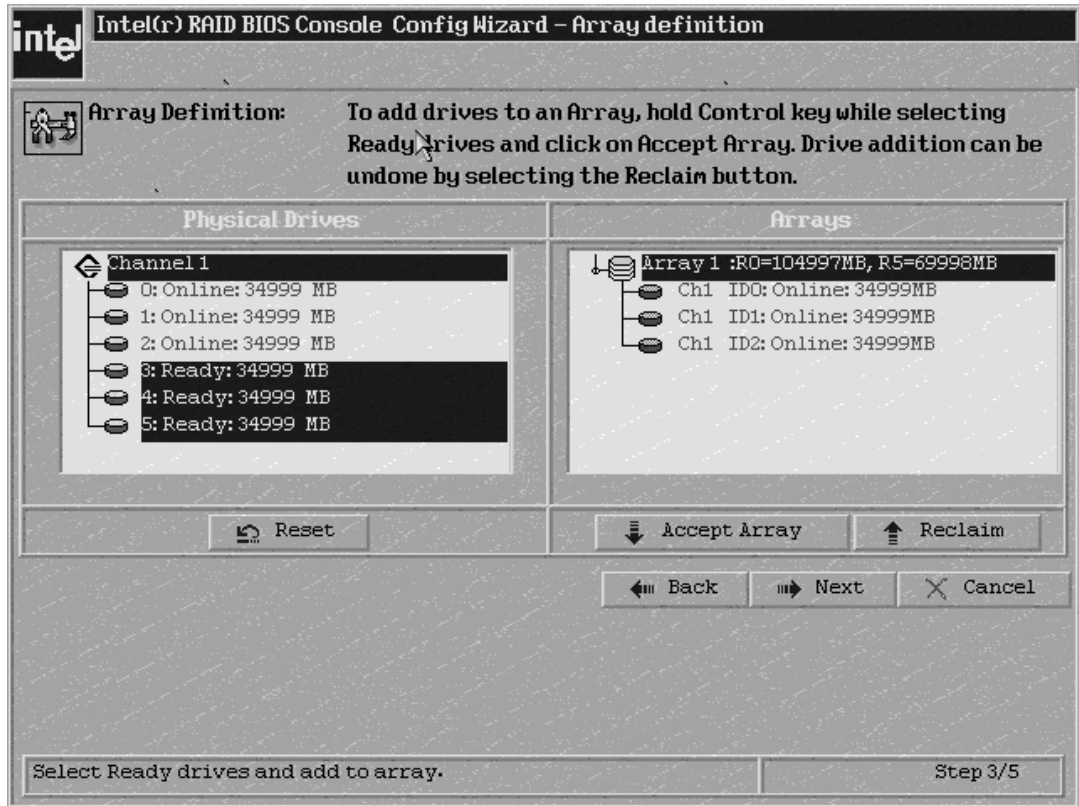
Intel(r) RAID BIOS Console Config Wizard – Array definition

Array Definition: To add drives to an Array, hold Control key while selecting
Ready drives and click on Accept Array. Drive addition can be
undone by selecting the Reclaim button.

Physical Drives

Channel 1
  0: Online: 34999 MB
  1: Online: 34999 MB
  2: Online: 34999 MB
  3: Online: 34999 MB
  4: Ready: 34999 MB
  5: Ready: 34999 MB

Arrays

Array 1 :R0=69998MB, R1=34999MB
  Ch1 ID0: Online: 34999MB
  Ch1 ID1: Online: 34999MB
Array 2 :R0=69998MB, R1=34999MB
  Ch1 ID2: Online: 34999MB
  Ch1 ID3: Online: 34999MB

Reset   Accept Array   Reclaim

Back   Next   Cancel

Select Ready drives and add to array.   Step 3/5

1.) To create a RAID 10, the two created arrays need to be setup with RAID 1 and spanning enabled. Select both arrays by holding down the control key and selecting each array with your mouse.

Intel(r) RAID BIOS Console Config Wizard – Logical Drive definition

Logical drive definition — Define Logical Drives using the arrays defined in the previous screen.

Logical Drive 1

RAID Level	RAID O ▼
Stripe Size	64 KB ▼
Read Policy	No Read Ahead ▼
Write Policy	Write Thru (No BBU)
Cache Policy	Direct IO ▼
Span	Disable ▼
Select Size	MB

Configuration

Array 1 :RO=69998MB, R1=34999MB
Array 2 :RO=69998MB, R1=34999MB

Array n: RAID Level = Size Available

↓ Accept   ↺ Reset

◀ Back   ▶ Next   ✕ Cancel

Choose parameters for new Logical Drive.   Step 4/5

2.) Select the appropriate raid parameters as shown below:

RAID LEVEL: RAID level 1,

Span: Enable

3.) Select Size: Enter the size of your drive as shown in the left hand pane.(34999MB)

Other parameters should be set according to your application needs. See the section "Setting Logical Drive Parameters" for more information. Hit the <Accept> button when done selecting the additional raid parameters..

Intel(r) RAID BIOS Console Config Wizard – Logical Drive definition

Logical drive definition   Define Logical Drives using the arrays defined in the previous screen.

Logical Drive 1		Configuration
RAID Level	RAID 1 ▼	Array 1 :R0=69998MB, R1=34999MB
Stripe Size	64 KB ▼	Array 2 :R0=69998MB, R1=34999MB
Read Policy	No Read Ahead ▼	
Write Policy	Write Thru (No BBU)	
Cache Policy	Direct IO ▼	
Span	Enable ▼	Array n: RAID Level = Size Available
Select Size	34999 MB	

⬇ Accept   ↺ Reset

◀ Back   ▶ Next   ✕ Cancel

Choose parameters for new Logical Drive.   Step 4/5

4.) The configuration preview screen displays the logical drive as shown below. Verify that a raid 1 has been created with the two arrays. Hit the accept button to save the configuration.

Intel(r) RAID BIOS Console Config Wizard – Preview

Configuration Preview: This is the configuration defined. Click ACCEPT to save this configuration.

Physical Drives

Channel 1
  0: A1: Online: 34999 MB ... ...
  1: A1: Online: 34999 MB ... ...
  2: A2: Online: 34999 MB ... ...
  3: A2: Online: 34999 MB ... ...
  4: Ready: 34999 ME
  5: Ready: 34999 ME

Logical Drives

Array 1
  LD1: RAID1: 69998 MB: Optimal
Array 2
  LD1 (Contd)

◀▥ Back   ▮ Accept   ✕ Cancel

Click Accept to save configuration.   Step 5/5
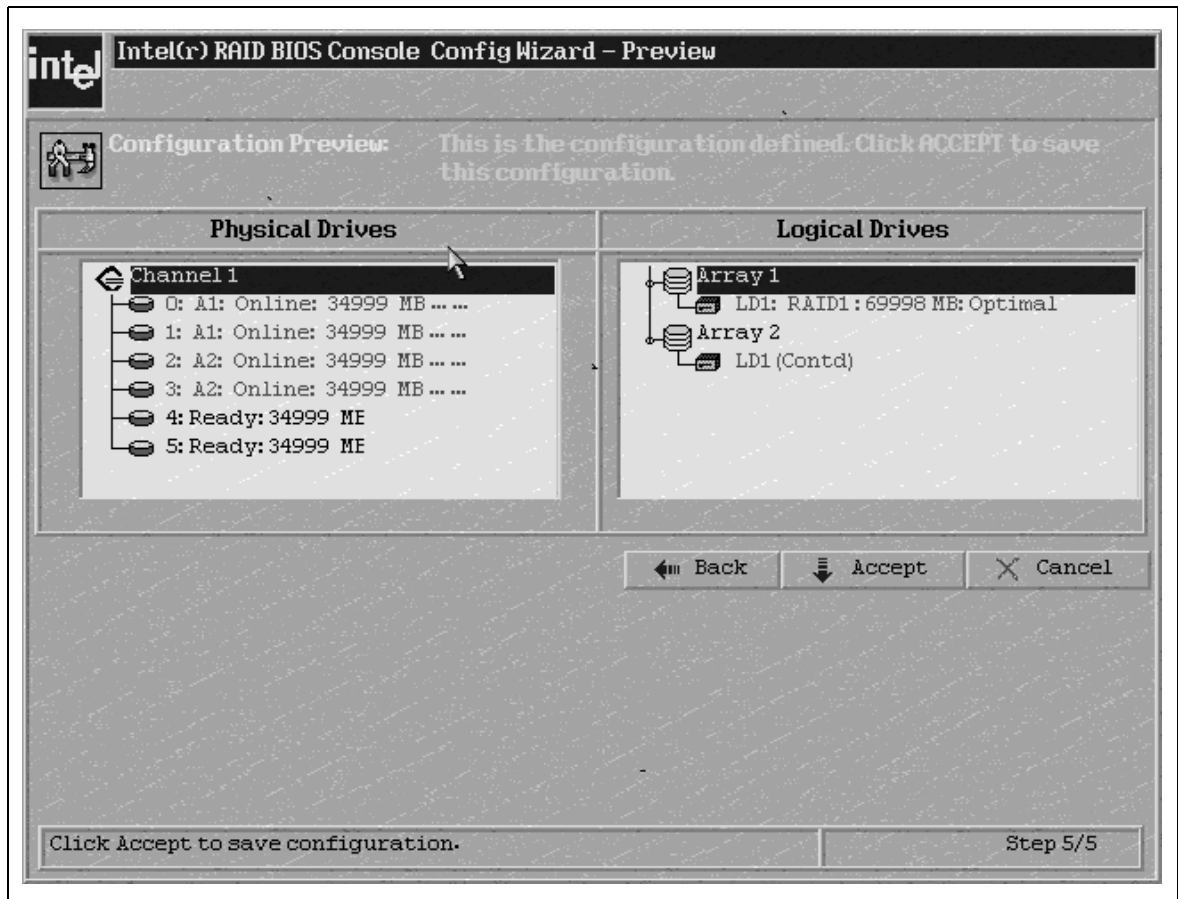
5.) Select the <Yes> button when asked to Save the configuration. This will store the RAID 0 configuration in the raid controller.

6.) Select the <Yes> button when asked to initialize the drive. The drives will initialize based on the RAID settings.

7.) Select the <home> button at the BIOS Console screen to return to the main screen.

4.6   RAID 50 Creation Using BIOS Console

A RAID 50 logical drive consists of at least two or up to eight spanned RAID 5 arrays with data striped across them. The logical drive can consist of up to 40 physical drives; although it is limited to the physical capabilities of the controller. For example, an SRCS16 controller can accommodate up to 6 SATA drives and an SRCU42X controller can accommodate up to 30 SCSI drives. In addition to data, parity is also striped across the drives. In the event of a single drive failure, data for that drive can be rebuilt from parity information that is held on the other logical drive members. The advantage of RAID 50 is that in some conditions two members can be lost and data rebuilt. The condition is that only one drive per stripe can be lost. In this configuration, hot spare drives have great value. Hot Spare Drive Creation is described in Section 4.8, "Creating a Hot Spare."

RAID 50 is a special case where two arrays of three or more drives are selected and added to the right array pane. This section creates two arrays in the right pane that can then be spanned to create a raid 50 logical drive. Additional arrays can be created and added to the right pane by selecting additional drives and creating an array. However, each array must consist of the same number and size of drives in order to be spanned. Up to eight arrays can be added to the Arrays pane and spanned to create a RAID 50 logical drive. Follow the steps below to create a RAID 50.

1.) In the array definition window screen select three drives by holding down the <CTRL> key and clicking on each drive icon with your mouse until the target drives are highlighted.
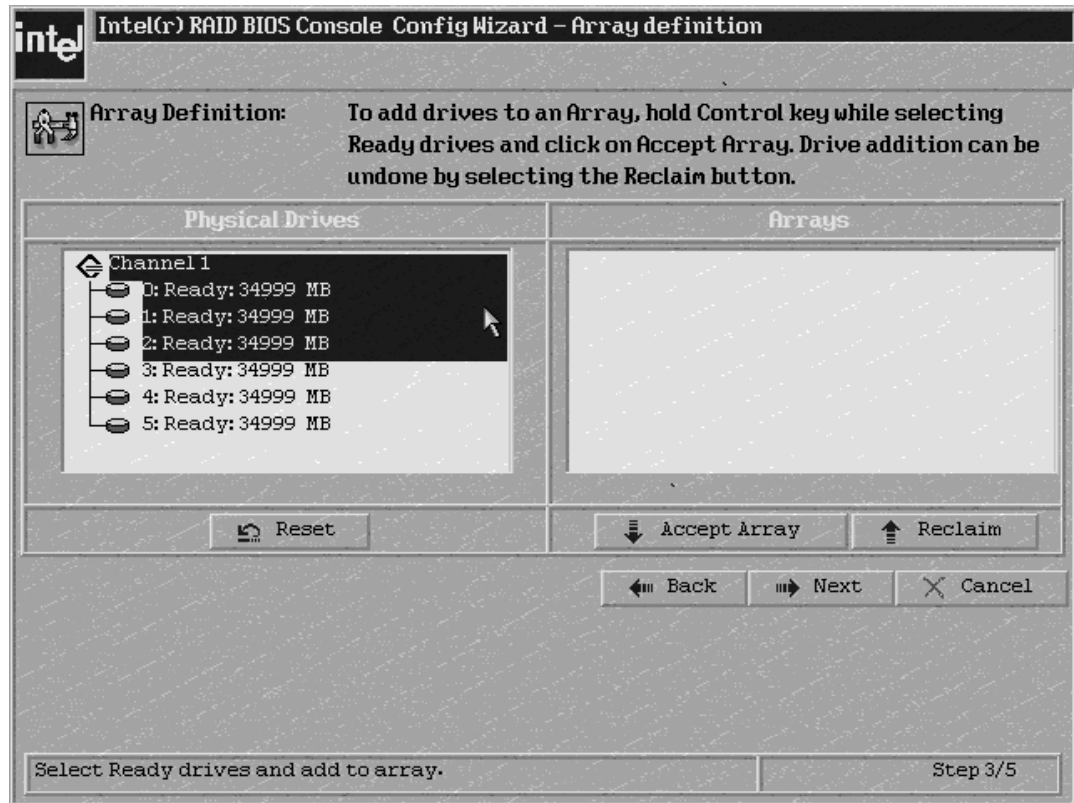
2.) Once the three drives in the first array are highlighted select the <Accept Array> button. The first array will show up in the Arrays window on the right hand side as shown below.

Intel(r) RAID BIOS Console Config Wizard – Array definition

Array Definition: To add drives to an Array, hold Control key while selecting Ready drives and click on Accept Array. Drive addition can be undone by selecting the Reclaim button.

Physical Drives

Channel 1
- 0: Online: 34999 MB
- 1: Online: 34999 MB
- 2: Online: 34999 MB
- 3: Ready: 34999 MB
- 4: Ready: 34999 MB
- 5: Ready: 34999 MB

Arrays

Array 1 :R0=104997MB, R5=69998MB
- Ch1 ID0: Online: 34999MB
- Ch1 ID1: Online: 34999MB
- Ch1 ID2: Online: 34999MB

↺ Reset   ↓ Accept Array   ↑ Reclaim

◀ Back   ▶ Next   ✕ Cancel

Select Ready drives and add to array.   Step 3/5

3.) Repeat the process of selecting the drives with another set of three drives.

4.) Once the drives are highlighted, hit the <Accept Array> Button.

```
Intel(r) RAID BIOS Console  Config Wizard – Array definition

  [intel]

  [icon] Array Definition:        To add drives to an Array, hold Control key while selecting
                                  Ready drives and click on Accept Array. Drive addition can be
                                  undone by selecting the Reclaim button.

         Physical Drives                              Arrays

  ◆ Channel 1                              ↓🖴 Array 1 :R0=104997MB, R5=69998MB
    🖴 0: Online: 34999 MB                    🖴  Ch1  ID0: Online: 34999MB
    🖴 1: Online: 34999 MB                    🖴  Ch1  ID1: Online: 34999MB
    🖴 2: Online: 34999 MB                    🖴  Ch1  ID2: Online: 34999MB
    🖴 3: Ready: 34999 MB
    🖴 4: Ready: 34999 MB
    🖴 5: Ready: 34999 MB


         ↩ Reset                        ↓ Accept Array      ↑ Reclaim


                                    ◀ Back    ▶ Next    ✕ Cancel


  Select Ready drives and add to array.                      Step 3/5
```

5.) The resulting two arrays should be defined as shown below. Click the <Next> button to accept the array definition.

```
intel   Intel(r) RAID BIOS Console  Config Wizard – Array definition

     Array Definition:        To add drives to an Array, hold Control key while selecting
                              Ready drives and click on Accept Array. Drive addition can be
                              undone by selecting the Reclaim button.

        Physical Drives                              Arrays

     Channel 1                            Array 1 :RO=104997MB, R5=69998MB
        0: Online: 34999 MB                  Ch1  IDO: Online: 34999MB
        1: Online: 34999 MB                  Ch1  ID1: Online: 34999MB
        2: Online: 34999 MB                  Ch1  ID2: Online: 34999MB
        3: Online: 34999 MB               Array 2 :RO=104997MB, R5=69998MB
        4: Online: 34999 MB                  Ch1  ID3: Online: 34999MB
        5: Online: 34999 MB                  Ch1  ID4: Online: 34999MB
                                             Ch1  ID5: Online: 34999MB

              Reset                    Accept Array         Reclaim

                                     Back       Next        Cancel

     Select Ready drives and add to array.                    Step 3/5
```

6.) To create a RAID 50, both arrays need to be selected. Select the two arrays in the right hand pain by holding down the <CTRL> key and clicking each array with your mouse. Both arrays should be highlighted as shown below:

```
intel  Intel(r) RAID BIOS Console  Config Wizard – Logical Drive definition
```

Logical drive definition   Define Logical Drives using the arrays defined in the
                            previous screen.

Logical Drive 1		Configuration

RAID Level	RAID 0 ▼
Stripe Size	64 KB ▼
Read Policy	No Read Ahead ▼
Write Policy	Write Thru (No BBU)
Cache Policy	Direct IO ▼
Span	Disable ▼
Select Size	MB

Array 1 :R0=104997MB, R5=69998MB
Array 2 :R0=104997MB, R5=69998MB

Array n: RAID Level = Size Available

↓ Accept   ↰ Reset

◀▥ Back   ▥▶ Next   ✕ Cancel

Choose parameters for new Logical Drive.   Step 4/5

7.) Choose raid level 5, enable span, and select the size to be 69999MB, as shown in the
following figure. Enter additional parameters based on your application needs. See the section
"Setting Logical Drive Parameters" for more information on setting other parameters. Hit the
<Accept> button to define the new configuration.

Intel(r) RAID BIOS Console Config Wizard – Logical Drive definition

Logical drive definition   Define Logical Drives using the arrays defined in the previous screen.

Logical Drive 1

RAID Level	RAID 5 ▼
Stripe Size	64 KB ▼
Read Policy	No Read Ahead ▼
Write Policy	Write Thru (No BBU)
Cache Policy	Direct IO ▼
Span	Enable ▼
Select Size	69998 MB

Configuration

Array 1 :R0=104997MB, R5=69998MB
Array 2 :R0=104997MB, R5=69998MB

Array n: RAID Level = Size Available

⬇ Accept   ⤺ Reset

⬅ Back   ➡ Next   ✕ Cancel

Choose parameters for new Logical Drive.   Step 4/5

In the configuration window verify the RAID 50 configuration by seeing that a RAID5 has been created across two arrays.

8.) Hit the <Accept> button to accept the configuration.

```
┌─────────────────────────────────────────────────────────────────────────┐
│ intel   Intel(r) RAID BIOS Console  Config Wizard – Preview              │
├─────────────────────────────────────────────────────────────────────────┤
│  ┌──┐  Configuration Preview:   This is the configuration defined. Click ACCEPT to save │
│  │🐕│                            this configuration.                      │
│  └──┘                                                                      │
│        Physical Drives                        Logical Drives              │
│   ┌──────────────────────────────┐   ┌──────────────────────────────┐    │
│   │ ◈ Channel 1                  │   │  🛢 Array 1                   │    │
│   │  ─● 0: A1: Online: 34999 MB …│   │   └🖴 LD1: RAID5 : 139996 MB: Optimal │
│   │  ─● 1: A1: Online: 34999 MB …│   │  🛢 Array 2                   │    │
│   │  ─● 2: A1: Online: 34999 MB …│   │   └🖴 LD1 (Contd)             │    │
│   │  ─● 3: A2: Online: 34999 MB …│   │                               │    │
│   │  ─● 4: A2: Online: 34999 MB …│   │                               │    │
│   │  ─● 5: A2: Online: 34999 MB …│   │                               │    │
│   └──────────────────────────────┘   └──────────────────────────────┘    │
│                                                                           │
│                              ┌──────────┬──────────┬──────────┐           │
│                              │ ◀ Back   │ ⬇ Accept │ ✕ Cancel │           │
│                              └──────────┴──────────┴──────────┘           │
│                                                                           │
│ ┌───────────────────────────────────────────────┬─────────────────────┐  │
│ │ Click Accept to save configuration.           │         Step 5/5    │  │
│ └───────────────────────────────────────────────┴─────────────────────┘  │
└─────────────────────────────────────────────────────────────────────────┘
```

9

9.) Select the <Yes> button when asked to save the configuration. This will store the RAID 50 configuration in the raid controller.

10.) Select the <Yes> button when asked to initialize the drive. The drives will initialize based on the RAID settings.

11.) Select the <home> button at the BIOS Console screen to return to the main screen.

4.7   Setting Logical Driver Parameters

RAID level 0 = Data Striping with no redundancy, up to 30 physical drives are allowed in the array but will be limited to the capability of the controller (SCSI support up to 30 drives per controller, Sata = number of ports)

RAID level 1 = Mirror, only two physical drives are allowed in a mirror.

RAID level 5 = Data Striping with parity, up to 30 physical drives are allowed in the array but will be limited to the capability of the controller (SCSI support up to 30 drives per controller, Sata = number of ports).

RAID level 10 = 2 or up to 8 RAID 1 arrays with data striped across them. Up to 30 physical drives are allowed in the resulting logical drive but will be limited to the capability of the

controller (SCSI support up to 30 drives per controller, Sata = number of ports). This is not an option on the menu, but can be created by enabling spanning and highlighting the arrays in the right pane by holding down the control key and selecting; the result will be the logical drive spanned across multiple RAID 1 arrays.

Raid Level 50 = w or up to 8 RAID 5 arrays with data striped across them. Up to 30 physical drives are allowed in the logical drive but will be limited to the capability of the controller (SCSI support up to 30 drives per controller, Sata = number of ports). This is not an option on the menu, but can be created by enabling spanning and highlighting the arrays in the right pane by holding down the control key and selecting; the result will be the logical drive spanned across multiple RAID 5 array.

4.7.1   Stripe Size

Specify the size of the segment written to each disk in a RAID configuration. You can set the stripe size to 4, 8, 16, 32, 64, or 128 Kbytes. The default is 64 Kbytes.

4.7.2   Read Policy

Enables the read-ahead feature for the logical drive. You can set this parameter to Normal, Read-ahead, or Adaptive. Normal specifies that the controller does not use read-ahead for the current logical drive. Read-ahead specifies that additional consecutive stripes are Read and Buffered into Cache. This option will improve performance for sequential reads. Adaptive specifies that the controller begins using readahead if the two most recent disk accesses occurred in sequential sectors. Read-ahead is the default setting.

4.7.3   Write Policy

Use this screen to select the write and cache policies. The write policy parameter specifies the cache write policy. You can set the write policy to Write-back or Write-through. In Write-back caching, the controller sends a data transfer completion signal to the host when the controller cache receives all the data in a transaction. In Writethrough 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 is the default setting. Write-through caching has a data security advantage over write-back caching. 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.

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

4.7.4   Cache Policy

The cache policy applies to I/O on a specific logical drive. It does not affect the read ahead cache. The options are Cached I/O or Direct I/O. Cached I/O buffers all reads in cache memory. Direct I/O does not buffer reads in cache memory. When possible, Direct I/O does not override the cache policy settings. Direct I/O transfers data to cache and the host concurrently. If the same data block is read again, the host reads it from cache memory.

4.7.5 Span

Enable or disable the spanning mode for the current logical drive. If spanning is enabled, the logical drive can occupy space in more than one array. If spanning is disabled, the logical drive can occupy space in only one array. For two arrays to be spannable, they must be the same size and have the same stripe width and must be consecutively numbered. If these criteria are not met, the utility ignores the Span setting. Spanning allows the logical drive to stripe across multiple arrays. Using this option enables the use of RAID 10 and RAID 50.

RAID 10: To configure a RAID 10 array, create multiple RAID 1 drive arrays (minimum of two) and enable the span option, then choose the size of the logical drive. It is possible to span up to eight arrays in a logical drive. When looking at the logical drive, you will not see a "RAID 10" label, but you will see multiple arrays in the logical drive representing a RAID 10 configuration.

RAID 50: To configure a RAID 50 array, create multiple RAID 5 drive arrays (minimum of two) and enable the span option, then choose the size of the logical drive. It is possible to span up to 8 arrays in a logical drive. When looking at the logical drive, you will not see a "RAID 50" label, but you will see multiple arrays in the logical drive representing a RAID 50 configuration.

4.7.6 Select Size

Set the size of the logical drive in Mbytes. The right pane of the logical drive configuration window will list the maximum capacity that can be selected, depending on the RAID level chosen.

4.8   Creating a Hot Spare

Create a hot spare by clicking on the icon for the desired drive you want to turn into a hot spare.

Figure 4.1   Creating A Hot Spare
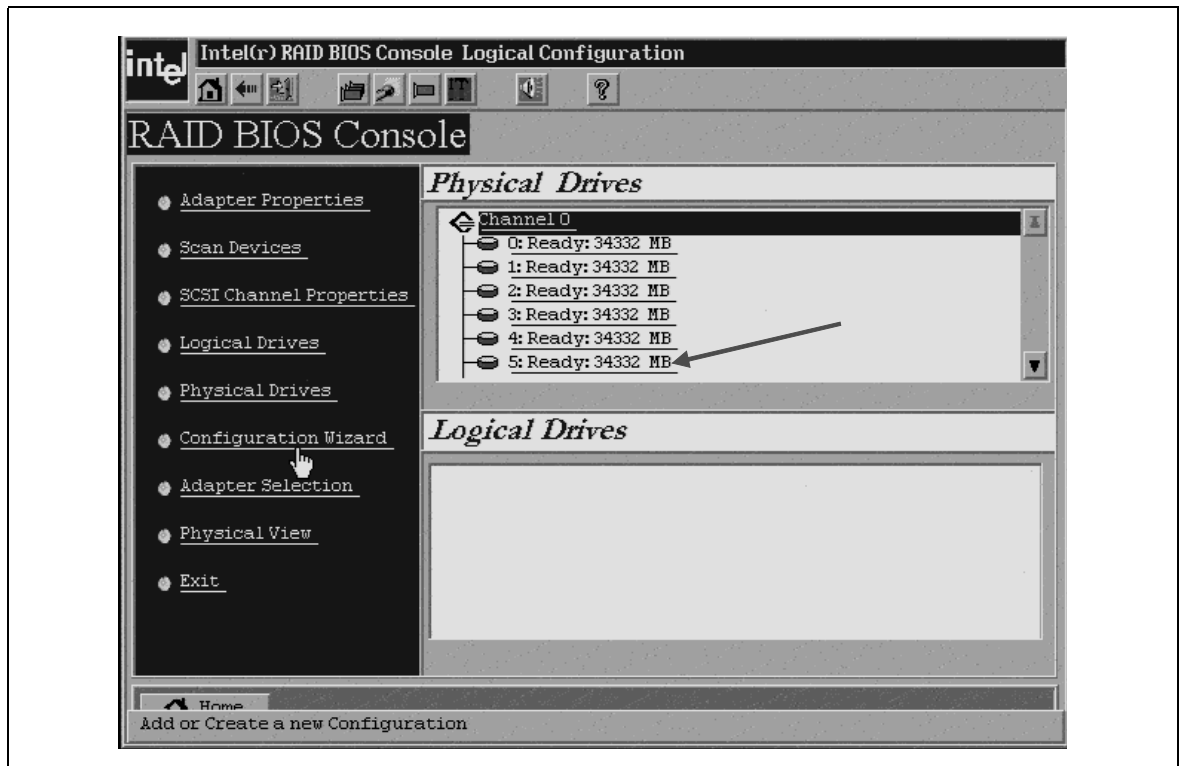
1.) In the drives properties view, click the radio button to make the drive a hot spare drive and click the "go" button.

Returning to the physical drive view, you will then see the drive marked as a hot spare in the main view.

Figure 4.2   Main Drive View
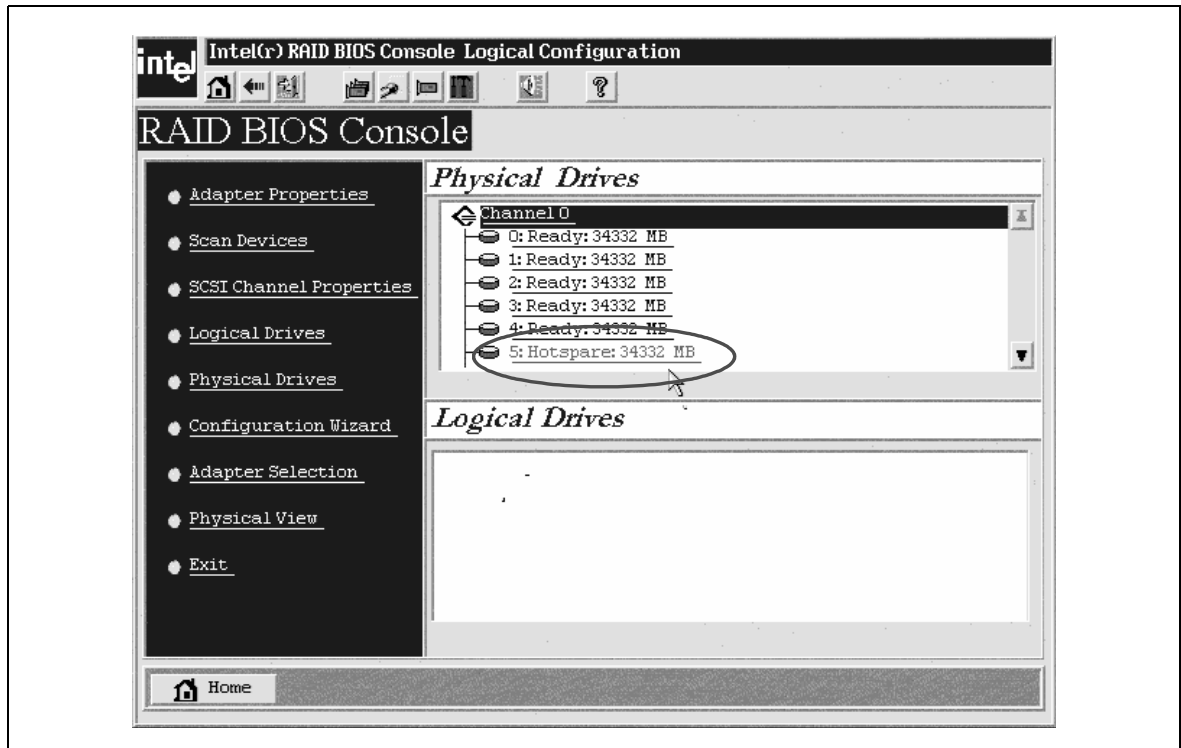
Chapter 5
Intel® RAID Web Console

5.1 Web Console Overview

The Intel RAID Web Console is a Java-based, object-oriented GUI utility that lets you efficiently configure and monitor RAID arrays locally or through a network. Web Console runs on Microsoft* Windows* XP/2000/2003, Linux, and Novell NetWare* servers that are capable of monitoring and being monitored.

> Note: Web Console for Windows requires at least Microsoft* Internet Explorer 5.5. Be certain to install the latest Service Packs for Windows XP/2000/2003.

5.1.1 Web Console Components

Web Console includes the following software components:

- RAID Web Server, the client support module running on a RAID server that allows managing a RAID server remotely from a browser on a client system. It does not require a locally installed RAID adapter or any specially installed software on the client system other than a browser. Just point the browser on a client at the address of the RAID server along with the access port address, then provide a password to enter the management utility.

- RAID Server is a module that runs on a server configured with a RAID adapter that provides the connection from the host device (server) to a RAID array (on that server) and provides the tools to manage the array. It must be installed on each server that contains a RAID controller in order to manage the RAID configuration from within an OS (either locally or remotely) via a browser.

- RAID Registration Server is a module running on a RAID server that tracks RAID servers on a network. It contains a database of the RAID servers that have registered with it as RAID servers. RAID servers automatically register with the registration server once the registration server's IP address is entered into their RAID server `regsrv.dat` file.

5.1.2 Features

The Web Console tool provides:

- A configuration wizard that guides you through the disk configuration process

- LSI Logic* FlexRAID[*] functionality for seamless online expansion without interrupting server operations

- RAID level migration

- A consistency check to ensure parity and mirrored data accuracy

- A performance monitor

- The ability to change logical drive write, read, and cache policies after the logical drive configuration

- The ability to save the configuration
- The ability to spin down physical drives before their removal
- The ability to view the current data transfer rate
- Complete system monitoring capabilities
- A RAID event log

5.1.3 Client System Requirements

The client systems running Web Console must:

- Run Windows* XP/2000/2003, Linux, NetWare*, OpenServer*, or UnixWare*
- Utilize a browser that supports Java scripting
- Use a Pentium grade processor or higher CPU
- Have at least 8 Mbytes of system memory
- Have a network interface
- Have at least 5 Mbytes of free hard disk drive space
- Use the TCP/IP protocol

5.2 Quick Configuration Steps

This section provides quick installation steps for users that are familiar with RAID utilities and tools. Refer to Configuring Arrays and Logical Drives for detailed configuration instructions.

The steps to configure arrays and logical drives using the Web Console are:

1) Boot the system.

2) Install the JRE. The JRE may be included in the installation package.

3) Install Web Console.

4) Start Web Console.

5) Choose a configuration method.

6) Designate hot spare disks (optional).

7) Create arrays using the available physical drives.

8) Define the logical drive(s) using the space in the arrays.

9) Initialize the new logical drives.

5.3   The Registration Server

The Registration Server is a RAID server that also has a registration process running on it.

The Registration Server Maintains a database of all RAID servers in a network, providing remote management of all available RAID servers through a single point of access. Only RAID servers can be designated as a registration server. Each RAID server should be registered with only one registration server.
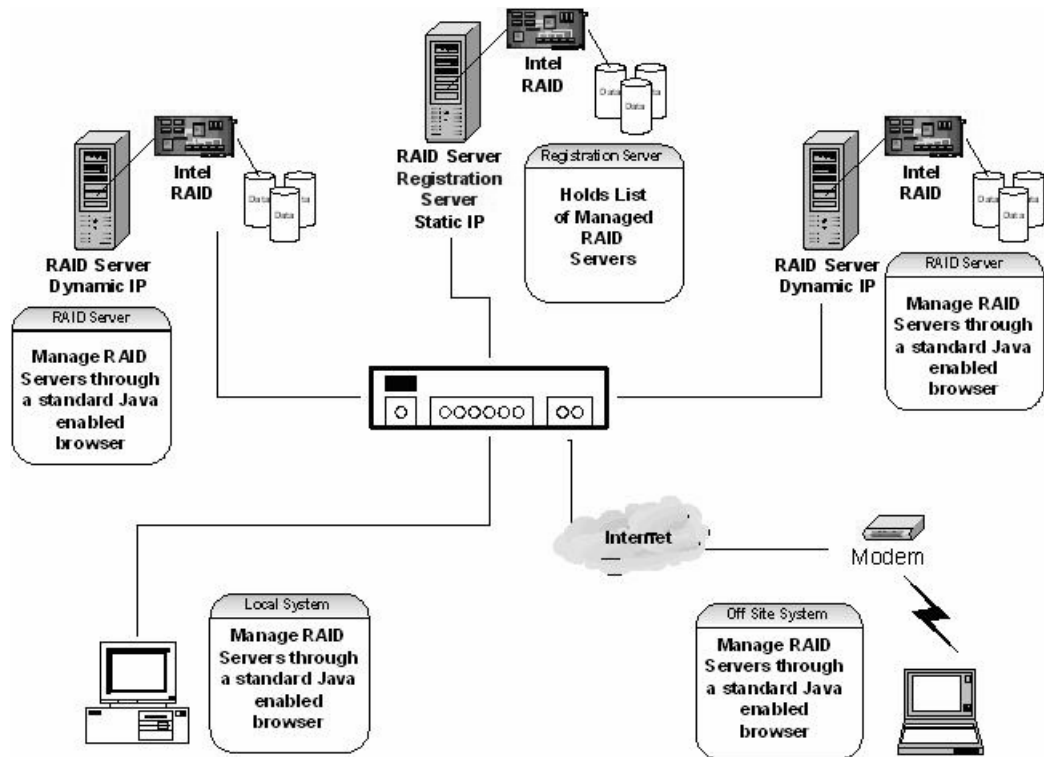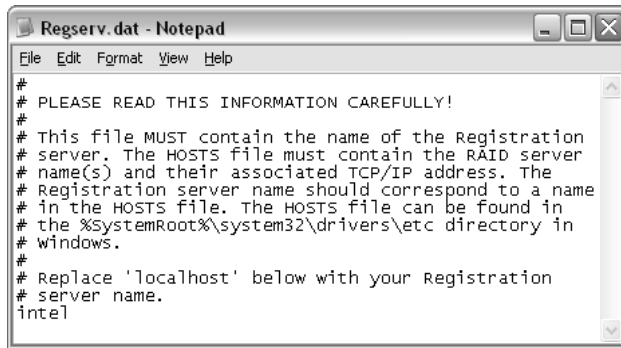
Note: To enable the registration server feature, ensure that the 'networking' option is selected during RAID Web Console installation on each RAID Server. Registration servers must have a static IP address. RAID servers that are not registration servers may have static or dynamically configured network addresses.

5.3.1   Enabling the Registration Server

To enable the registration server, complete the following steps:

1) Set a static IP address for the registration server.

2) On each RAID server to be managed, edit the regserv.dat file located in the etc directory. Change the "localhost" entry to the host name of the registration server (see Figure 5.1).
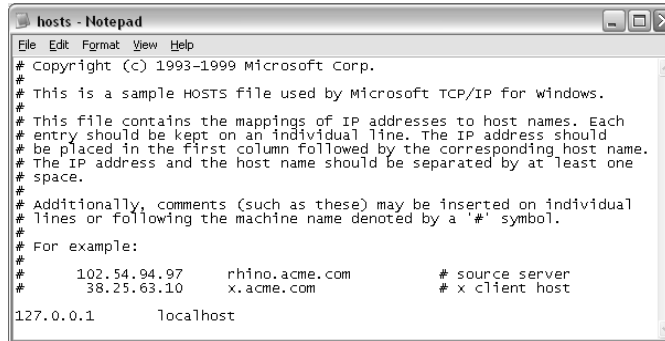
Figure 5.1   Sample Modified regserv.dat File

3) Edit the `hosts` file on each RAID server to resolve the registration server IP address. Add the IP address and the host name of the registration server. See Figure 5.2 and Figure 5.3 for an example.

Figure 5.2   Sample Hosts File

Figure 5.3   Sample Modified Hosts File

4) It will take about two minutes for the change to take effect.

5.3.2   Registration Server Operation

When the networking option is enabled in Web Console, the RAID server will look up the registration server address in the `regserv.dat` file and resolve it to an IP address through

the hosts file or through DNS resolution. The RAID server will then register its name and address with the registration server. Each RAID server that is registered with the registration server will display on the Web Console screen, as shown below.

Figure 5.4   RAID Servers Listed in Web Console

A RAID server or a client system that does not have a RAID controller installed can be used to remotely manage a RAID server through a standard web browser interface. To do this, point the browser at the registration server using either the host name or the IP address of the registration server, such as http://w2k:3570 or http://192.168.1.1:3570.

The Local SetPass utility must be used to set a password on each RAID server. SetPass is installed as part of the Web Console installation. For Web Console installation instructions, see Section 5.4.

5.4   Windows Web Console Installation

This section describes the installation of the Web Console components on systems running Windows XP/2000/2003.

5.4.1   System Configuration

Complete the following system configuration tasks before installing Web Console.

- Install the proper operating system software and service packs. Be certain to install the latest service packs for Windows XP/2000/2003.
- Install and configure the required network cards.
- Install an Intel RAID adapter card in the RAID server.
- Install the TCP/IP Protocol on all the necessary systems.
- Ping the systems to verify a proper connection.

5.4.1.1   Installation Overview

Installation is a three-step process.

1) Install the Java Runtime Environment (JRE).

2) Install Web Console.

3) Configure the `REGSERV.DAT` and `HOSTS.DAT` files.

5.4.1.2 Installing the Web Console Software on a Windows System

The following steps provide detailed instructions for the installation of the Web Console software.

1) Insert the Resource CD in the CD-ROM drive and double-click on the Install icon to run the program, or download and extract the Web Console installation files and click on the Setup icon.

2) Click on **Next**.

The license agreement and `README` screens appear.

3) Choose standalone or networking. Choosing Standalone allows the correct modules to be installed to support local management through Web Console. Choose networking if you wish to remotely manage this or other remote systems and go to the next section, Networking RAID Console Installation.

4) Select the desired option and click on **Next.**

Figure 5.5   Package Setup
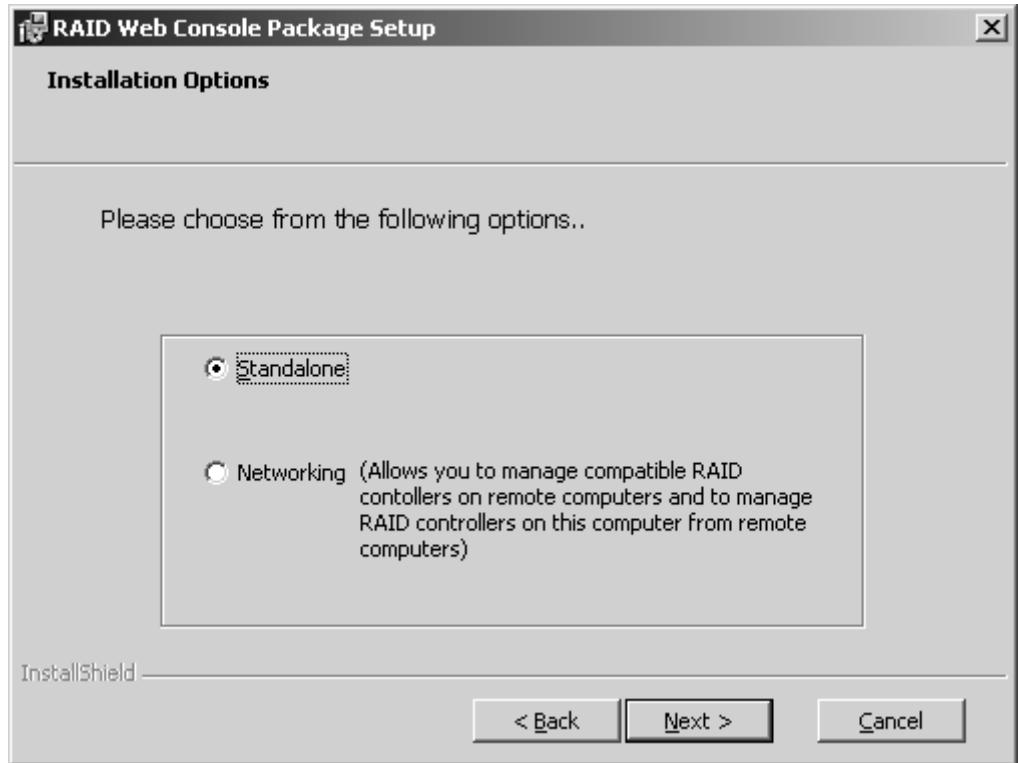
5) View the installation packages from the following screen. The options are: RAID Web server, RAID Server, or RAID Registration Server. Web Console allows any combination of the configuration options.

Figure 5.6   Configuration Setup
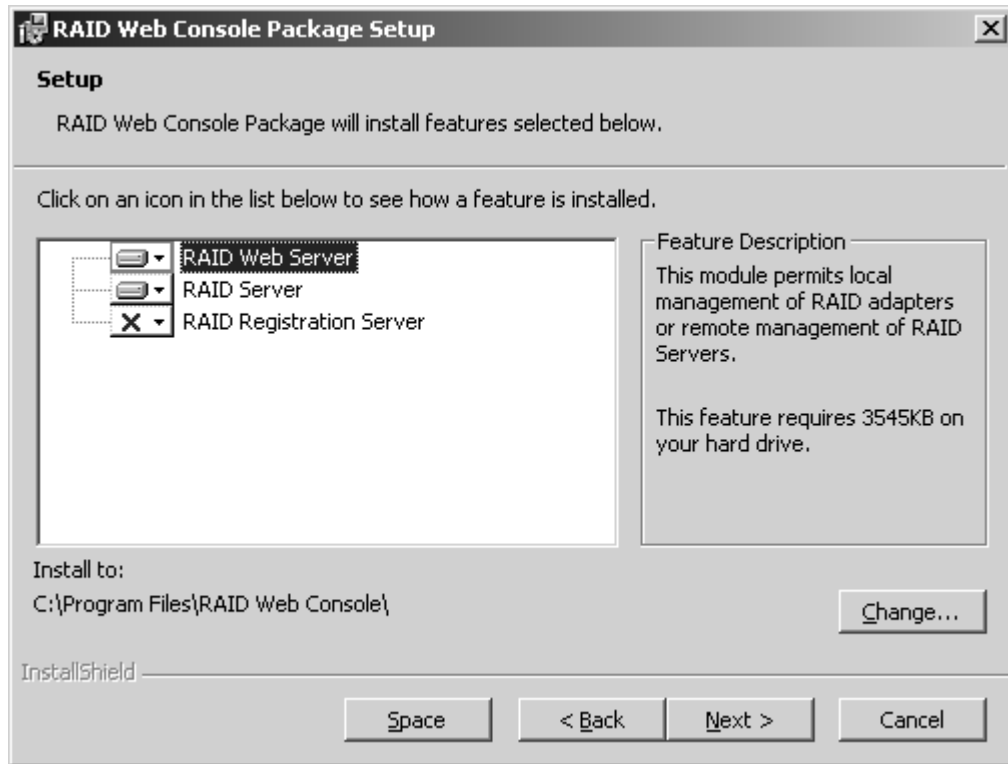
◊   RAID Web Server- This option provides the Java interface for the RAID Server.

◊   RAID Server - This option configures the current system as a RAID Server, which allows it to register with the Registration Server for monitoring by the RAID Client. It also includes the management tools to configure and manage RAID drivers.

◊   RAID Registration Server - This option configures the current system as the RAID Registration Server. This option allows other RAID Servers to register in the registration database.

6) Select the destination directory path. The default destination directory is

   `C:\Program Files\RAID Web Console.`

7) Click on **Next** to begin installation.

8) Hit the "Continue" button to install the Java Runtime Environment.

Figure 5.7   Installing the Java Runtime Environment

RAID Web Console Package Setup

The minimum required Java Runtime Environment is version 1.3.1.
No JRE was detected on your system.
The installation of JRE version 1.4.2 will now begin. Would you
like to continue?

InstallShield

< Back   Continue   Cancel
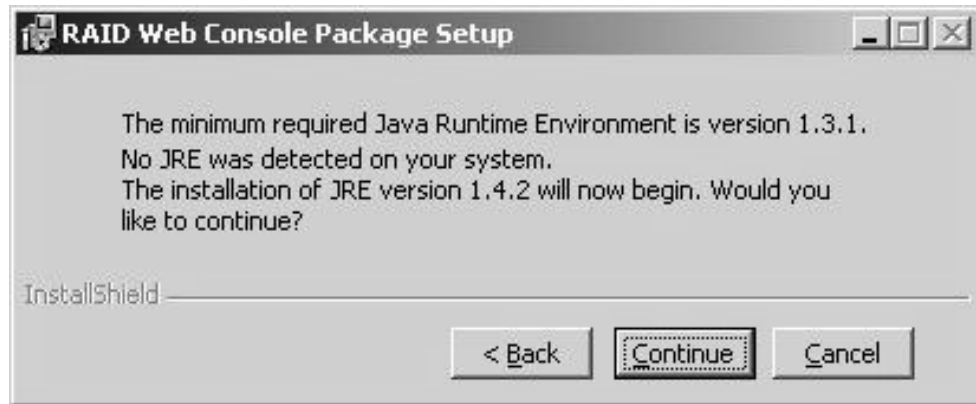
9) Enter the password when requested and hit the OK button.

Figure 5.8   Changing the Password for the Remote Intel RAID Web Console

Setting Password Version 2.04

Change password for Remote Intel(r) RAID Web Console Administrator

Old Password

New Password

Retype Password

OK   Cancel
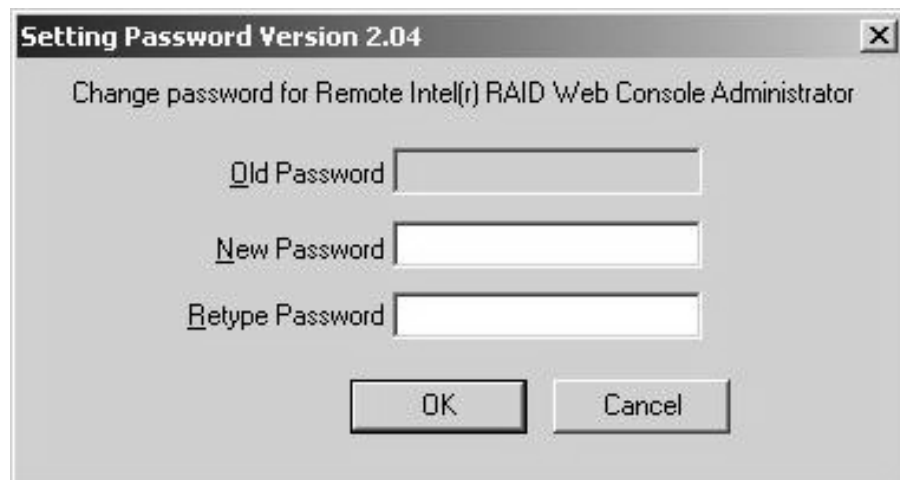
10) Hit finish to exit the installation software.

Figure 5.9   Exiting Installation

11) Edit the REGSERV.DAT and HOSTS.DAT files. The installation retrieves the files for editing. The REGSERV.DAT file is located at:
    C:\winnt\system32\drivers\etc. The HOSTS.DAT file is located at:
    C:\winnt\system32\drivers\etc. (See Section 4.3 for additional information.)

12) Save the file and exit.

13) Reboot your system.

5.4.1.3 Networking RAID Console Installation

1) Answer yes or no if you want to manage the other RAID controller over the network. If you answer yes, continue with the next few steps. If you answer no, then go to step 6.

Figure 5.10 RAID Web Console Package Setup

2) The managed network setup will load the RAID Registration server, RAID Server and RAID web server. The RAID Server resides on servers configured with RAID adapters and allows these adapters to be managed by clients once registered. RAID Registration server is the module for which RAID Servers register for management for the client. Hit the <Next> button to install the features selected.

Figure 5.11   Installing RAID Web Console Package Features
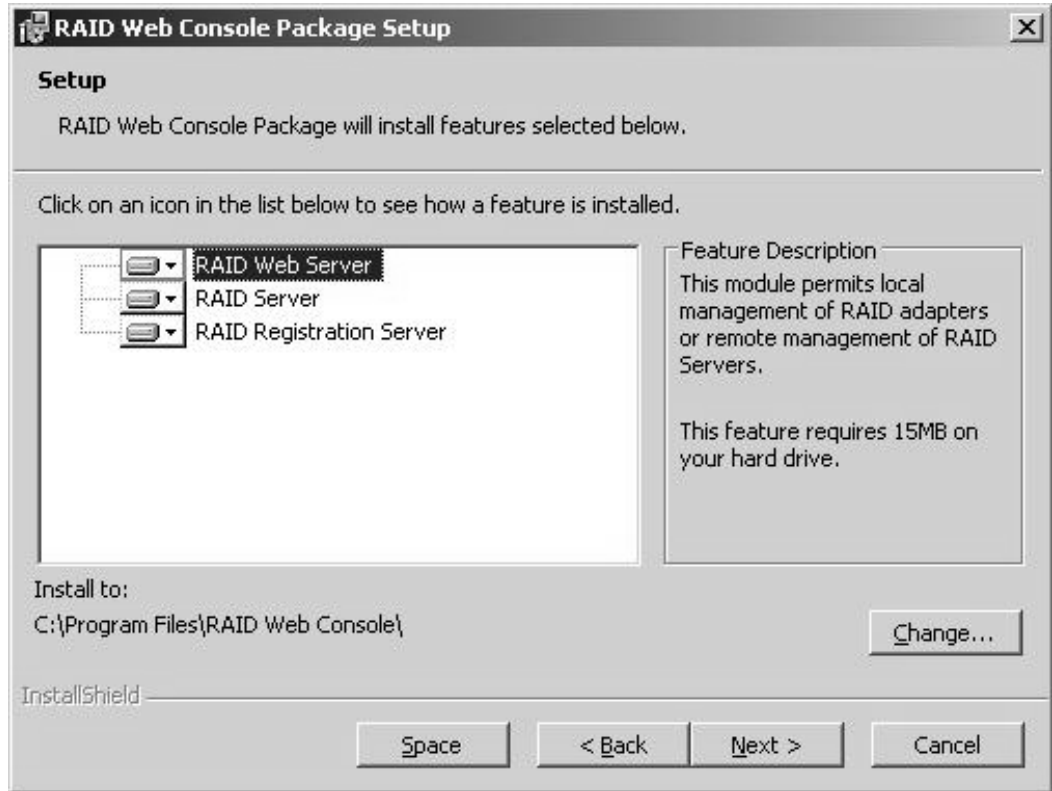
3) Hit the "Continue" button to install the Java Runtime Environment.

Figure 5.12   Java Runtime Environment Installation
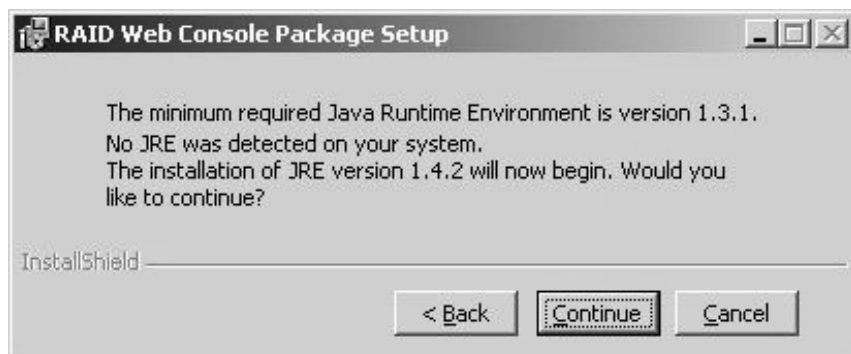
4) Enter the password for access to the RAID Web Console.

Figure 5.13 Entering the Password for Access to the RAID Web Console

5) Hit finish to exit the installation software.

Figure 5.14 Exiting the RAID Web Console Package Installation

6) If you want your RAID Controller to be managed from a RAID server on the network, answer yes when you are asked, "Do you want this RAID Controller to be managed?"

Figure 5.15 RAID Web Console Package Setup, Continued

7) Enter the name of the registration server and hit the **OK** button.

Figure 5.16 Entering the Registration Server Name

8) The software will install the RAID Registration server module. Hit the <Next> button to install the selected software.

Figure 5.17 Installing RAID Web Console Features
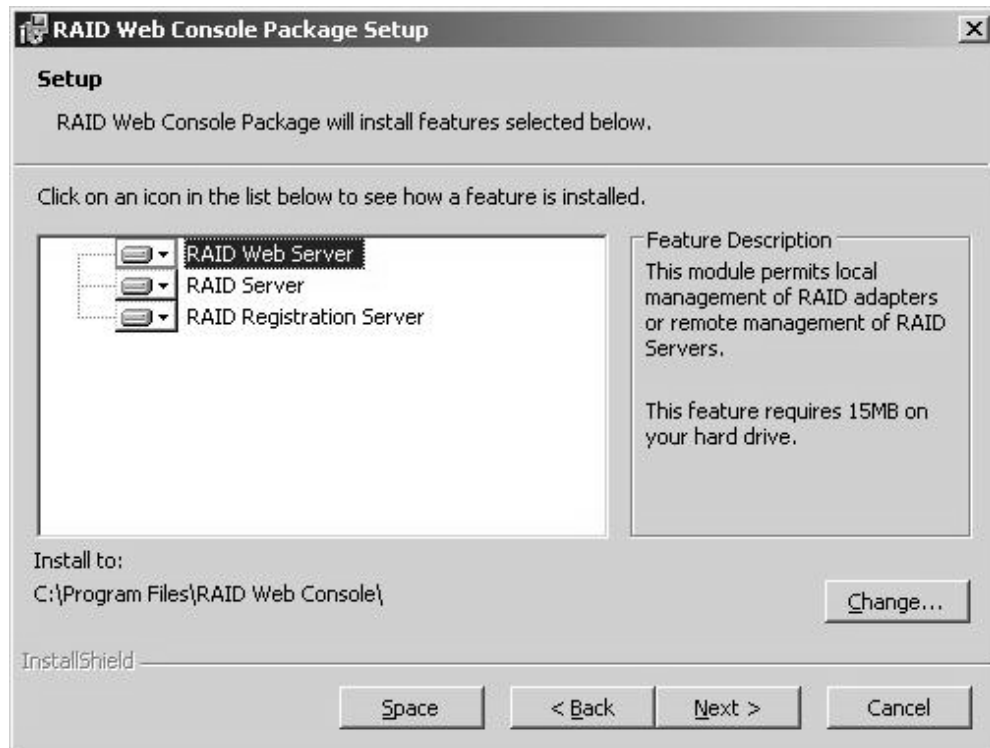
9) Hit the Continue button to install the Java Runtime Environment.

Figure 5.18 Installing Java Runtime Environment
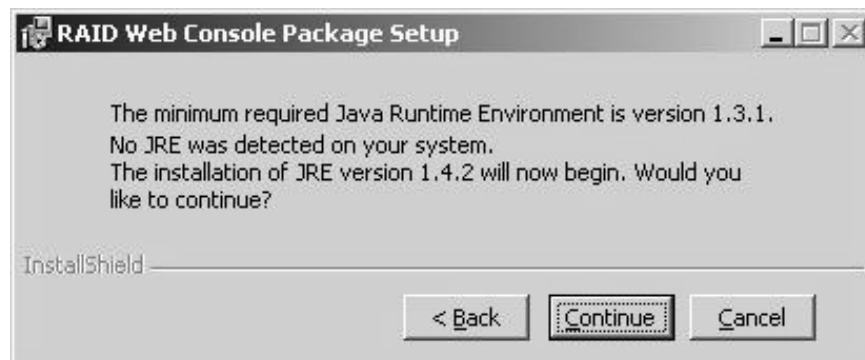
10) Enter the password for the Web console administration.

Figure 5.19 Entering the Password for the RAID Web Console Administrator

11) Hit Finish to exit the installation software.

Figure 5.20 Exiting the Installation Software
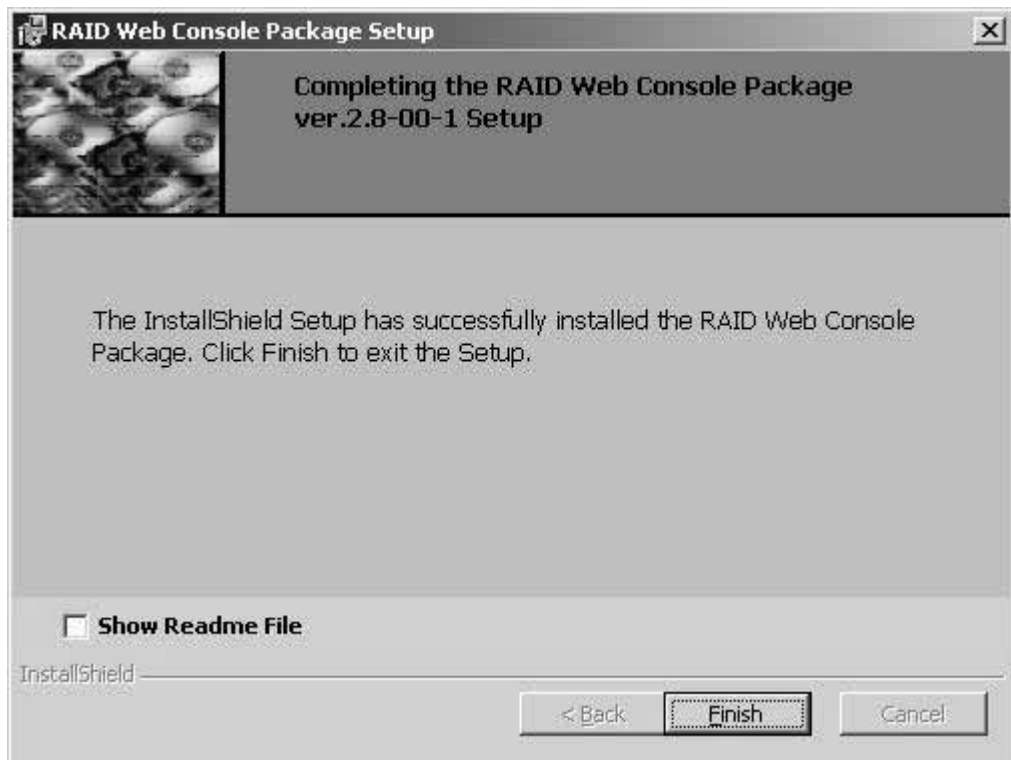
5.4.1.4 Securing Web Console under Windows XP/2000/2003

After installing the Web Console, you must secure Web Console for operation. This subsection provides instructions to secure Web Console utility when running Windows. These

instructions allow only users who are part of the selected groups to delete, copy, move, or execute Web Console files.

1) Log in as the Administrator.

2) Run File Manager.

3) Select the Web Console path.

4) Pull down the Security menu in File Manager and choose **PERMISSIONS**.

5) When the Permission dialog box appears, assign the **LIST** permission to all groups except Administrator, Backup Operators, System, and Creator Owner.

6) In the Permission dialog box, select **Replace Permissions On Subdirectories**.

7) Choose **OK**.

8) Exit File Manager.

9) Log in as a guest and verify the permission changes.

5.4.2   De-registering and Re-registering under Web Console

If the registration server fails or shuts down, the other RAID Servers or RAID Clients must log back into the Registration Server after the Registration Server is online. RAID Servers can register into the Registration Servers without resetting.

To de-register or re-register in Windows:

1) Click on **Control Panel** →**Administrative Tools** →**Services** in Window XP/2000/2003.

2) Click on **Stop RAID_Server** to de-register.

Click on **Start RAID_Server** to re-register.

5.4.3   Accessing Web Console through Browser

Refer to Section 5.3.2, "Registration Server Operation," for information on accessing Web Console through your browser.

5.5   Linux Web Console Installation

The following instructions are provided if you are using earlier versions (<2.4) of the Linux RAID Web Console or the current version of the RAID Web Console provided for the SUSE OS.

The 2.4 or greater versions of the Linux RAID Web Console installation will detect if the JRE is already installed and will only install the JRE if it is not installed or the JRE version is out of date. If you are using the latest Linux version (>2.4), you may proceed to Section 5.5.1.1, "Web Console Installation (Linux, Suse, Netware, Openserver)."

Linux Installation Requirements

Feature	Requirement
RAID Web Server	The TCP stack needs to be up and running for Web Server to function. In addition, the Java run-time environment must be installed. Web Server is installed in **/opt/** directory. The **.jar** files and directories are copied to **/opt/** directory.
Registration Server	The TCP Stack needs to be up and running for Registration Server to function. In addition, Java run-time environment must be installed. It is installed in **/usr/sbin** directory.
RAID Server	Java run-time environment must be installed. RAID server and its sub features can be installed only if the Intel RAID Controller driver is loaded. This is checked by checking if the directory **/proc/megaraid** exists and is readable.

5.5.1   Installing Linux and Java Run-time Environment (Red Hat and SuSE)

1.) Download the Java Runtime Environment (JRE). JRE is a requirement to launch the Web Console installation file. The Linux JRE can be downloaded from http://java.sun.com/j2se/downloads.html. The recommended file is j2re-1_4_2_0-linux-i586-rpm.bin.

2.) Create a driver diskette from your RAID adapter's Resource CD.

3.) Boot your OS install CD and install Linux using the driver disk created above.

Note: You must install Xwindows for the RAID software to work properly.

4.) When the OS installation is complete, log in as "root" and copy the Java Run-time Environment (JRE) .bin file and the RaidWebConsole Linux .jar file to a directory on the local machine.
```
j2re-1_4_2_0_6-linux-i586-rpm.bin
```

Note: Please check the support website for the latest available versions.

5.) Open up a terminal window and change directory to the one used in step 4. Run the java .bin file (e.g. type: `./j2re-1_4_2_0_6-linux-i586-rpm.bin`). When this process completes an .rpm file will be created (e.g.: j2re-1_4_2_0_6-linux-i586).

6.) Run the rpm (e.g. type: `rpm -ivh j2re-1_4_2_0_6-linux-i586-rpm`).

7.) Ensure that the rpm worked properly by verifying that the following directory exists:
`/usr/java/`*j2re1.4.2_0_6*`/bin`

8.) Edit the following file for your corresponding OS.

RedHat: – `/root/.bash_profile` Add `/usr/java/j2re1.4.2_0_6/bin` to the line

that begins with "PATH" For example: Before

```
PATH=$PATH:$HOME/bin
```

After:

```
PATH=/usr/java/j2re1.4.2_0_6/bin/:$ PATH:$HOME/bin
```

SuSE: – `/etc/profile` Directly under the line that reads: "`export HOST CPU HOSTNAME`

```
HOSTTYPE OSTYPE MACHTYPE" enter the following lines:
PATH=/usr/java/j2re1.4.2_0/bin export PATH
```

9) Reboot the server

10) Log in as "root" and open a terminal window and change the directory to the one used in step 4.

11) Extract the .jar file.

12) Type:

```
java. /RAIDWebConsole_Linux.bin
```

This should start a GUI based installation. Follow the onscreen instructions as described in Section 5.5.1.1, "Web Console Installation (Linux, Suse, Netware, Openserver)," starting in step 4.

5.5.1.1 Web Console Installation (Linux, Suse, Netware, Openserver)

1) Insert the resource CD into the CD drive and Mount the CD.

2) Change the directory to /mnt/CDROM/Utilities/Linux/webconsole/

3) Launch the RAID Web Console_Linux.bin using the following command:

```
java ./RAIDWebConsole_Linux.bin
```

4) Follow the screen prompts as described below:

5) Click next on the Welcome Screen
6) After reading the license agreement, accept the terms and hit next.
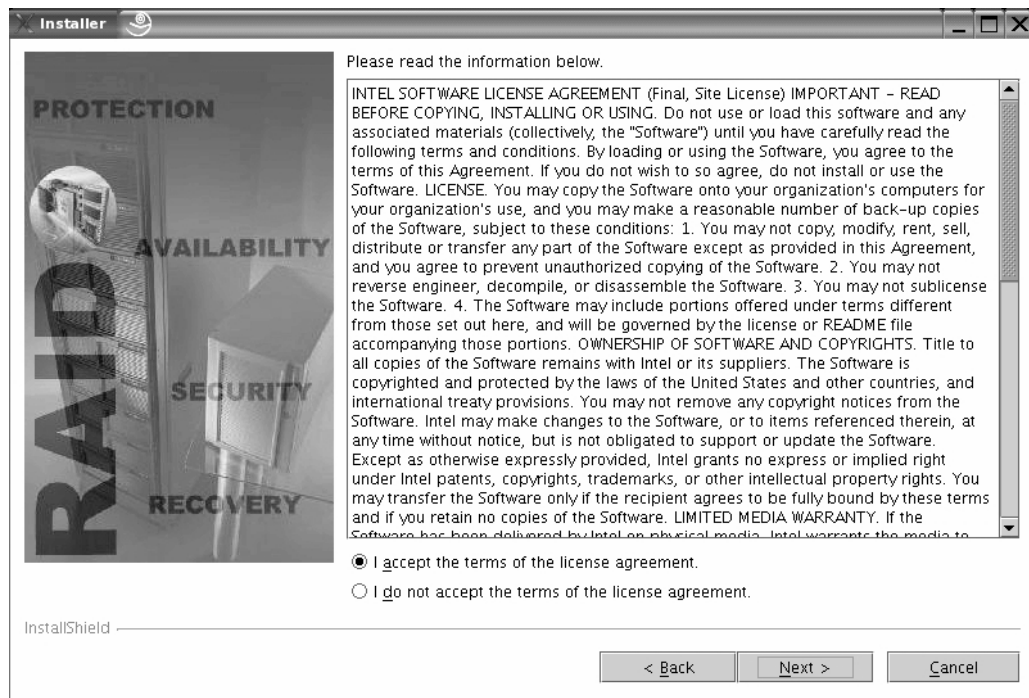
7)   Choose the type of installation you want:

a.   Standalone option installs and configures Web Console files for local operation of Web Console.

b.   Networking installs and configures Web Console files for both local and remote operation. Remote operation allows management of a RAID controller and it's attached arrays remotely via a TCPIP connection.

Note: To enable the registration server feature, the 'networking' option must be enabled on each RAID Server.

If you choose the networking option follow the steps starting from step 8.

8) After selecting the appropriate option , click the <Next> button.
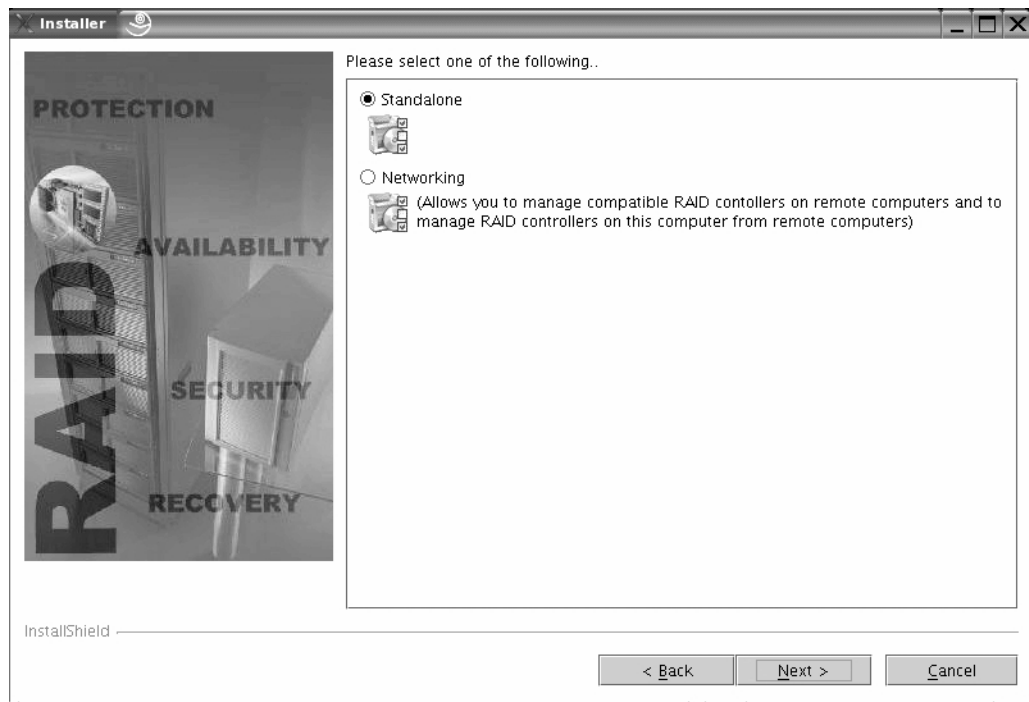
9) If you choose "Standalone" (or local management) then you will get following screen. Select next, to move to the next screen in the installation.
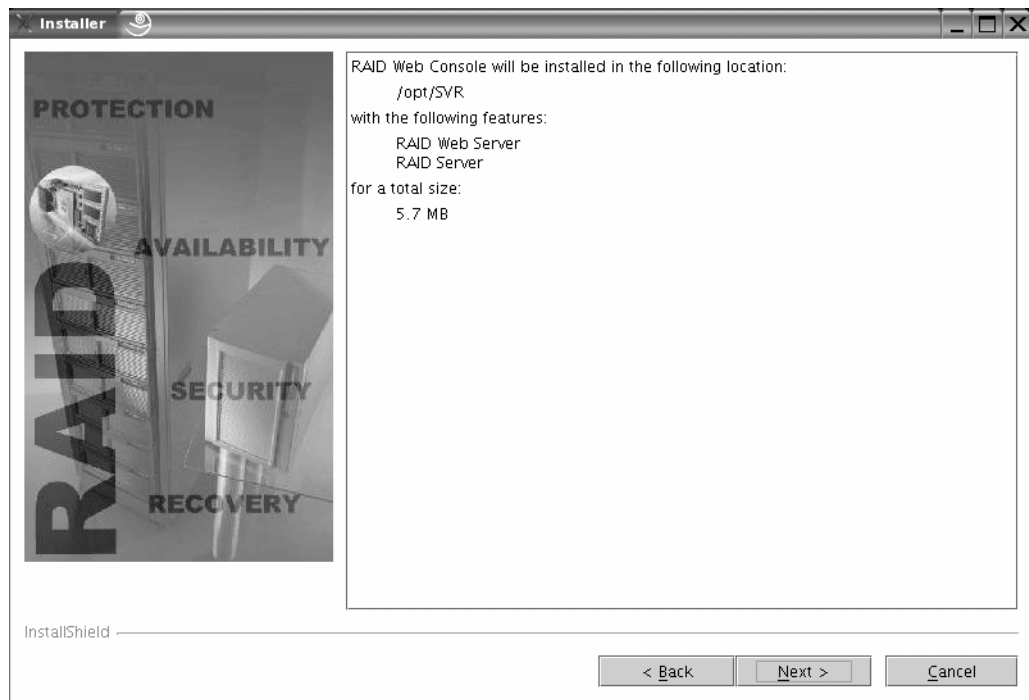
10) Enter your password for accessing the RAID web console and choose the <Next> button.
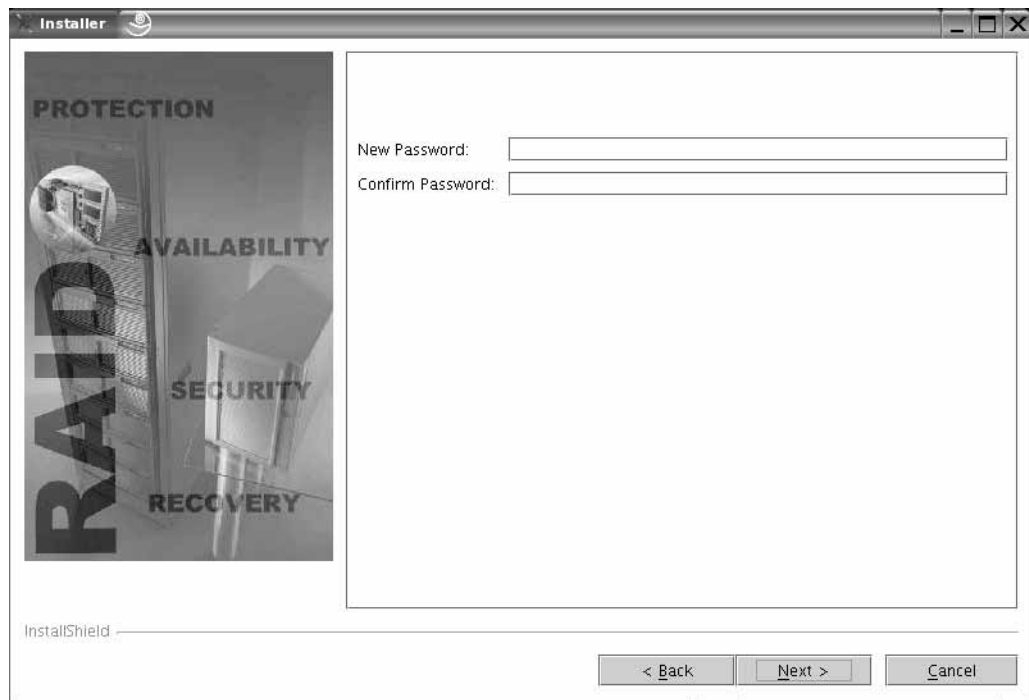
11) When the installation completes, click finish.
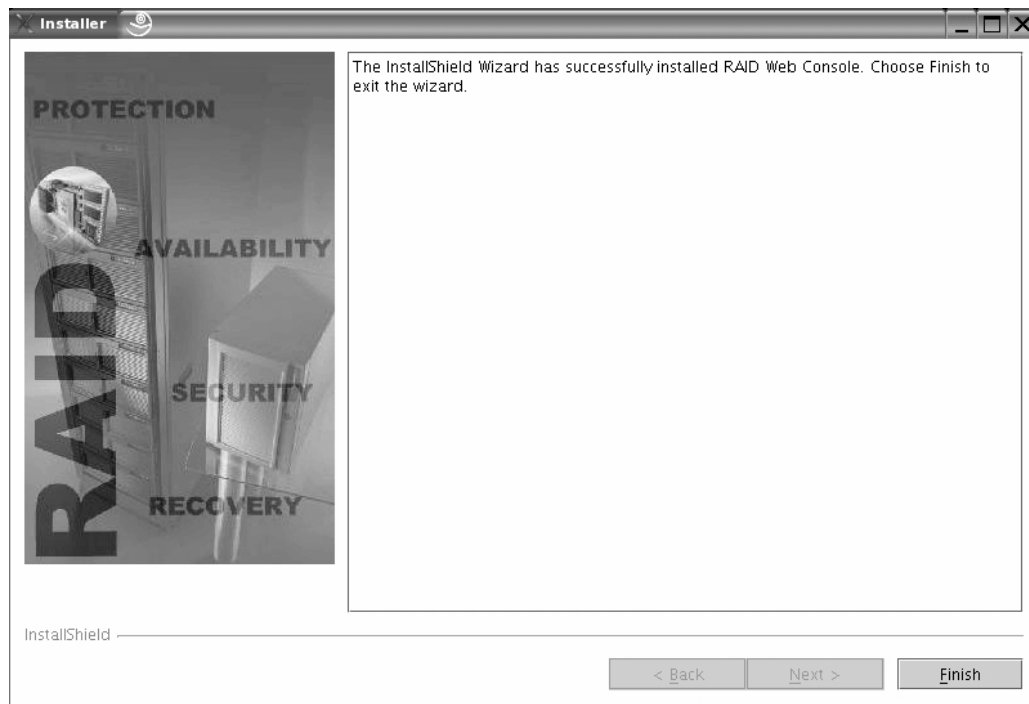
12) If you chose the "Networking" option shown in step 3 then you will get following screen. Choose whether or not you wish to remotely manage RAID controllers, then click next.
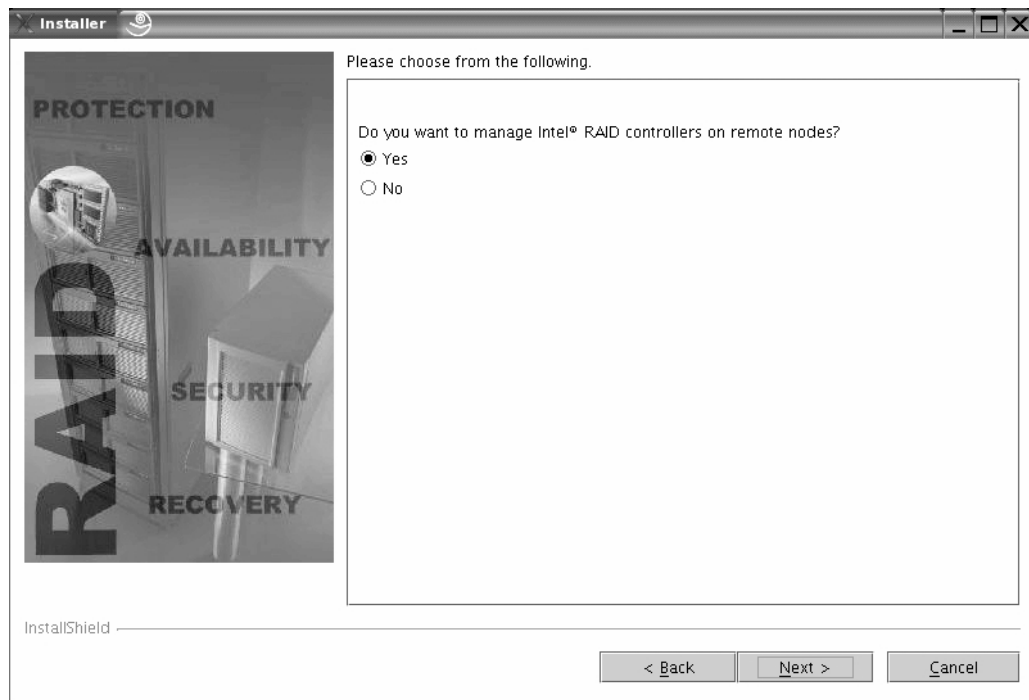
13) If you choose "Yes" option shown then you will get following screen. If you select "No", go to step 12.

14) Click the <Next> button to continue
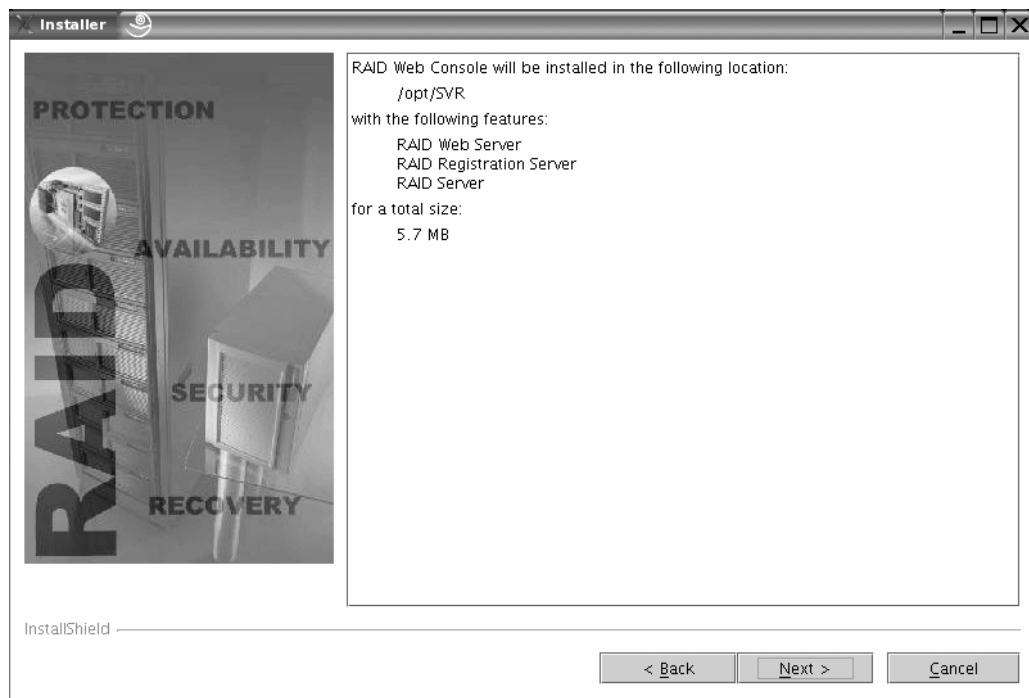
15) Enter your password and click the <Next> button to continue.
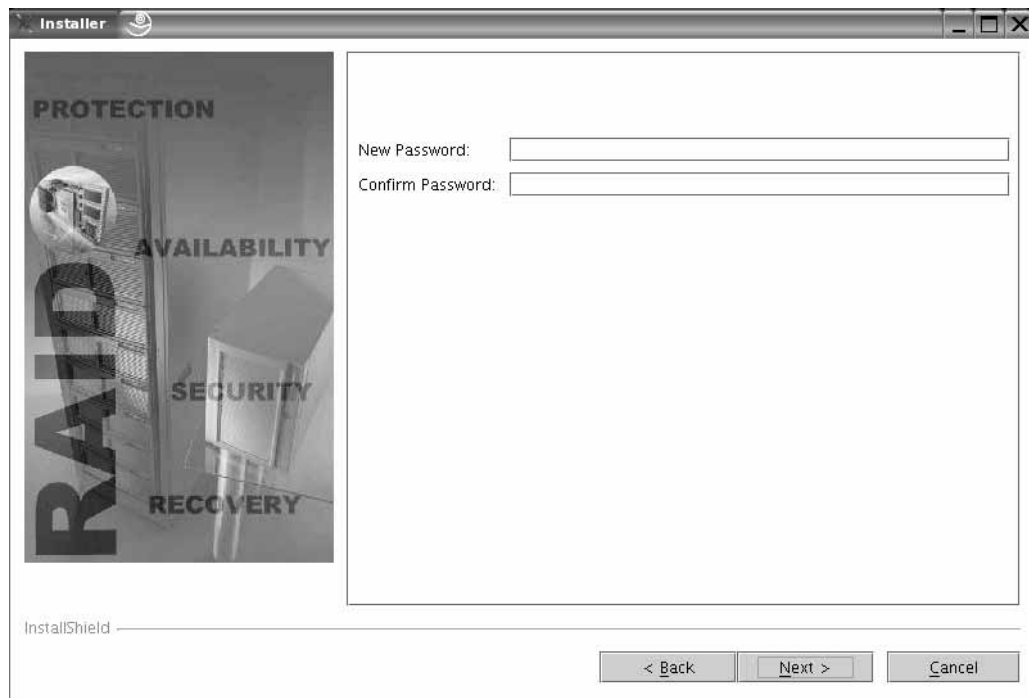
16) If you choose "Yes" to the question, "Do you want this raid controller to be managed?" then enter the name of the registration server when asked and click the <Next> button.

17) Click next button to continue at the RAID installation screen.

18) Enter finish after the RAID software has installed.
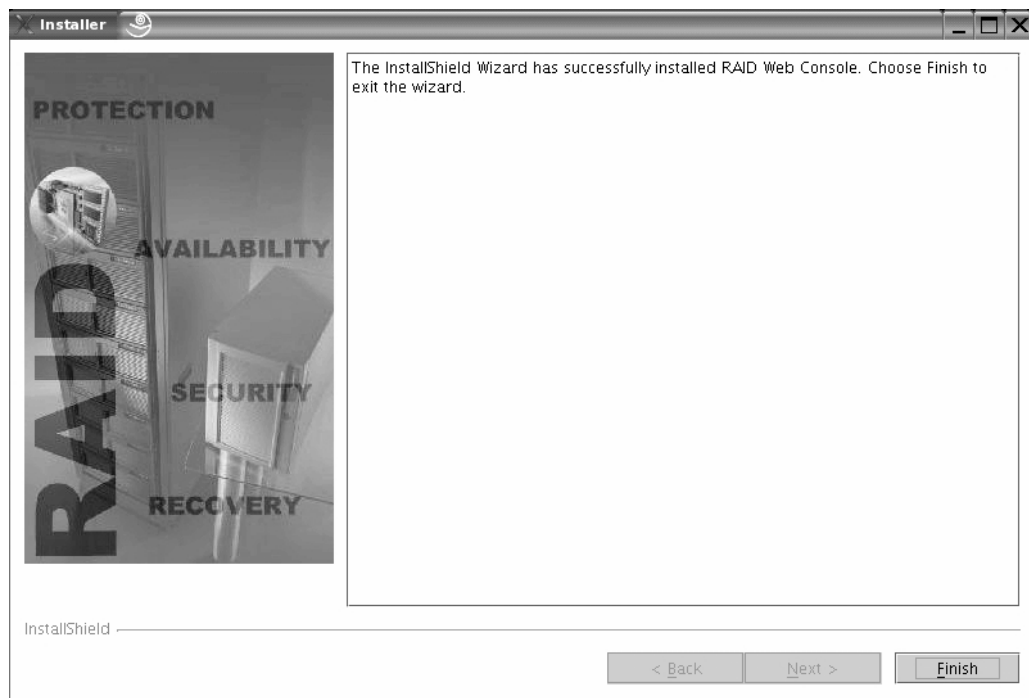
19) Change to the /opt/SVR directory by typing:

>   cd /opt/SVR

20) Startup the RAID Web console by typing:

<div align="center">./startup.sh</div>

21) To run web raid console, open the web browser and enter the following address:

```
http://localhost:3570
```

and enter the password.

5.5.3 Securing Web Console under Linux

After installing Web Console, you should secure Web Console for operation. This section provides instructions to secure the Web Console and use the Linux permission control function to secure this access. This section assumes that you are familiar with Linux administration. Please refer to your Linux user's guide for additional information pertaining to Linux operation and command syntax.

5.5.3.1 Steps to Secure Web Console

Web Console uses a service functioning as a port listener to receive requests from a web browser. Web Console can be stared with the command `/opt//startup.sh` and can be stopped with the command `/opt//shutdown.sh`. When you first install Web Console, any user from any group has rights to the `/opt/`subdirectory where these scripts are located; this means any user can start or stop Web Console. Web Console management can be secured, however, through the use of a specific group (such as "raidadmin") and by restricting access to this sensitive area to that group. The following step-by-step instructions describe this process: 1) Log in as `root`. 2) Change directory to `/opt/`: cd /opt/

4) Run the Web Console shutdown script:

```
./shutdown.sh
```

5) Edit the properties file:
vi mcc.properties

6) Change the start server parameters (change the
STARTSERVERAUTO=true to
STARTSERVERAUTO=false).

7) Change the permissions for the startup shell script:

```
chmod 700 startup.sh
```

8) Change the permissions for the shutdown script:

```
chmod 700 shutdown.sh
```

9) Change ownership of the startup script:

```
chown username:usergroup startup.sh
```

You can grant access rights to a single user or to an entire group (for example, a group named "raidadmin").

10) Change ownership of the shutdown script:

```
chown username:groupname shutdown.sh
```

You can grant access rights to a single user or to an entire group (for example, a group named "raidadmin").

11) Make the user, who you wish to grant access to, a member of the group defined in Steps 8 and 9 (groupname or "raidadmin"). This can be accomplished using the GNU interface, or you can do it at the command line. For example, to create a user "test" who belongs to the group "raidadmin", do the following at the command line:

```
adduser -G raidadmin -p password test
```

12) Add the location of the Java Runtime Environment (JRE) to the path of the user by editing the profile file in the user's home directory for your corresponding OS. For example (for Red Hat Linux), login as that user, edit `/home/test/.bash_profile`, and add `/usr/java/j2re1.4.2_0/bin` to the line that begins with `PATH`:

Before

```
PATH=$PATH:$HOME/bin
```

After

```
PATH=/usr/java/j2re1.4.2_0/bin/:$PATH:$HOME/bin
```

13) Log out and log back in as the user (for example, "test") to make sure the PATH change takes effect.

14) Execute the startup script:

```
./opt//startup.sh
```

You will be prompted with the following message when Web Console has been successfully started:

```
RAID Web Console version 1.36-00 release
Listening on port:3570
Root=/opt/
```

15) Open the browser and type `http://localhost:3570` in the address space to enter the RAID Web Console Interface.

16) To exit Web Console, use the `exit` command, then close the browser. 16) To stop the RAID server service, execute the shutdown script:

```
./opt//shutdown.sh
```

You will be prompted with the following message when successfully done:

```
Stopping MCC Server
[1]+Done ./startup.sh
```

16) Only the user who has been granted access in Steps 8 and 9 can successfully startup and shutdown the Web Console. When you have a new user who wants to perform RAID admin tasks, you only need to change that user's PATH statement and add the user to the "raidadmin" group.

5.5.4 Linux Uninstall Instructions

To uninstall Web console, Switch to a GUI screen.

At the prompt, type "**java –jar /opt//_uninst/uninstall.jar**"

Follow the prompts to complete the uninstall process.

5,5.5 Linux Update Steps

Web Console installation does not support component updates currently. You must uninstall a feature and reinstall that particular feature.

5.5.6 Set and Modify Full Access Password (Linux)

1. Password must be set on every machine that runs RAID Server (**RSLinux**).
2. To set the password for the first time, type **/usr/sbin/SetPass** at the shell prompt.
3. **SetPass** utility prompts user to enter a new password and confirm it.
4. Length of the password must not be more than **40** characters.
5. If a password has already been set, then **SetPass** allows a user to modify it.
6. Password is maintained in the file **/etc/raidpass.val**
7. Password needs to be set every time you uninstall and install Web Console

5.5.7 Accessing Web Console through Browser

Refer to Section 4.3.2, "Registration Server Operation," for information on accessing Web Console through your browser.

5.6 NetWare Web Console Installation

5.6.1 Netware Preparation

Table 5-1 Netware Installation Requirements

Feature	Requirement
RAID Web Server	TCP stack needs to be up and running for Web Server to function. Java Virtual Machine must be installed. Web Server is installed in **SYS:\PUBLIC\MCC** directory.
Registration Server	The TCP Stack needs to be up and running for Registration Server to function. In addition, Java Virtual Machine must be installed. It is installed under **SYS:\PUBLIC\MCC** directory. **REG_SERV.NLM** is automatically loaded.
RAID Server	Java Virtual Machine must be installed. RAID server can be installed only if "**mega4_xx.HAM**" driver loaded.

5.6.2 Installing Java Virtual Machine

Because local operation of Web Console relies on the NetWare version of Java for it's functionality, some Web Console features may not be available locally. Full functionality can be obtained by remotely managing the NetWare based RAID array from a remote server or client running Java under Linux or Windows.

The JRE is included in Netware 6.5 releases and is installed automatically. However, for previous releases, the JRE must be downloaded and installed separately.

JVM can be downloaded from Novell's support web site.

https://download.novell.com/ICSLogin/?"http://download.novell.com/filedist/steps/eLogin.jsp

Download the Java file "jvm141sp1.exe". This file must be installed from a Client system that is running Novell's Client32. Connect to one or more target NetWare servers from a system running client32 and launch the jfv141sp1.exe installation application:

1) The client system will read the installation package and verify it's integrity.

2) You will be presented with a welcome screen, click "next".

3) You will be presented with a license agreement, if you consent to the agreement, click "Yes".

4) You will be notified of the modules to be installed, click "next".

5) You will be notified of the system requirements, if your system meets these requirements, click "next".

6) The system will then search for available NetWare servers and you will be presented with a list of servers that have been discovered. Choose the target servers by clicking on the box next to the server name, then click "next".

7) The installation will then continue and when complete you will be presented with a list of servers on which the installation was successful, click "next".

8) You may then finish the installation by clicking "Finish".

5.6.2.1 NetWare Web Installation

For information on Netware Web Installation, refer to Section 5.5.1.1, "Web Console Installation (Linux, Suse, Netware, Openserver)."

5.6.3 NetWare Uninstall Instructions

1) Switch to GUI screen.

2) At the shell prompt, type:

    `java -jar SYS:\PUBLIC\MCC\_uninst\uninstall.jar`

3) Follow the prompts to complete the uninstall process.

5.6.4 Netware Update Steps

Intel® RAID Web Console Installation does not support component updates currently. One must uninstall a feature and reinstall that particular feature.

5.6.5 How to Set and Modify a Full Access Password

- Password must be set on every machine that runs RAID Server (RAIDSERV).
- To set the password for the first time, type SetPass at the console prompt.
- **SetPass** utility prompts the user to enter a new password and confirm it.
- Length of the password must not be more than **40** characters.
- If a password has already been set, then **SetPass** allows a user to modify it.
- Password is maintained in the file **c:\nwserver\setpass.nlm**
- Password needs to be set every time you uninstall and install Intel® RAID Web Console

5.7 UnixWare Web Console Installation

5.7.1 UnixWare Web Console Installation Preparation

Table 5-2 UnixWare Installation Requirements

Feature	Requirement
RAID Web Server	The TCP stack needs to be up and running for Web Server to function. In addition, JRE must be installed. Web Server is installed in the /opt/Mcc directory. The .jar files and directories are copied to the /opt/MCC directory.
Registration Server	The TCP stack needs to be up and running for Registration Server to function. In addition, JRE must be installed. It is installed in the /usr/sbin directory.
RAID Server	JRE must be installed. RAID Server and its sub-features can be installed only if the Intel® RAID Controller is loaded.

5.7.2 UnixWare Web Console Installation

For additional information, refer to Section 5.7, "UnixWare Web Console Installation".

1) Log into the UnixWare GUI as root user.

2) Mount the CD where the installation file (1.42-00-2.jar) is located.

3) Copy the `2.8-00-1.jar` file to the local machine. For example, copy the file to the `/tmp` directory. (Note: the file version may change as updated versions are made available.)

4) Install the RAID Web Console. At the command prompt, type:

```
java -jar /tmp/2.8-00-1.jar
```

5) Follow the prompts as described in Section 5.5.1.1, "Web Console Installation (Linux, Suse, Netware, Openserver)," starting at step 4.

6) Open the web browser and enter the following address.

```
http://localhost:3570
```

Next, enter the password.

5.7.3   UnixWare Uninstall Instructions

To uninstall Web Console, switch to a GUI screen. At the prompt, type in the following:

```
java -jar /opt/MCC/_uninst/uninstall.jar
```

Follow the prompts to complete the uninstall process.

5.7.4   UnixWare Update Instructions

The Web Console installation does not currently support component updates. You must first uninstall a feature and then reinstall that particular feature.

5.7.5   Setting and Modifying the Full Access Password

- The password must be set on every machine that runs the RAID Server (RaidServ).
- To set the password for the first time, type /usr/sbin/SetPass at the command prompt.
- The SetPass utility prompts the user to enter a new password and confirm it.
- The length of the password must not be more than 40 characters.
- If a password has already been set, then SetPass allows a user to modify it.
- The password is maintained in the /etc/raidpass.val file.
- A password needs to be set every time you uninstall and install Web Console.

5.8   OpenServer Web Console Installation

5.8.1   OpenServer Web Console Installation Preparation

Table 5-3   OpenServer Installation Requirements

Feature	Requirement
RAID Web Server	The TCP stack needs to be up and running for Web Server to function. In addition, JRE must be installed. Web Server is installed in the /opt/Mcc directory. The .jar files and directories are copied to the /opt/MCC directory.
Registration Server	The TCP stack needs to be up and running for Registration Server to function. In addition, JRE must be installed. It is installed in the /usr/sbin directory.
RAID Server	JRE must be installed. RAID Server and its sub-features can be installed only if the Intel® RAID Controller is loaded.

5.8.2   OpenServer Web Console Installation

1) Use the vi editor to edit the /.profile file to change the PATH environment variable as follows:

   a. vi /.profile

   b. Add /usr/java/bin to the line that begins with PATH. For example:

   Before
   ```
   PATH=$PATH:$HOME/bin
   ```

   After
   ```
   PATH=/usr/java/bin/:$PATH:$HOME/bin
   ```

2) Mount the CD as follows:

   ```
   mount /dev/cd0/mnt
   ```

3) Copy the .jar file onto the hard disk

   ```
   cp /mnt/$RWC/Open*.jar /usr/java/bin
   ```

4) Start the java-based installation:

`java -jar Openserver2.8-00-1.jar` (Note: the version may change as updates become available.)

This will start a GUI-based installation. Follow the screen prompts as shown in Section 5.5.1.1, "Web Console Installation (Linux, Suse, Netware, Openserver)."

5.8.3   OpenWare Uninstall Instructions

To uninstall Web Console, switch to a GUI screen. At the prompt, type in the following:

`java -jar /opt/MCC/_uninst/uninstall.jar`

Follow the prompts to complete the uninstall process.

5.8.4   OpenWare Update Instructions

The Web Console installation does not currently support component updates. You must first uninstall a feature and then reinstall that particular feature.

5.8.5   Setting and Modifying the Full Access Password

- The password must be set on every machine that runs the RAID Server (`RaidServ`).
- To set the password for the first time, type `/usr/sbin/SetPass` at the command prompt.
- The `SetPass` utility prompts the user to enter a new password and confirm it.
- The length of the password must not be more than 40 characters.
- If a password has already been set, then `SetPass` allows a user to modify it.
- The password is maintained in the `/etc/raidpass.val` file.
- A password needs to be set every time you uninstall and install Web Console.

5.9   Launching Web Console

Web console is launched from a Web Browser that supports Java scripts. Microsoft* Internet Explorer 5.5 or later and Netscape* Browsers are supported.

Launch the web browser and access the RAID controller via port address 3570. For Example, for a remote system:
`http://192.168.0.1:3570`

For local RAID management:
`http://localhost:3570`

For access to RAID servers listed in the Registration Server Database, use the registration server's host name or IP address.

Select the RAID controller to be managed by clicking on the name of the server in the window.

You will be presented with an option to control read only functions of the RAID controller or full access to the RAID Controllers configuration options. You must have the proper rights to manage the RAID controller's configuration options.

Figure 5.21 Web Console Login
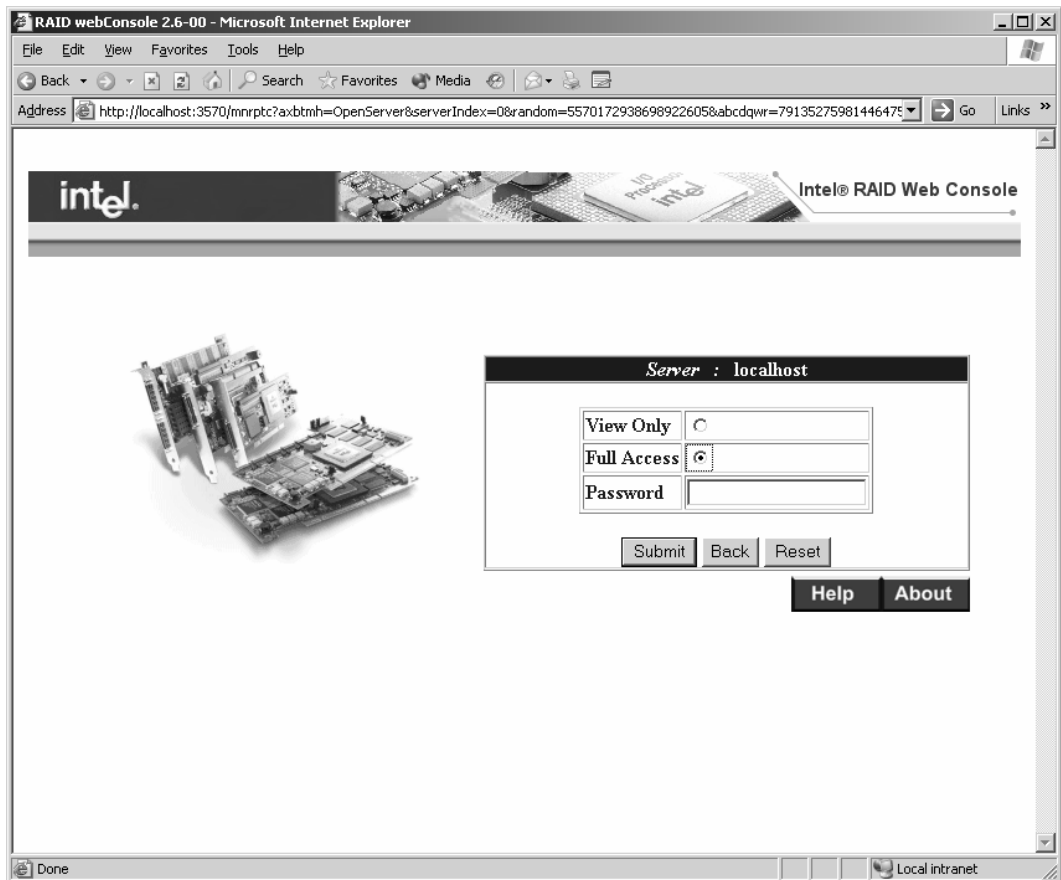
Full access options will be described in this document. Click in Full Access and enter the assigned password.

You will be presented with a menu that contains the management options available for the RAID controller and its attached physical and logical drives.

The main Raid web console screen shows a physical view and logical view of the drives. The physical view displays all the individual drives that are connected to each adapter installed in the system. The Logical view shows logical drives that have been configured with a RAID level. The menu items for functions to configure or view the status of logical drives are summarized in Table 5-5 and Table 5-6. Refer to the corresponding sections for a description of each item.

Refer to table 4.6 and 4.7 for more information on logical and physical drive states.

> Note: Only one session with Full Access Privilege exists at any one time. Please select exit to log out of Web Console. If you close the browser window after logging into Web Console with Full Access Privilege, you must wait 2 minutes before logging in again so that the previous session times out.

Figure 5.22 Management Options
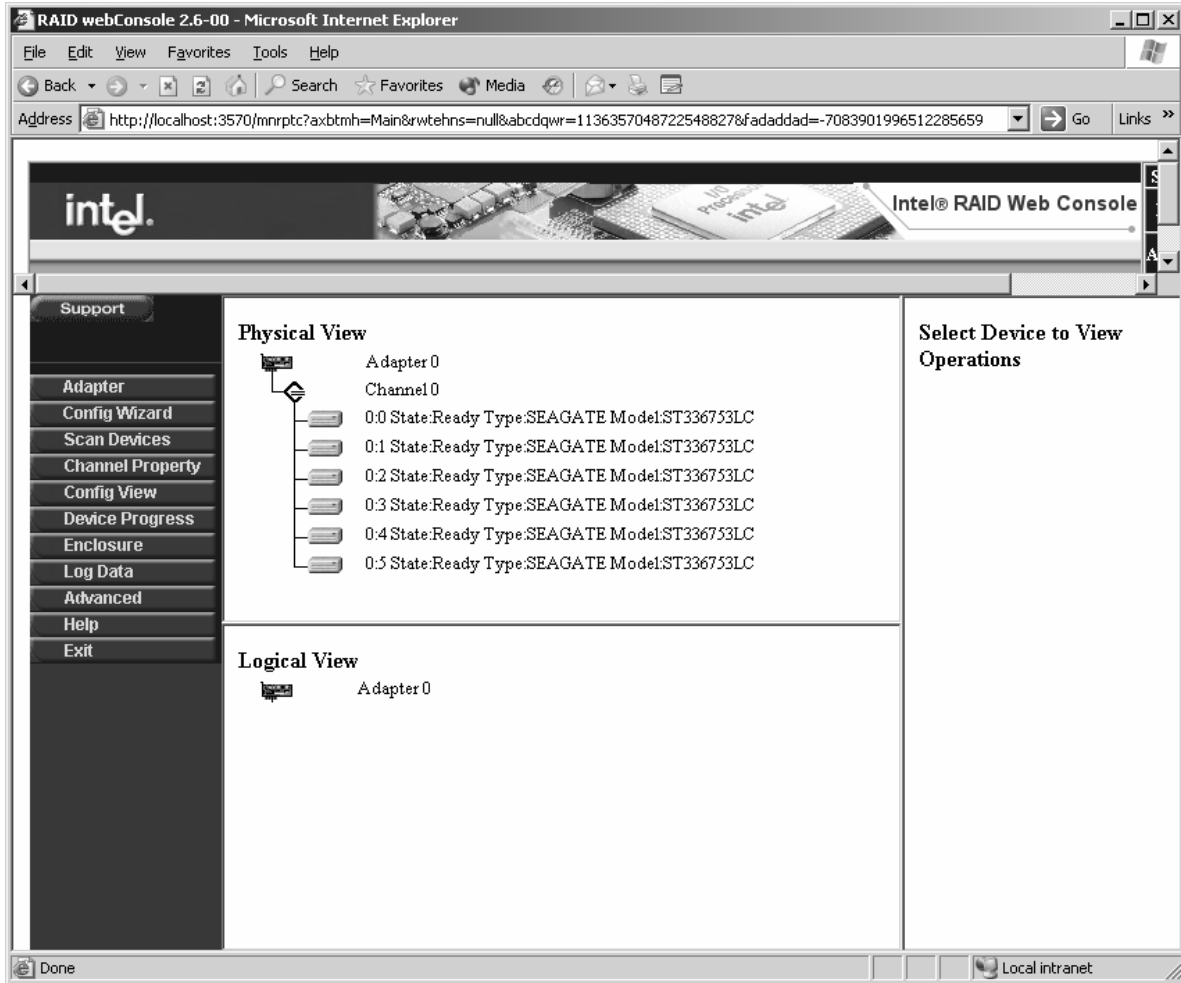
The following table describes each of the options on this page:

Table 5-4   Web Console Management Options

Element	Description
Adapter	This option enables you to configure the adapter properties
Configuration Wizard	This option provides series of options to allow you to create new drive arrays, to add capacity to existing arrays, or to modify existing arrays.
Channel Properties	This option allows you to configure the properties of the available SCSI channels on the RAID controller
Config View	This option allows you to change between the Logical and Physical drive view.
Device Progress	Provides progress of an operation being performed such as array initialization.
Enclosure	This option displays the enclosure status with its attached drives

Table 5-4   Web Console Management Options

Element	Description
Log Data	This option allows configuration of the logged data output.
Advanced	This option allows you to change the RAID server name, log data location, firmware location, and perform a firmware update.
Help	This option provides the RAID configuration help screens.
Exit	This option allow exit from the utility and prompts for reboot.

5.10 Web Console Adapter View Option

The adapter view gives a summary of the current adapter properties, channel termination, logical drives and operations that can be performed on a drive.

Figure 5.23   Adapter View
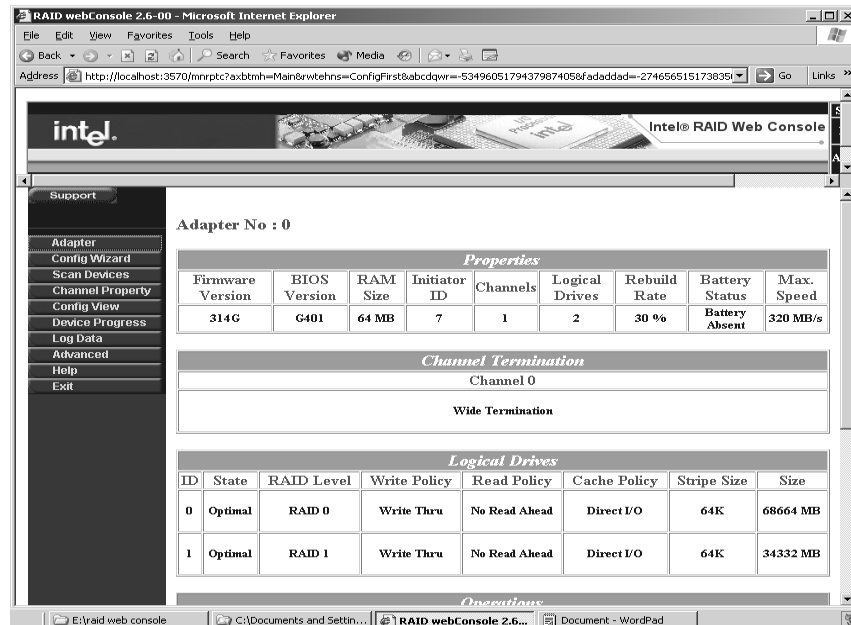
Properties Shown for SCSI Adapter

Firmware Version – Displays the current firmware version for the adapter.

Bios Version – Displays the bios version of the Card.

RAM SIZE – Displays the onboard RAM size of the adapter. The on board RAM size depends on the adapter purchased.

Initiator ID – Each adapter is set to SCSI channel 7.

Channels – The number of channels that the card supports is displayed.

Logical Drives – This shows the current number of logical drives that are defined.

Rebuild Rate – Displays the current setting for rebuild rate that determines the amount of CPU resources dedicated to rebuilding a drive.

Channel Termination – The current SCSI termination on the drive.

Battery Status – Shows the current battery status if any batteries are installed on the system

Transfer Speed – Displays the theoretical bus speed of the card.

Additional information about each logical drive is shown below.

Logical Drives

Each defined logical drive will be listed.

Refer to Section 4.7, "Setting Logical Driver Parameters" for more information on the logical drive Options.

Operations

Reset Config – This option resets the configuration of all drives. This will clear out all drive configuration so be sure to backup all data before performing this operation.

Flush Cache – This clears out all data that is currently stored in the on board cache and stores it on the logical drive.

Enable/Disable Alarm – Will turn on/off the audio alarm depending on the current state of the alarm.

Silence Alarm – Turns off the speaker when an alarm occurs. This does not disable the alarm but temporarily turns off the speaker so that you can clear out the current error condition. Subsequent errors will cause an audible alarm to be heard.

Initialize Drives – Selecting this option will present checkboxes for each logical drive. Selecting the appropriate drives will initialize each drive with the configured RAID configuration.

Patrol Read – The drives can be setup so that a patrol read can be done on them for enhanced detection of device failure. A periodic read is done of each drive sector to test for valid read. If the read fails, the sector is marked as failed.

5.11 Config Wizard

The Configuration wizard guides you through the steps for creating RAID logical drives. Choose one of three configuration options:

- Custom Configuration – This is for advanced users. See the next chapter for information on setting up RAID 0, 1, 5, 10 and 50 logical drives using custom configuration.

- Auto Configuration(Without Redundancy) – This automatically configures the drives without redundancy. Configures all available drives as a RAID 0 logical drive.

- Auto Configuration (with redundancy) – This configures the drives with redundancy. This option configures RAID 1 for systems with 2 drives or RAID 5 for systems with 3 or more drives. All available physical drives will be included in the logical drive using all available capacity on the disks.
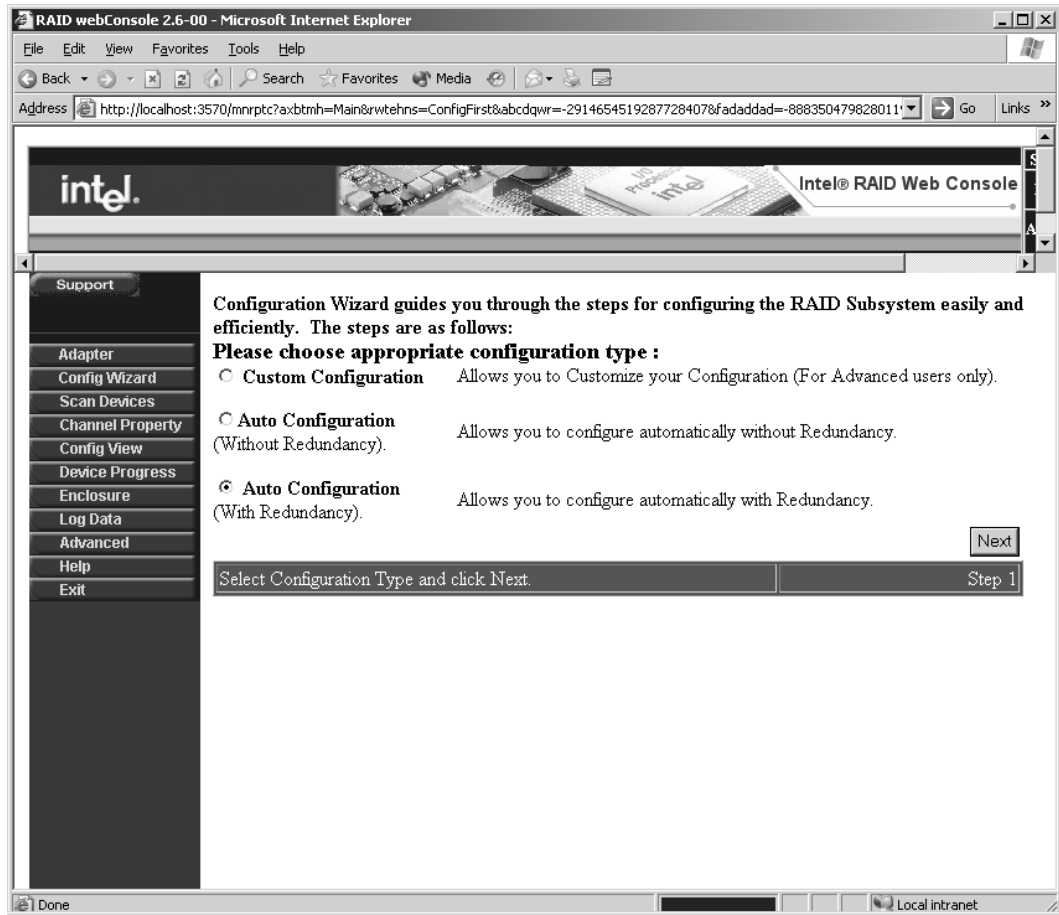
5.12 Scan Devices

When you select the Scan devices option, the RAID Web console checks the physical and logical drives for any changes of drive status. The results of the scan are shown in the physical and logical drive windows.
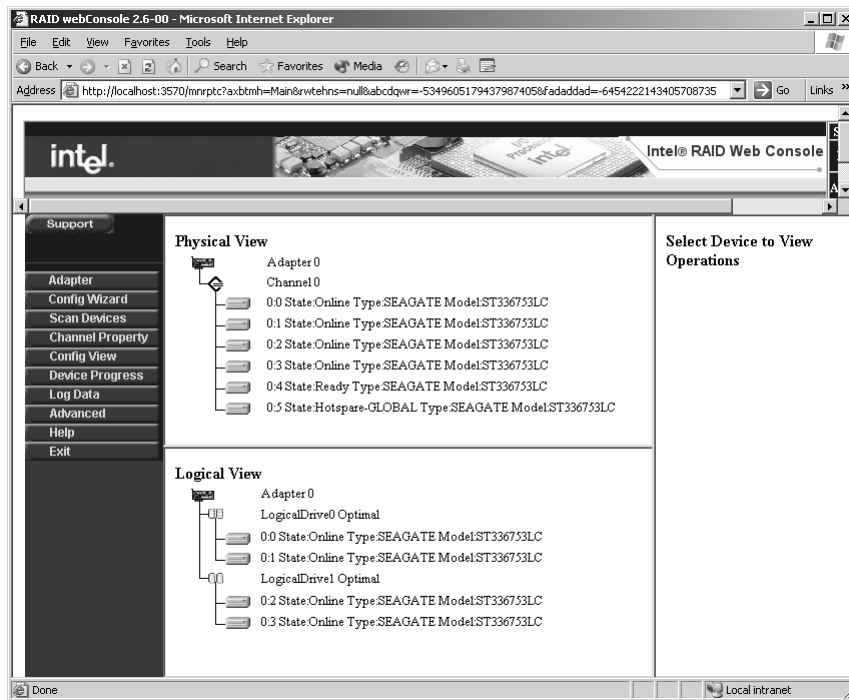
5.13 Channel Property

The channel properties option shows the channel's current state, termination, ID and number of drives.

Channel Properties			
Channel ID	Channel State	Channel Termination	Number of Drives
0	CHANNEL ACTIVATED	WIDE TERMINATION	6

5.14 Config View

The config View displays a physical and logical view of all the drives and adapters in the system. You can select either the adapters or individual drives to perform different operations on the drive. The operations presented will depend on the state of the drive.
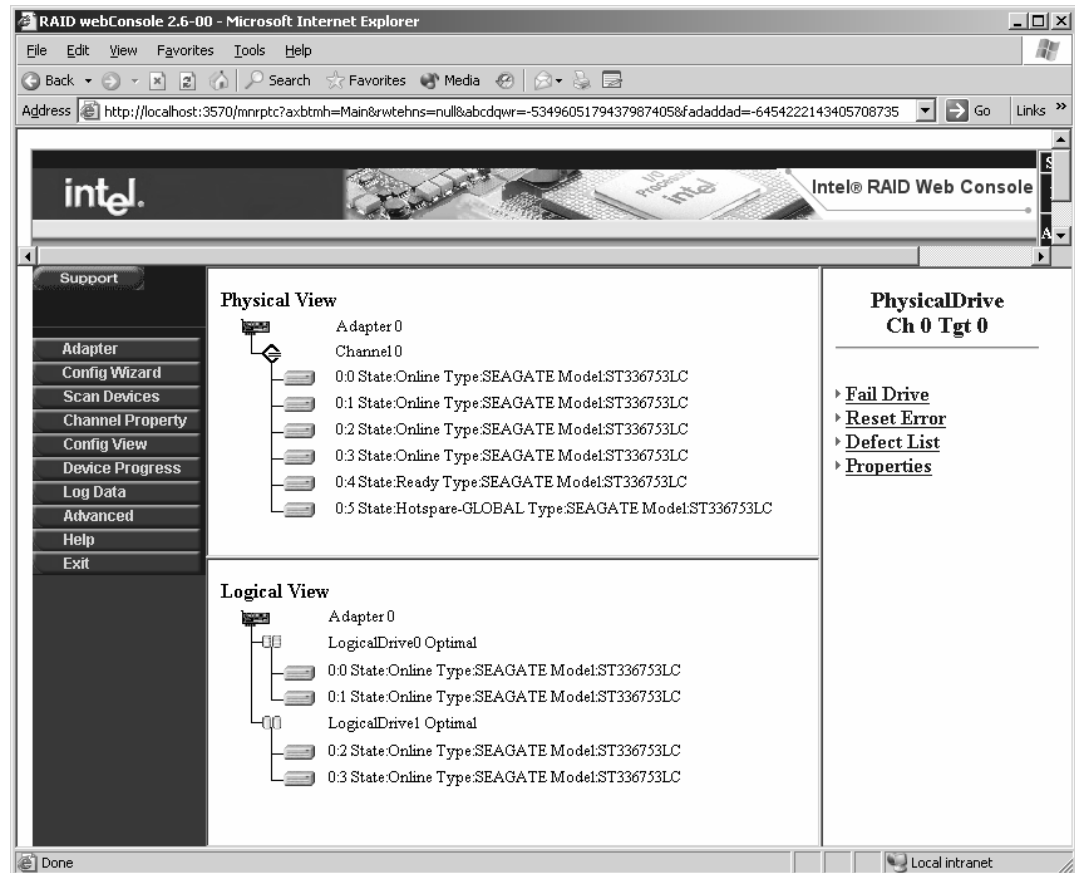
Idle Drive Operations in Config View

Selecting an Idle drive will display a set of options on the right hand side. The options made available depend on the state of the drive.

Make Hot Spare

The Hot spare option turns an idle drive into a Global or Dedicated Hotspare drive. The dedicated option is only made available when there is a logical drive defined. A drive that fails will automatically be replaced by a hot spare.

Fail Drive

This option takes the selected drive offline.

Spin Up

This option brings spins the drive up and once again makes it operational.

Spin Down

This option spins down the drive so that you can take a drive offline.

Remove

This operation removes the selected drive from the array.

Defect List

This option shows the size, state, speed and termination of the drive. The health of the drive is displayed showing the media and non media errors that have occurred for the drive. The channel, target id, vendor, product and version for the drive is shown in the right hand menu. The operations that can be performed on the drive is also shown.
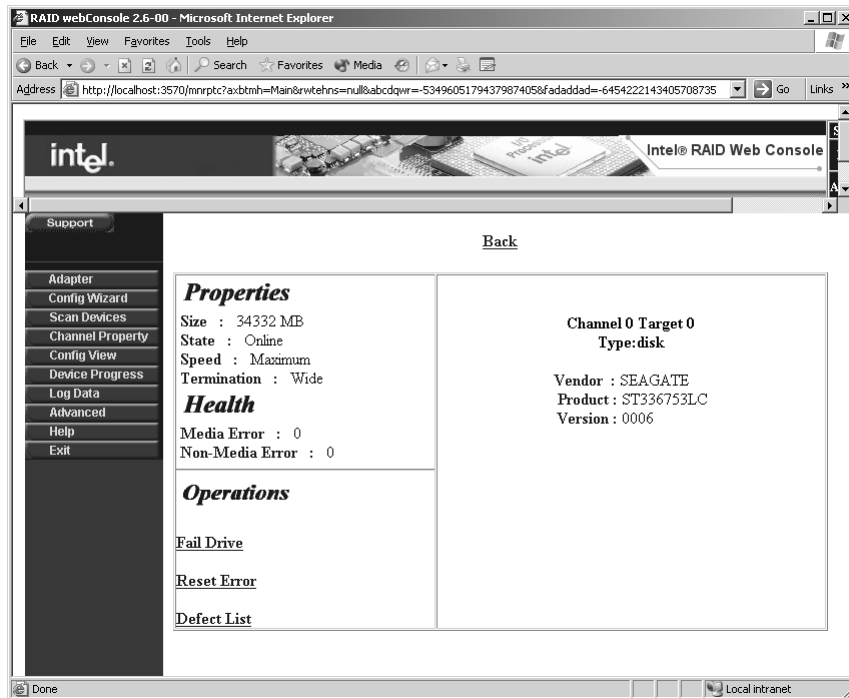
Properties

Selecting properties displays the current RAID level of the drive, its current state, size and stripe size as shown. The current drive polices for read, write and I/O are also shown.
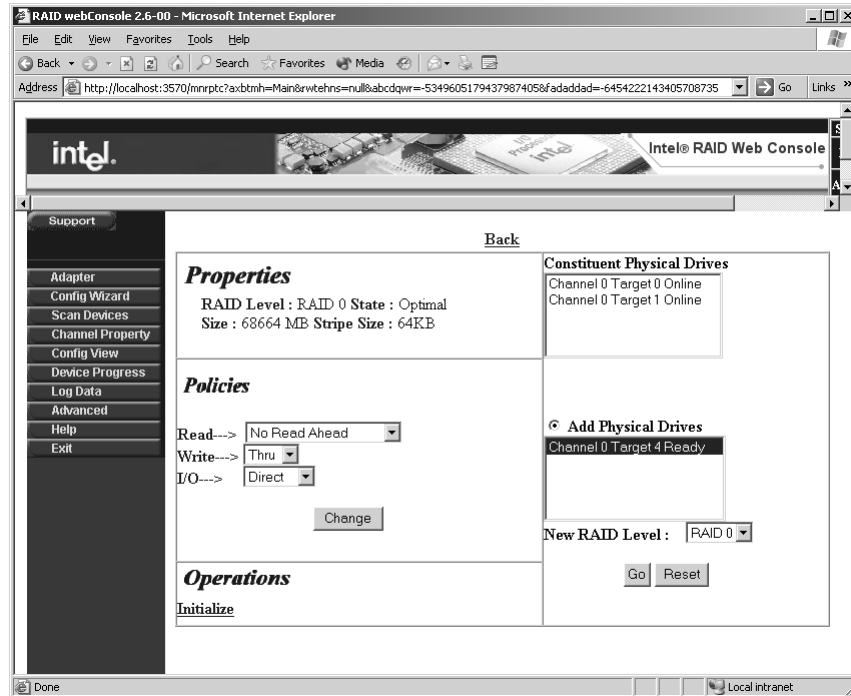
Adapter Operations in Config View

Select any of the adapters in the config view and the operations that can be performed will be shown in the right hand pane. The various options are described below.

Reset Config

Resets the current board configuration. This is a destructive operation so ensure that you backup any data before performing this operation.

Rebuild Rate

This option selects the amount of system resources devoted to rebuilding failed disk drives. A higher percentage rate rebuilds drives faster but can degrade the system performance.

Flush Cache

This option sends the contents of cache memory to the logical drives. If the card is powered down rapidly you must flush the contents of the cache memory to preserve data integrity.

Disable Alarm

Disables the on board speaker alarm for the selected adapter.

Enable the Alarm

Enables the alarm for the adapter if the alarm is currently disabled.

Initialize Drives

This option initializes all the drives on the adapter by writing zeros to the entire volume and should be used to initialize new logical drives that you configure.

Check Consistency Drives

This option verifies the correctness of the redundancy data and is available for RAID 1,5, 10 or 50 logical drives. If a difference in the data is found the adapter assumes that the data is accurate and automatically corrects the parity value.

Properties

This option displays the logical drive properties and allows for performing various operations. See the next section for information displayed when this option is selected.
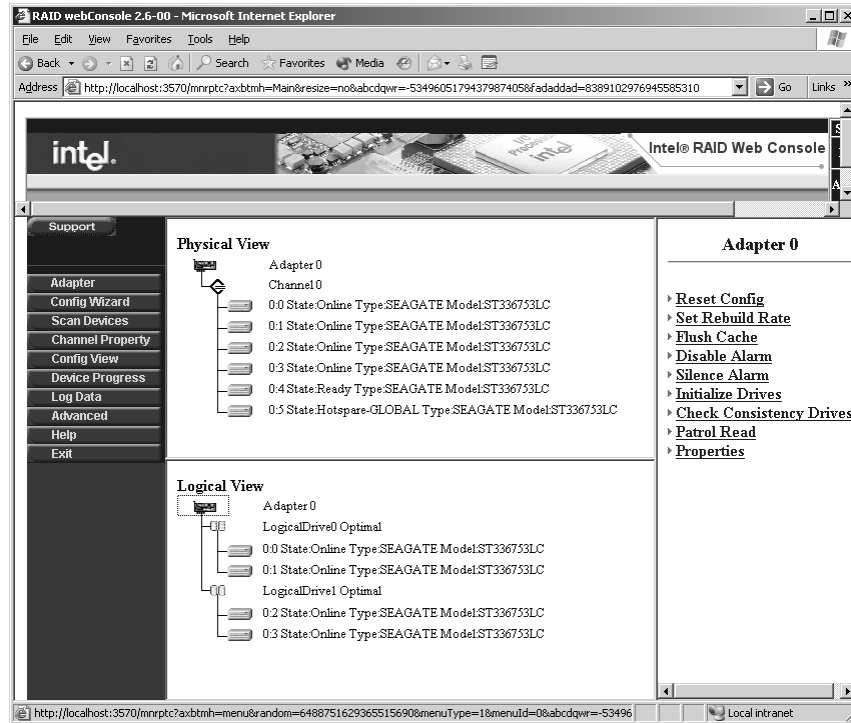
Adapter Properties Screen

The adapter properties screen is shown in the figure below. Each item is described as follows:

Firmware Version

Shows the current firmware version of the adapter.

BIOS Version

Displays the current bios version for the adapter.

RAM Size

Displays the Current ram size for the adapter.

Initiator ID

Displays the Current SCSI ID for the adapter.

Channels

Shows the number of channels on the adapter

Logical Drives

Displays the current logical drives that are defined on the adapter.

Rebuild Rate

Displays the current setting for the rebuild rate.

Battery Status

Shows if any battery is installed.

Max Speed

Displays the maximum speed of the adapter.

Channel Termination

Displays the current channel and channel termination for the drive.

Logical Drive Pane

ID

Displays the current ID of the logical drive.

State

Displays current state of the drive.

RAID Level

Displays the RAID level for the logical drive.

Write Policy

Displays the urrent write policy for the drive.

Read Policy

Displays the current setting of the read policy.

Cache Policy

Displays the current setting for the cache policy.

Stripe Size

Displays the current stripe size for the drive.

Size

Displays the size in MB of the logical drive.

5.14.1 Operations

The Rebuild rate for the drive can be optionally changed in this screen. Enter a value from 0 to 100 and hit the submit button.

Various operations can be done on the drive. Refer to the section "Adapter View Operations" for more information on what can be done with the drive.

5.15 Device Progress

The current state of any operations such as consistency checks, rebuilds, diagnostic tests or consistency checks or drive reconstructions are displayed in this window. The progress bar

shows the current percentage of the operation that has been completed. The example shows a currently running consisting check.

Intel® RAID Web Console
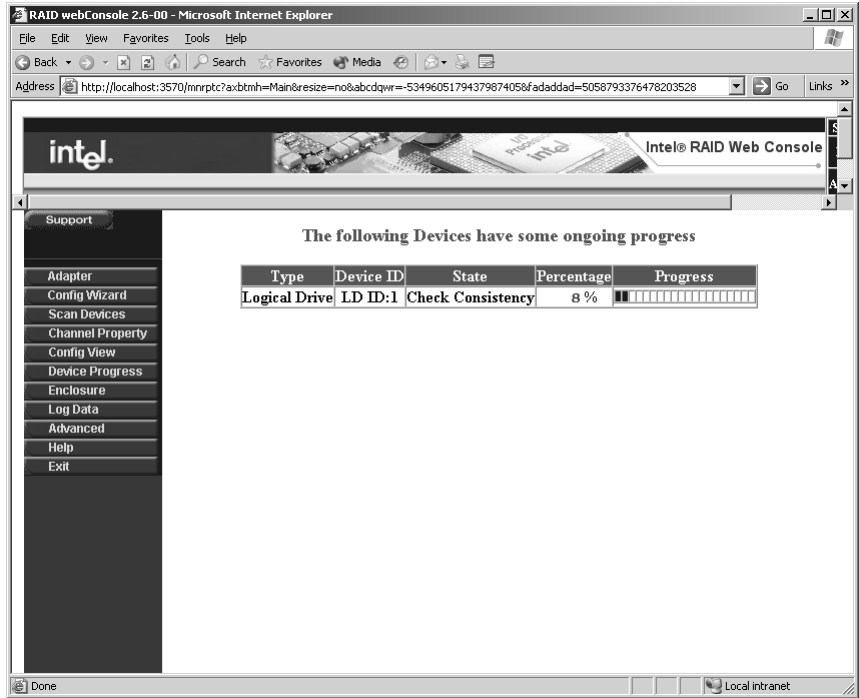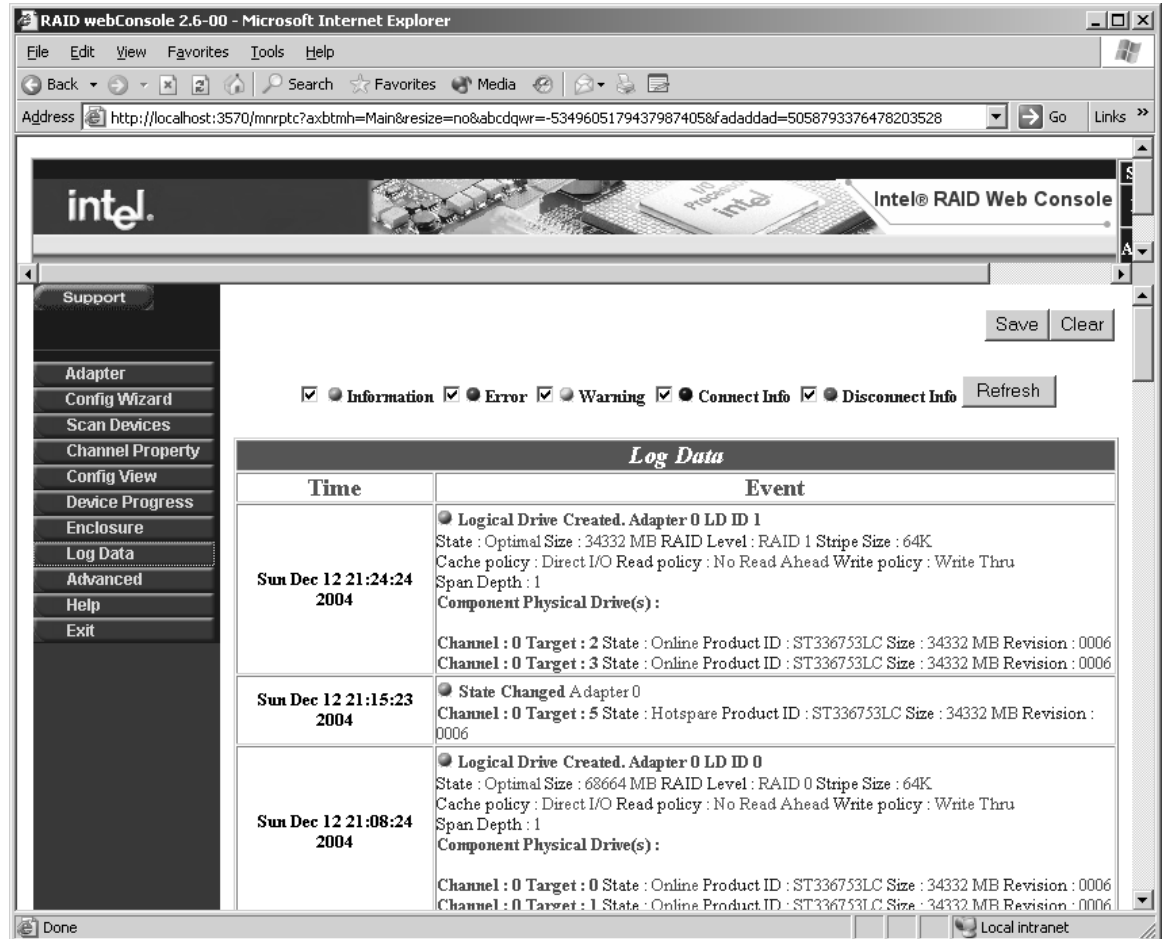
5.16 Setting Log Data Conditions

Log Information

Logs Information such as Error, Warnings, Connect Info, Disconnect Info, are logged in a predefined text file. Each of the conditions can be individually enabled or disabled by selecting the appropriate check box. The time the event took place and the details of the event are displayed in the right hand pane.

A text log file is generated and stored in the directory specified in advanced settings. Where the log file is stored can be changed by selecting the Advanced menu bar and then selecting Advanced Settings.

5.17 Advanced Configuration Options

5.17.1 Advanced Settings

The advanced options Window sets the default directories for saving log files, firmware and configurations, stores and loads the RAID Controller configurations and updates the firmware on the controller. Refer to the sections below for the different options.

For further information, refer to the section below titled "Configuring Advanced Settings."

Update Firmware

Refer to the section "Updating the RAID Controller Firmware."

Store/Download/Delete

Refer to the section, "Storing a RAID Controller Configuration."

Load/Update/Delete

Refer to the section, "Restoring a RAID Controller Configuration."
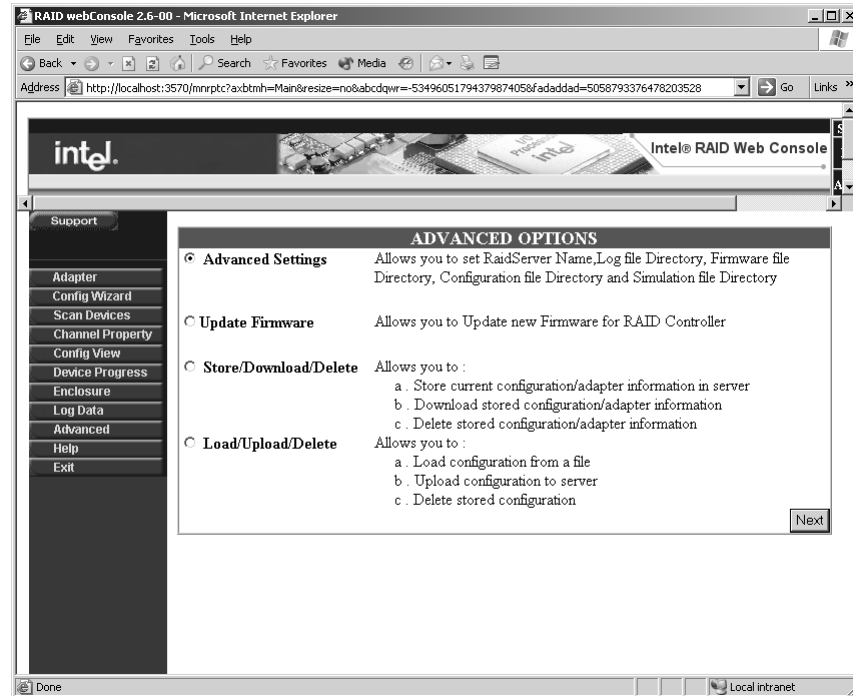
Configuring Advance Settings

The firmware file directory, configuration, log file directory, raid server name and RAID server port can be set in this window. The various options are described below.

Log File Directory

Sets the directory where the text log file is stored. Refer to the section "Setting Log Data Conditions" for more information.

Firmware File Directory

Lists the default firmware directory used to update firmware. If you are downloading firmware from the Intel Support site, the firmware should be loaded in this directory.

Configuration Directory

This is the directory where configuration files are stored for the RAID adapter.

RAID Server Name

This defines the name of the server on the network or is set to localhost if the raid controller is managed from the local machine

RAID Server Port

This sets the server port for communicating with the RAID web server.
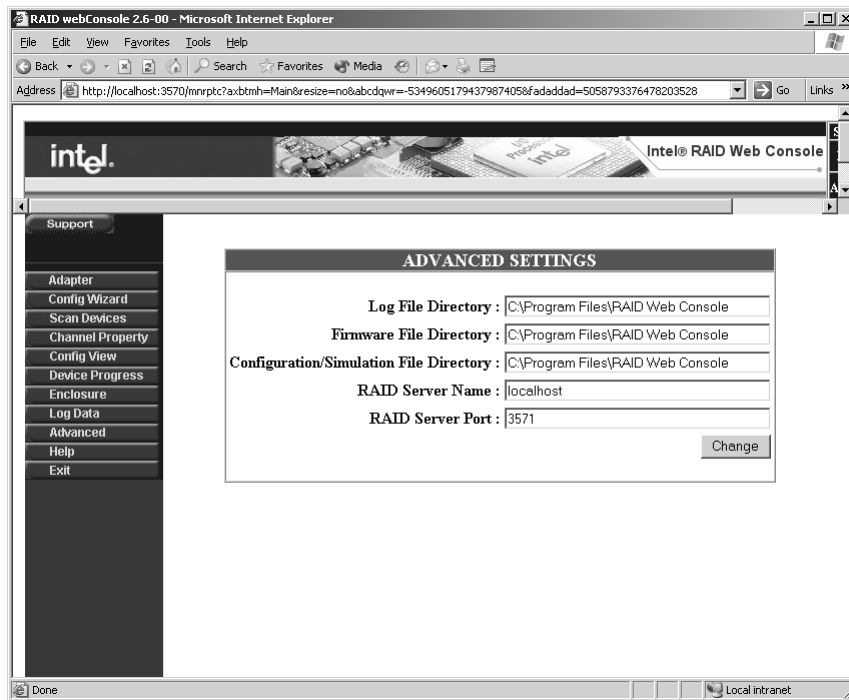
5.17.2   Updating the RAID Controller Firmware

The latest firmware for your raid controller can be found on the Intel Support Site. http://support.intel.com.

Updating Firmware from an FTP Site

Firmware can be downloaded from a user FTP site. To update the firmware enter the internet address for your FTP server, the name of the firmware's filename, the user id and the password and hit the Update button to program the firmware.

Updating Firmware from a Local File

Enter the name of the firmware file that is stored in the Firmware directory or select the Browse button to locate the file on your hard drive or on the network. Once the file is entered, click the <Update> button to program the firmware.

Note: If there is a background task like rebuilding, building, or checking consistency, the RAID Controller firmware cannot be upgraded.
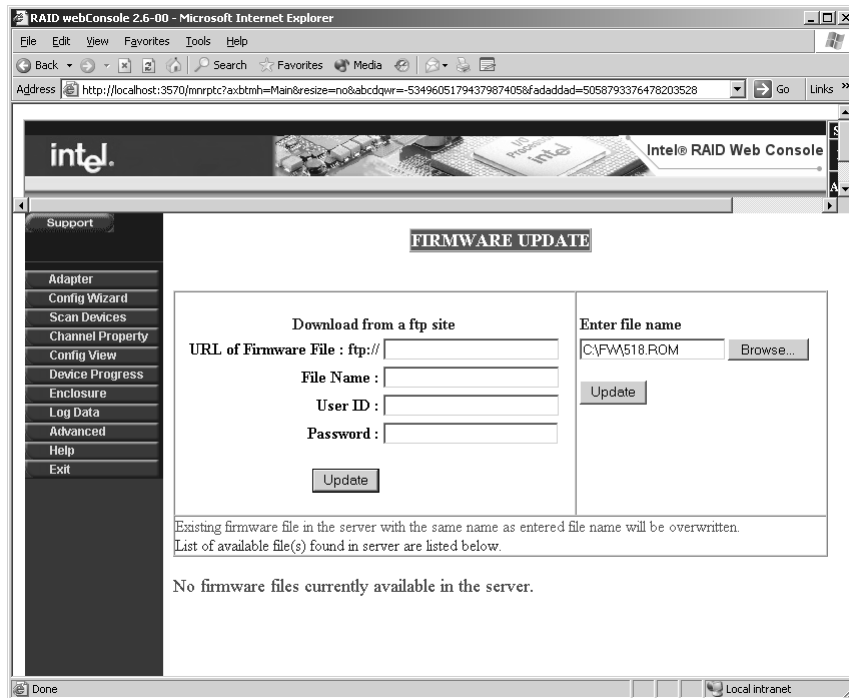
5.17.3   Storing or Loading RAID Controller Configurations

Storing a RAID Controller Configuration

The RAID configuration for your RAID controller can be saved to a file. This configuration can be used to configure additional systems or used to load configurations on adapters installed on a local machine.

1.) Select the Store Current Adapter configuration and hit the Store Button. The configuration will be stored below with the date and time tagged in the filename.
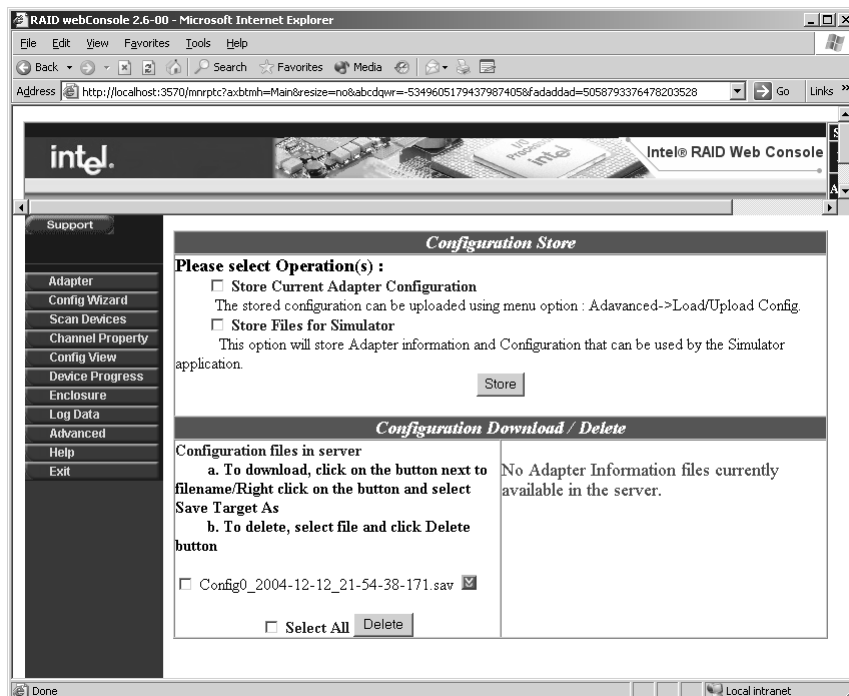
Restoring a Saved RAID Configuration

1.) To restore a saved configuration select the Check box next to the configuration you want to restore and hit the <Load> Key.

2.) You can load a configuration from your local system or out on the network by hitting the browse button. Once the appropriate file is selected hit the upload button.
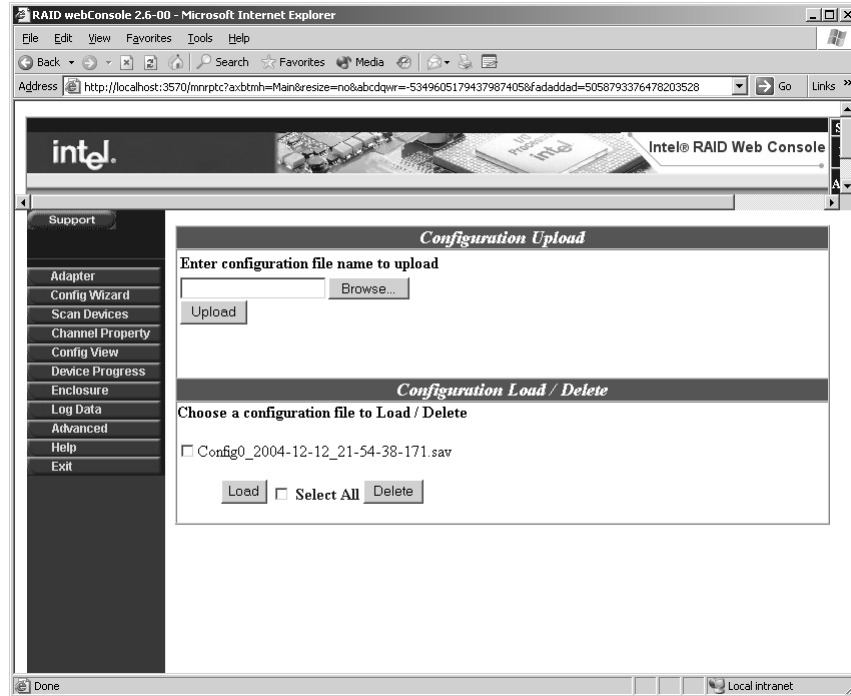
Deleting a Stored RAID Configuration File

To delete a stored configuration file, click the checkbox next to the configuration file you want to delete from your system and hit the delete button.

5.18 Configuring Arrays and Logical Drives

This section summarizes the configuration steps for arrays and logical drives using Web Console. The following subsections provide detailed descriptions of each step.

1) Start Web Console

2) Choose an adapter

3) Run the configuration wizard

4) Save the configuration

5) Initialize the system

6) Check the rebuild rate.

Table 5-5   Physical Drive State Description

Drive State	Code	Description
Online	ONLN	The drive is online, is part of a configured logical drive, and is functioning normally.
Ready	READY	The drive is functioning normally but is not part of a configured logical drive and is not a hot spare.
Hot Spare	HOTSP	The drive is running as a hot spare drive.
Failed	FAILED	The drive is out of service because it failed.
Rebuilding	REBUILD	The drive is being rebuilt with data from a failed drive.

To configure a hot spare drive, from the config view, highlight an unused drive and from the right pane, choose "Make Hot Spare.".

Table 5-6   Logical Drive States

Drive State	Code	Description
Optimal	Optimal	The drive operating condition is good. All configured drives are online.
Degraded	Degraded	The drive operating condition is not optimal. One of the configured drives has failed or is offline.
Offline	Offline	The drive is not available and is unusable from a storage standpoint.

5.18.1 Automatic Configuration

After starting the Configuration Wizard, if you chose one of the auto configuration options, Web Console displays the proposed RAID configuration in the Logical Devices window. Each logical drive has a label (such as LD1), RAID level, and drive capacity. Click on **Accept** to complete the configuration process.

You can delete a logical drive by clicking on it in the bottom config view pane and selecting Delete from the right config view pane.

5.18.2 Custom Configuration

If you choose Custom Configuration, the Web Console displays the Array Definition Screen with an "Arrays" pane containing all previously configured arrays. Each logical drive has a label (such as LD 0), RAID level, and drive capacity. Spanned arrays use hyphenated array numbers such as LD0-1, which indicates disk drive 1 in array 0.

To create an array, follow these steps:

1) Hold down the Ctrl key and click on the drives you want to add to the array. The selected drives will be highlighted in blue.

2) Click the **Add to Array** button. A new logical drive will be displayed in the Arrays pane.

3) Click on the **Accept** button and **Next** to continue.

5.18.3   Defining Logical Drives

The Logical Drive Parameter screen appears next, after configuring the physical drives. This screen displays the logical drive(s) for you to define. You can specify the RAID level and size. You can also span arrays and set advanced parameters. For examples of setting up RAID levels on logical drives, see the next chapter.

The Logical Drive window displays all the arrays on the current adapter and the global hot spare drive pool. Web Console labels logical drives as `New` or `LD0`, `LD1`, `LD2`, and so forth.

You must define all the logical drives to be configured in the new array. Do not create drives that span the current array and another array. Uncheck the **Span Array** box. The following steps provide instructions for defining logical drives.

1) Specify the RAID level by clicking on the **RAID Level** drop-down menu and selecting a RAID level. The Wizard does not allow an invalid RAID level configuration.

2) Set the size by accepting the default, or by clicking in the Size box and typing a smaller size. Specify a smaller size to leave room in the array for additional logical drives.

    Creating multiple logical drives in the same array disables FlexRAID, so you cannot change RAID levels or add capacity. Do not mix redundant and non-redundant logical drives in the same array.

3) Click on the **Advanced** button to set the stripe size, read policy, write policy, virtual sizing, and cache policy. Click on the respective drop-down menus to display the choices for each parameter. When finished, click on the OK button.

    If you use Web Console to configure an array on a NetWare server, you cannot use Write back as the write policy.

4) Click on **Accept**.

5) If space is still available in the current array, the new logical drive appears in the array. Define any additional logical drives in the current array. The Wizard continues to create logical drives for the same array until there is no more space available in the array, or until there are 40 logical drives in the array.

6) Span the arrays.

   Click on the **Span Arrays** box to create a logical drive that spans all defined arrays. An array that encompasses both spanned arrays appears in the Logical Devices window. Web Console labels the array A[array number]-[disk number]. The capacity in the Size box increases to reflect the total capacity of the spanned array.

7) When you have defined all logical drives the selected adapter, click on **Next**.

   The Preview Configuration screen displays the arrays, logical drives, and hot spares for the current adapter in the logical devices screen. The Physical Devices window displays the status of the physical drives.

8) Click on **Finish** to accept the displayed configuration. You can, instead, click on **Back** to return to the previous screen and redefine the logical drive parameters.

9) After you click on **Finish**, a dialog box prompts you to initialize. Intel recommends initializing all newly created logical drives.

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

   Note: When you are running the Configuration Wizard, you can remove the most recently created logical drive by clicking on the **Undo** button.

   You cannot undo an array after you finish running the Configuration Wizard.

5.18.4   Initialize Logical Drives

Select the adapter from the Adapter box. Select the logical drives you plan to initialize. Choose **Initialize** from the Logical Drive menu.

The Initialize screen has a separate window for each logical drive. A bar graph displays the progress of the initialization. Click on **Abort** if you want to stop the initialization.

Repeat this process for each adapter in the system.

5.18.5   Check Rebuild Rate

Choose the correct adapter from the Adapter box. Choose **Rebuild Rate** from the Adapter menu. If there is more than one adapter in the system, click on each adapter and check the rebuild rate. The rebuild rate is not affected when you clear the configuration.

5.18.6   Exit Web Console

Choose **Exit** from the Configuration menu to quit Web Console.

5.19   Creating a Hot Spare

In config view, select an idle drive and select the Make Hotspare option under operations.

Figure 5.24 Creating a Hot Spare
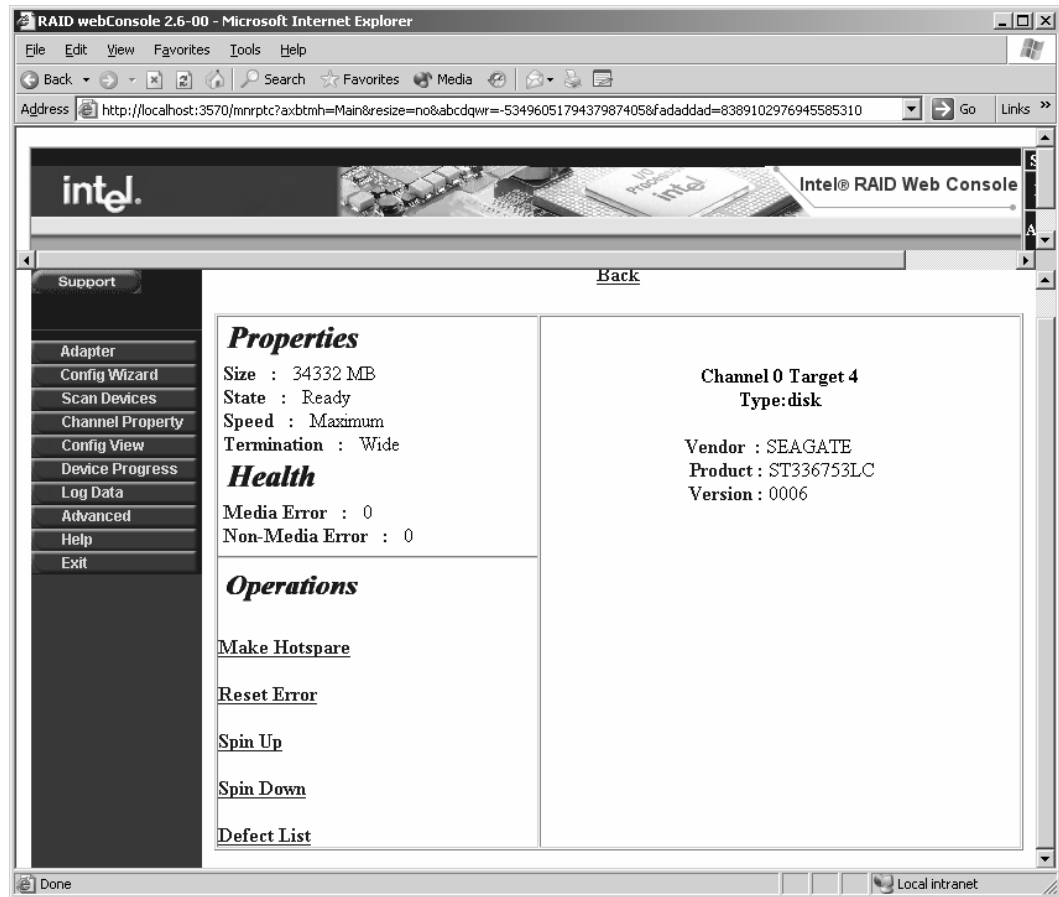
5.20 Reclaiming Hot Spare Disks

To reclaim hot spare disks during normal operation, select the drive and choose **Remove Hot Spare** from the right pane. Web Console changes the state of the selected drives to the READY state.

5.21 Reconfiguring Existing Arrays

This section provides instructions for adding and removing physical drives from existing arrays.

5.21.1 Adding a Physical Drive to an Existing Array

To add a physical drive to an array:

1) Go to the Config View screen.

2) Highlight the logical drive and choose properties from the left pane. Choose the drive to add from the Add Physical Drive pane.

5.21.2 Removing a Physical Drive from an Array

To selectively remove hard drives from an existing array:

1) Go to the Config View.

2) Highlight the logical drive you want to remove and choose delete from the left pane.

Chapter 6
Configuring A Logical Drive with Intel®
RAID Web Console

6.1 Setting Up a RAID Array With Redundancy Using Auto Configuration

The RAID Web console allows the automatic configuration of drives using either with redundancy or without redundancy. The without redundancy option sets all drives into a RAID 0 logical drive.

The with redundancy will set a RAID 1 for systems with 2 drives or RAID 5 for systems with 3 or more drives. If you are intending to use hot spares, they must be defined prior to using auto configuration wizard.

1. Select the <Config Wizard> menu item to create a RAID using one of the configuration wizard options.
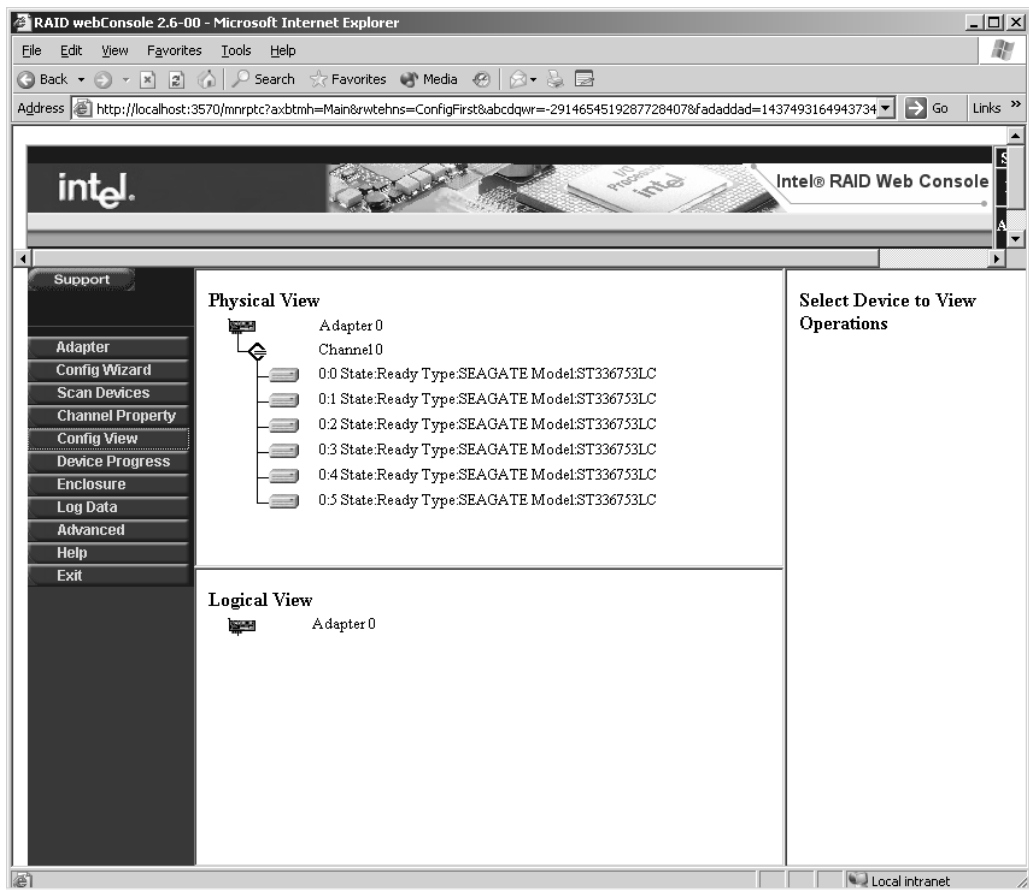
2. Select the <Auto Configuration with Redundancy> option radio button and select the <NEXT> Button.
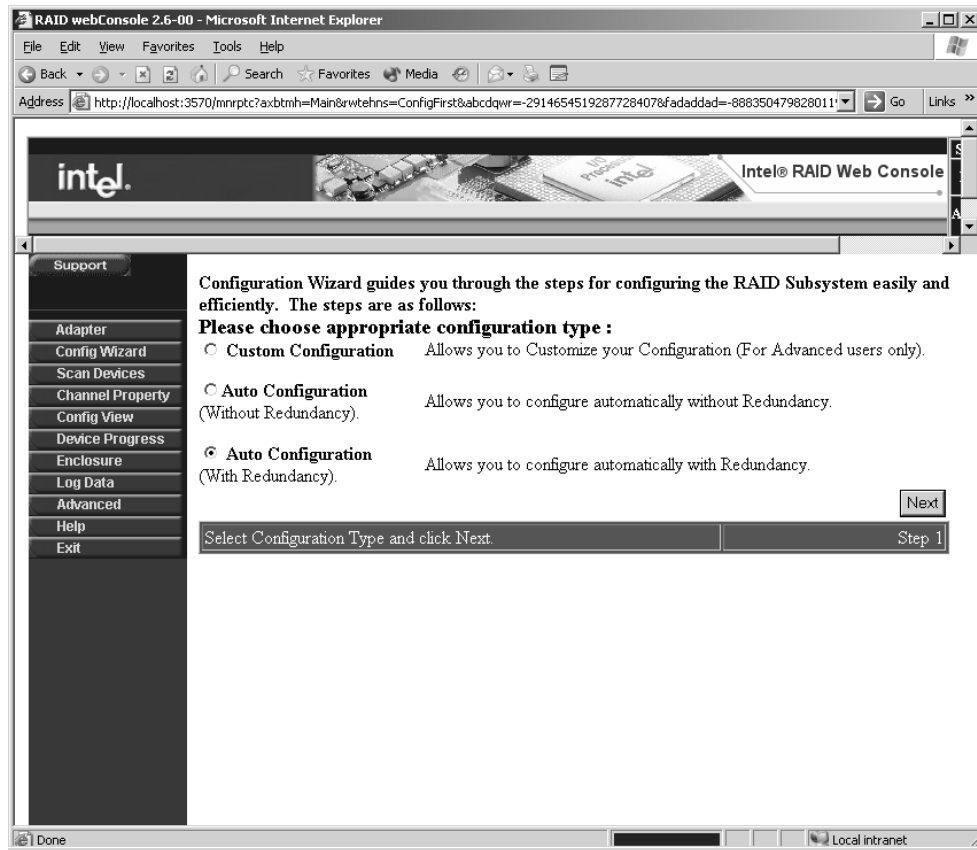
3. This wizard automatically creates a RAID 5 configuration across all the defined drives if there is more than two drives installed. The logical drive with the RAID 5 configuration will be displayed in the Configuration Preview Screen. Hit the <Accept> button to accept the configuration.
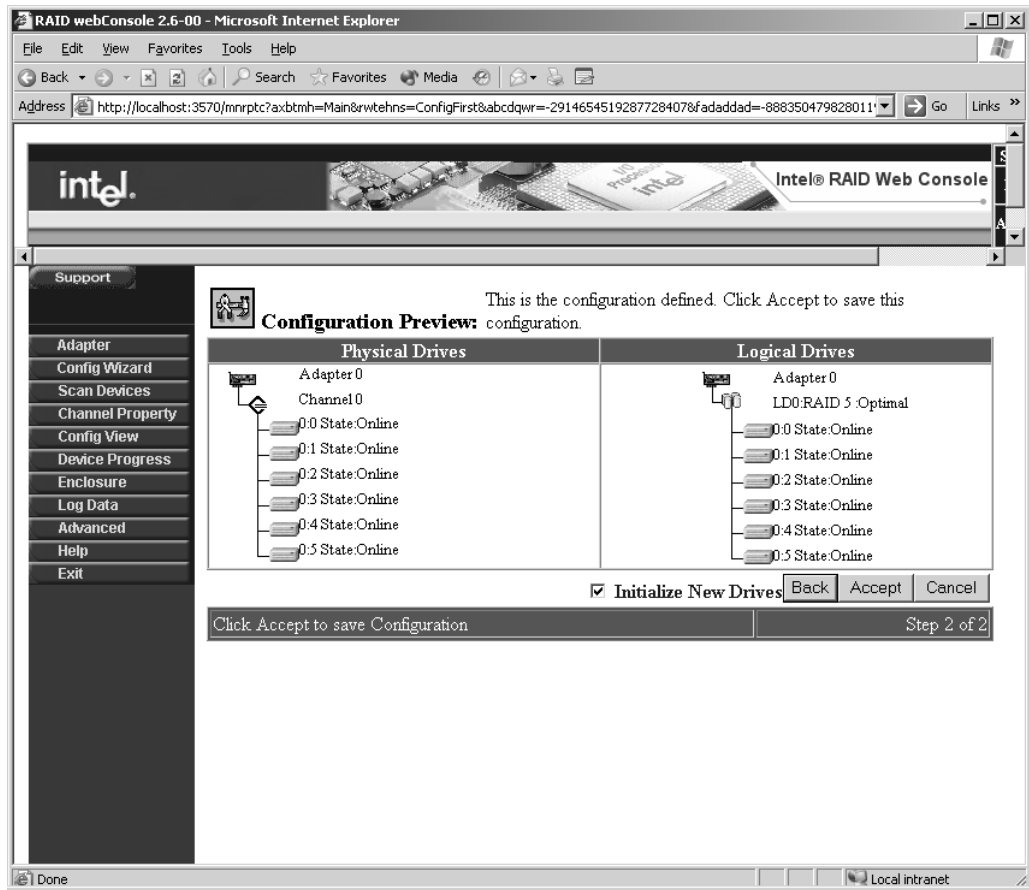
4. The software initializes the drives and shows the RAID 5 logical drive in the logical View drive pane as shown below.
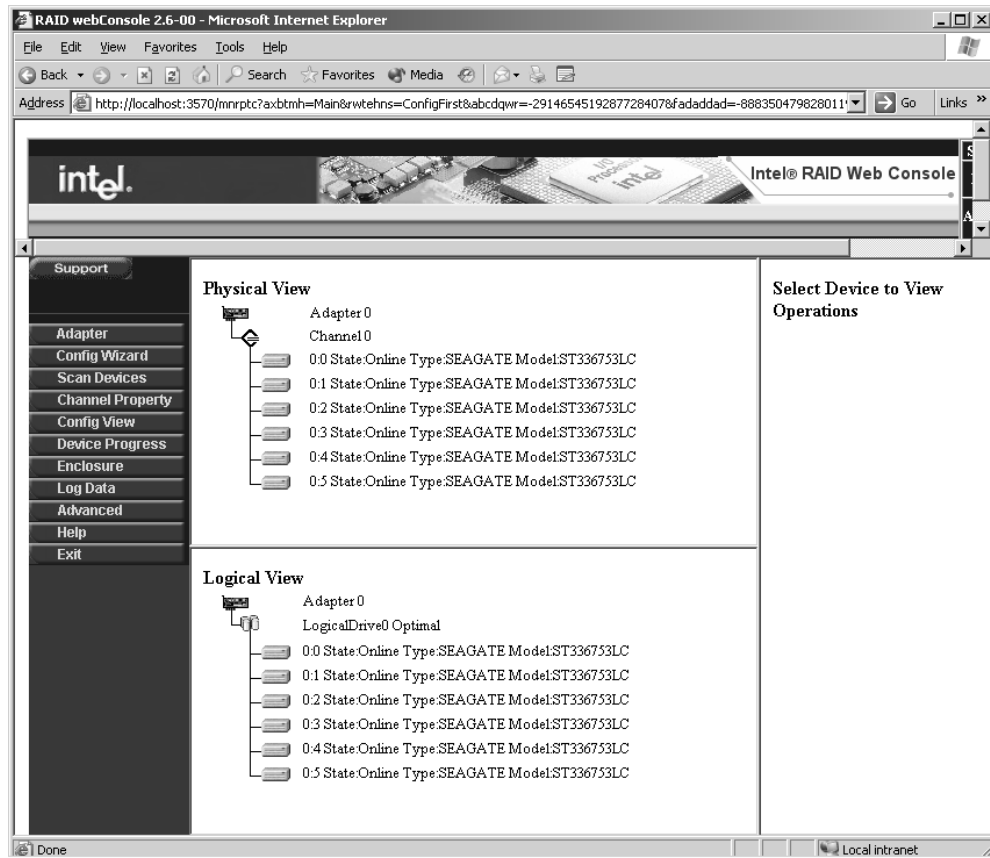
6.2   Setting up a RAID array With Redundancy using RAID Web Console

To setup a RAID array without redundancy follow the steps in the previous section only set the appropriate configuration type to Auto configuration With Redundancy. The configuration wizard configures the drives to a RAID 0 logical drive.

6.3   Setting up a RAID Array using Custom Configuration

This section describes how to setup different RAID configurations using RAID web Console. The examples use a system with at least 6 available drives to illustrate how to setup the various RAID configurations. The steps to create a RAID Level on a logical drive are:

1) Perform the necessary steps to prepare for a custom configuration option before configuring the appropriate RAID level for your application. Perform the steps covered in the next section.
2) After the custom configuration option has been selected refer to one of the appropriate sections that follow to setup a RAID 0, RAID 1, RAID 5, RAID 10 or RAID 50

6.3.1   Generating a Custom Configuration

1) Enter http://localhost:3570 into your web browser address bar and hit <Enter>. Click on the highlighted localhost button to administer drives connected to your Intel(R) Raid controller.

2) Select Full access and enter your RAID Web Console Password and hit the submit button.
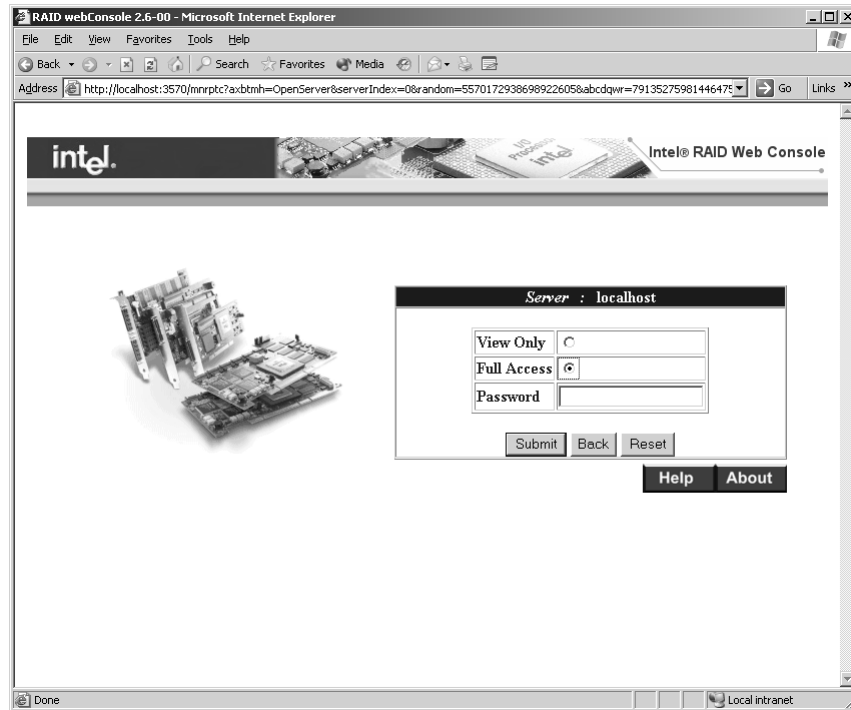
3) The Main Raid Web Console screen with both a logical view and physical view of the drives will be displayed. The left hand menu displays the program options that can be selected. In this case, select the Config Wizard menu item in order to setup RAID on your drives.
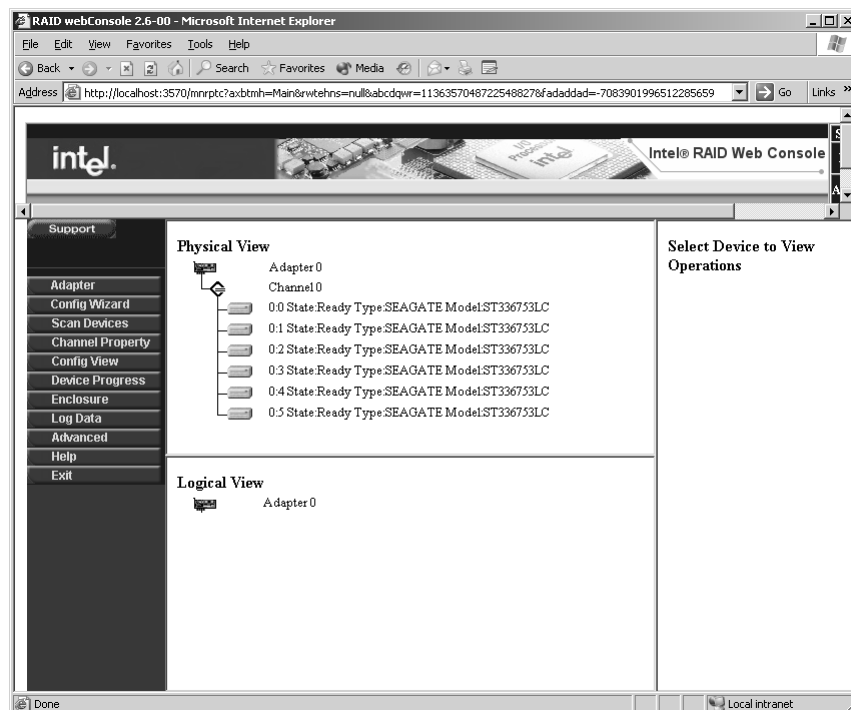
4) The Configuration Wizard Screen will popup with three different options: Custom

Configuration, Auto Configuration without Redundancy and Auto Configuration without Redundancy. Select the Custom Configuration radio button and select the <NEXT> button.

Refer to the appropriate RAID Section depending on what type of array RAID 0, RAID 1, RAID 5, RAID 10 or RAID 50 you are setting up for your application.
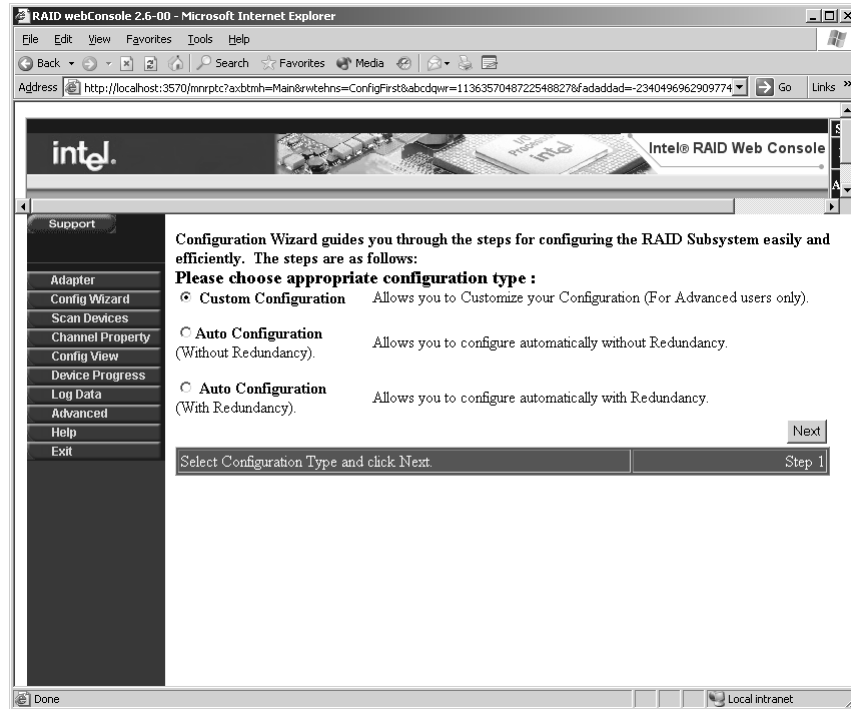
6.3.2   Configuring a RAID 0 Logical Drive

Follow the steps in section 6.3.1 "Generating a custom configuration" if not already done.

1) Select two drives by holding down the <CTRL Key) and then select the drive with your mouse button. Once the two drives are properly highlighted, select the <AddToArray> Button.

2) The two drives should be added to the right hand pane as shown below. Select the
   <Accept> button to accept the array and hit the <Next> button to define the logical drive
   from the created Array.
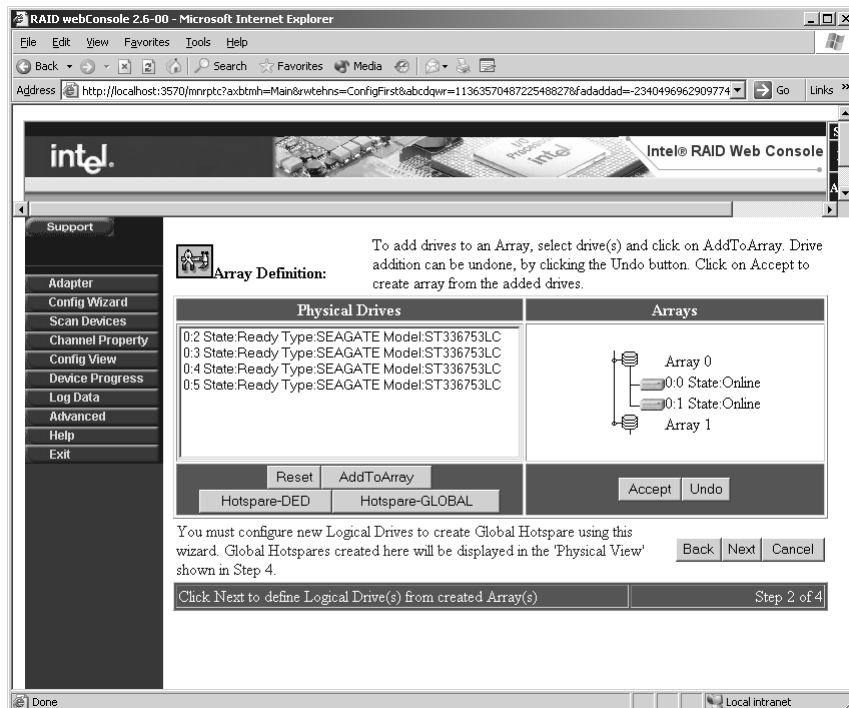
3) Select RAID 0 as the array type and set the rest of the RAID parameters, Stripe Size, Read
   Polity, Write Policy etc.. according to the needs of your application. For information on
   these parameters, refer to the Section "Setting Logical Drive Parameters". Notice that the

size of the logical drive for both raid levels is listed. After setting the appropriate RAID settings, hit the Accept button to define the logical drive set to RAID 0.
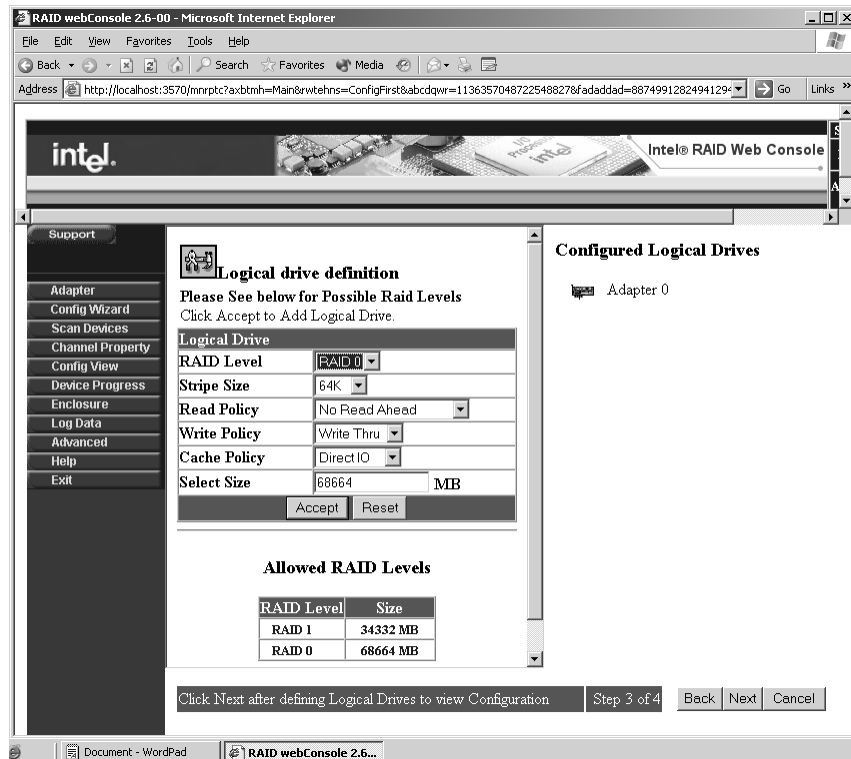
4) Select the <Next> button to define the logical drives and to preview the configuration.

Configuring A Logical Drive with Intel® RAID Web Console
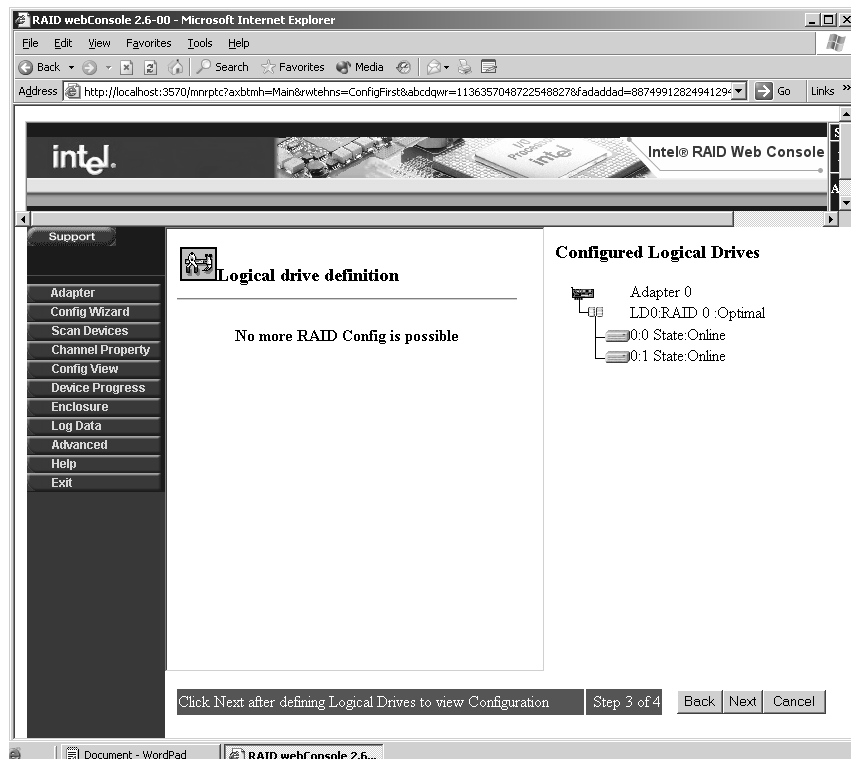
5) Hit the Accept button to initialize the drive with the new raid settings.
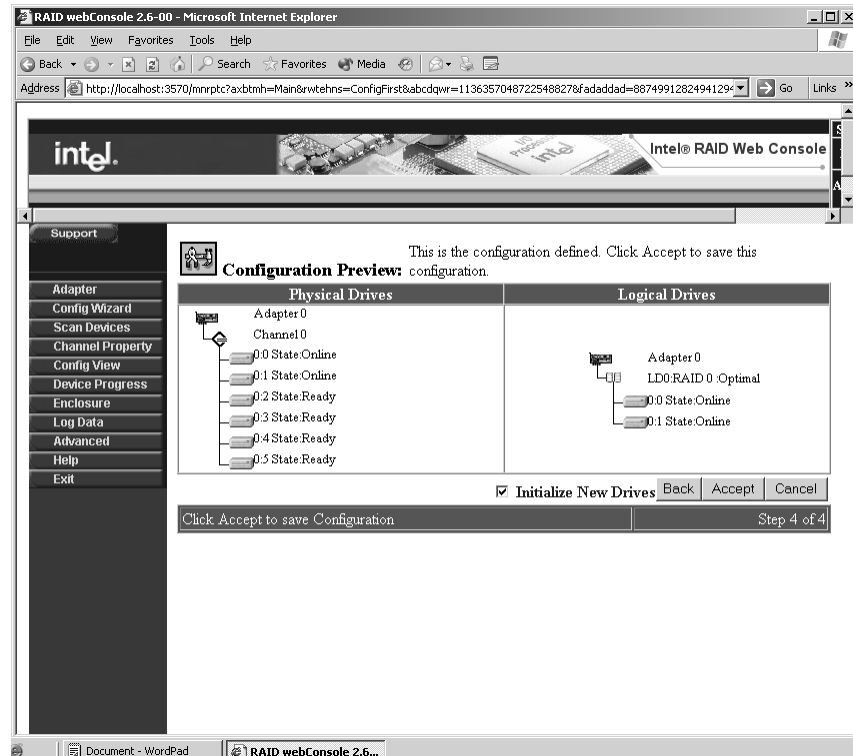
6) The software will initialize the drives and show the RAID 1 configured logical drive in the logical View drive pane as shown below.
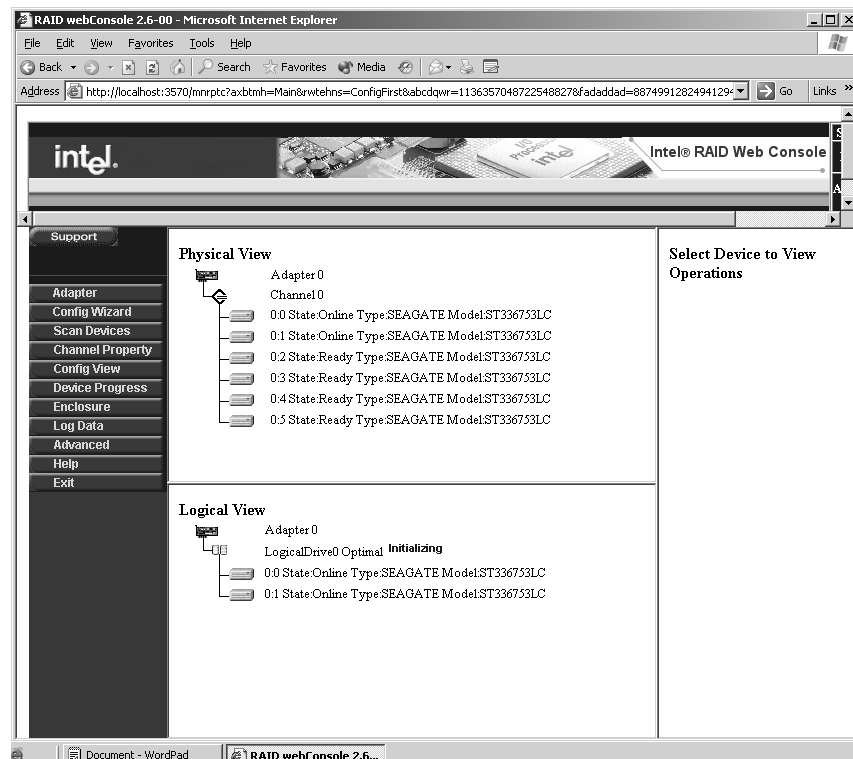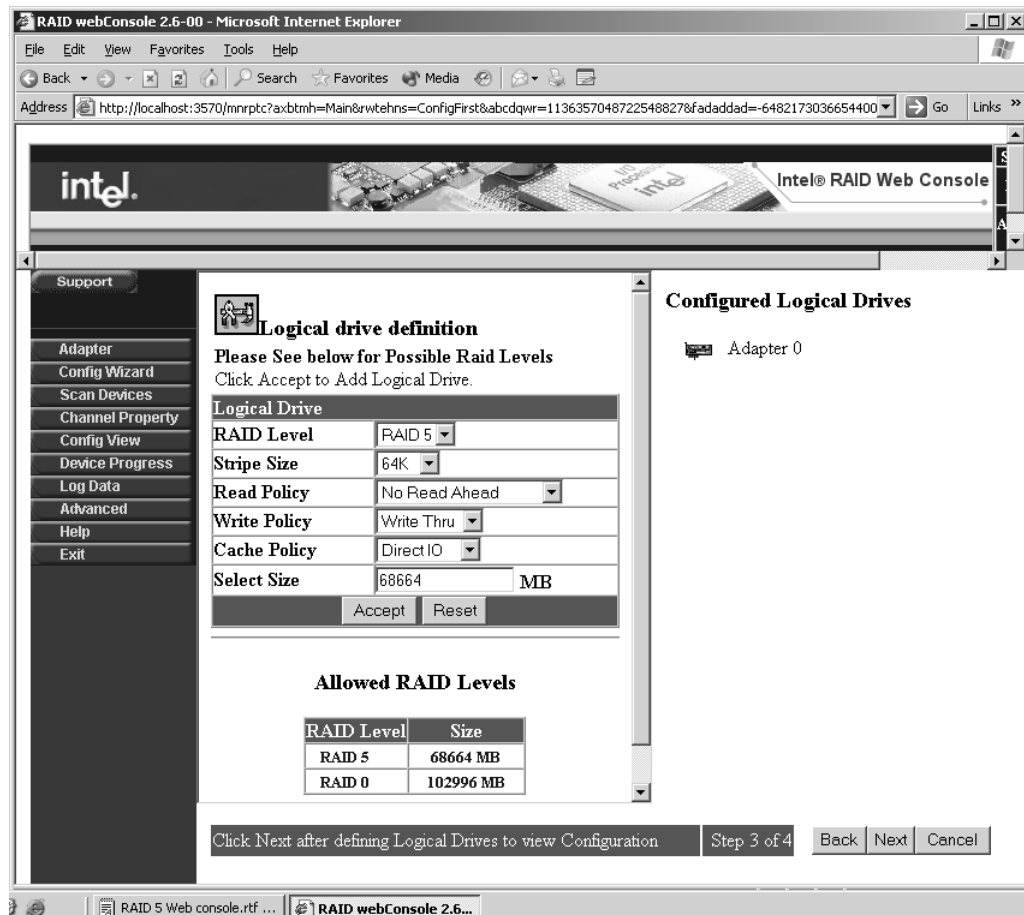
6.3.3   Configuring a RAID 1 Logical Drive

Follow the steps in Section 6.3.1, "Generating a Custom Configuration," if not already done.

1. Select two drives by holding down the <Ctrl> key and then select the drive with your mouse button. Once the two drives are properly highlighted, select the <AddToArray> button.
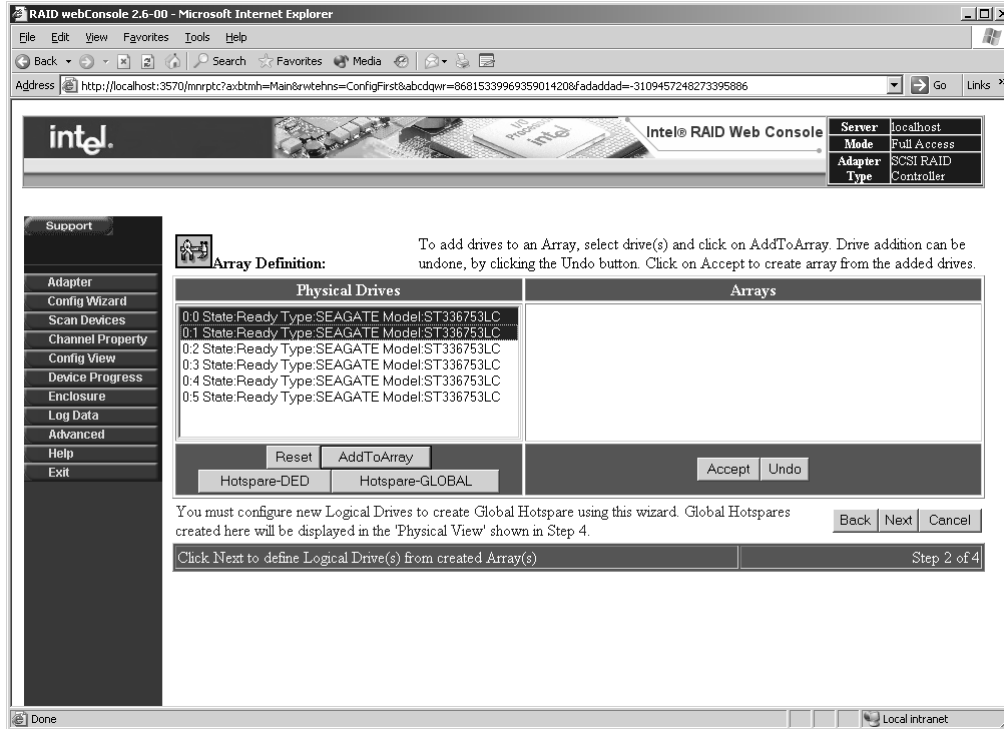

2. Click the next button.
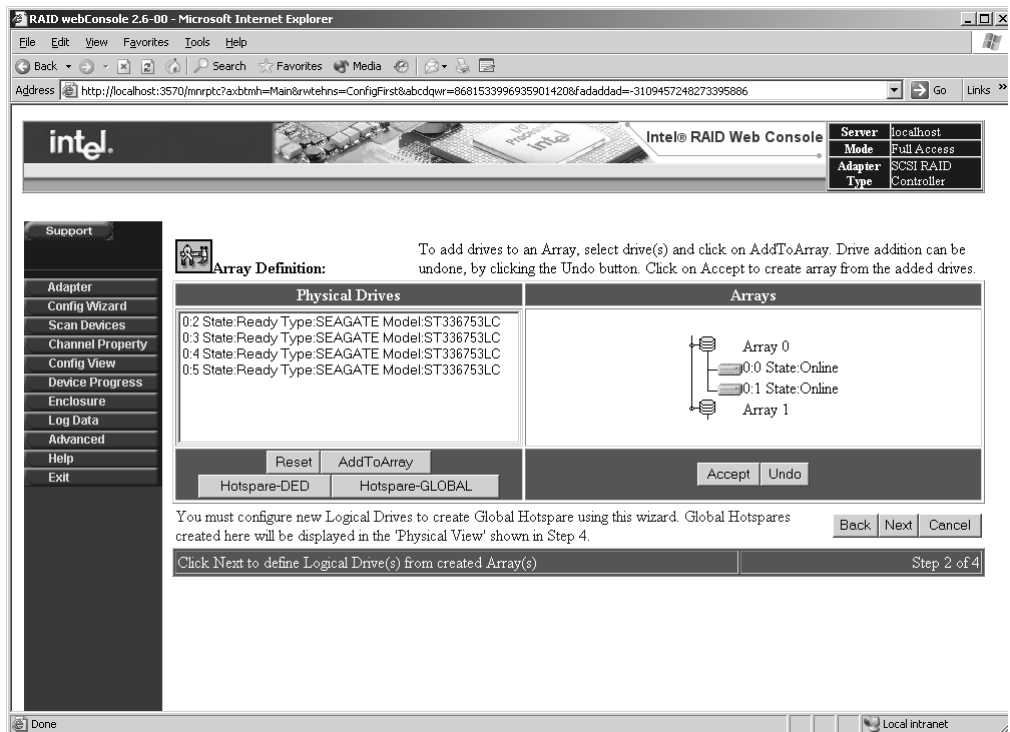
3. Select RAID 1 as the array type and set the rest of the RAID parameters according to the needs of your application. For information on these parameters, refer to the Section "Setting Logical Drive Parameters". Notice that the size of the logical drive for both raid levels is listed in the Allowed RAID levels table.

4. After setting the appropriate RAID parameter settings, hit the <Accept> button to define the logical drive to be a RAID 0.
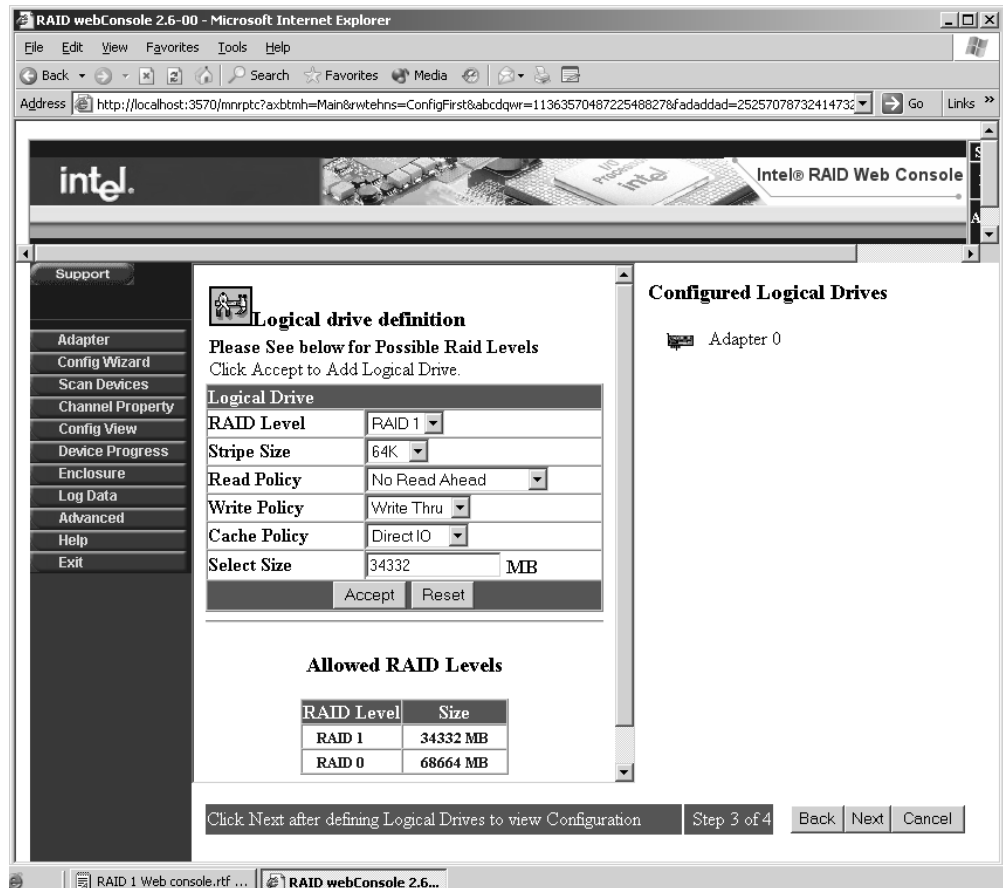
5. Select the <Next> button to define the logical drives and to preview the configuration.
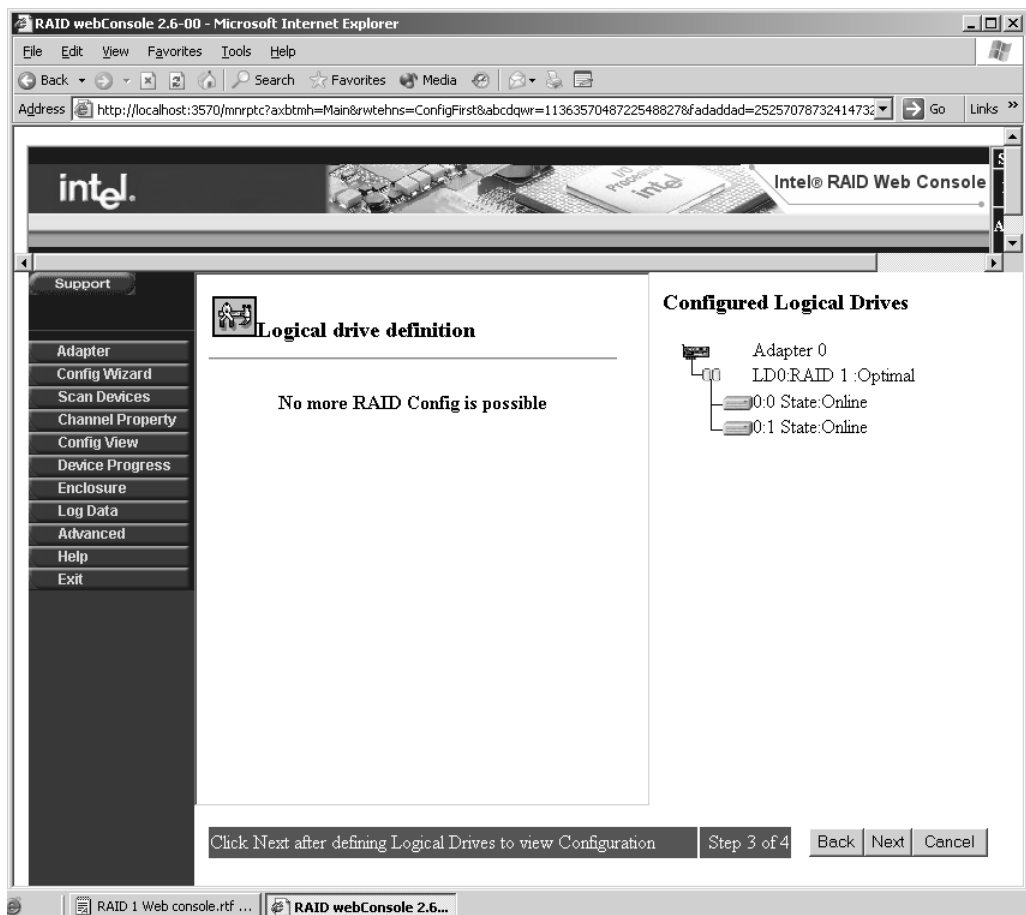
Configuring A Logical Drive with Intel® RAID Web Console

6. Click the <Accept> button to initialize the drive with the new raid settings.

7. The Software will initialize the drives and show the RAID 1 configured logical drive in the logical View drive pane as shown below.

Configuring A Logical Drive with Intel® RAID Web Console
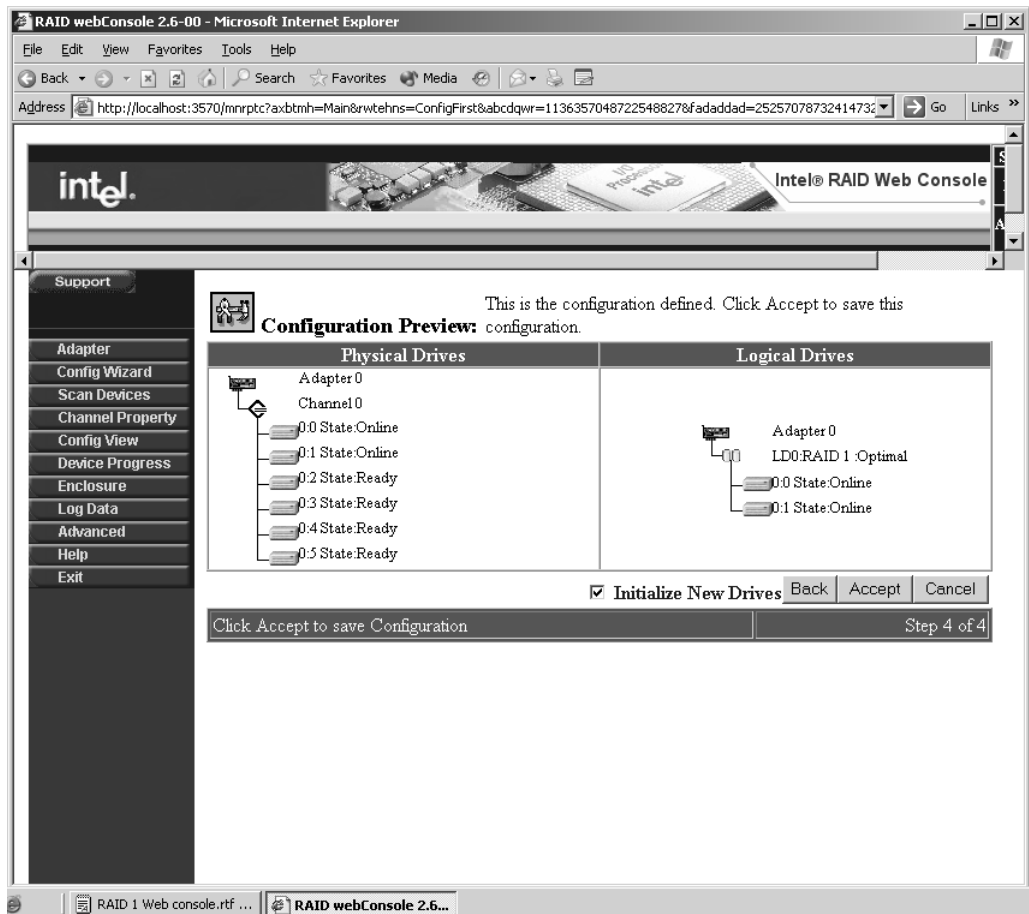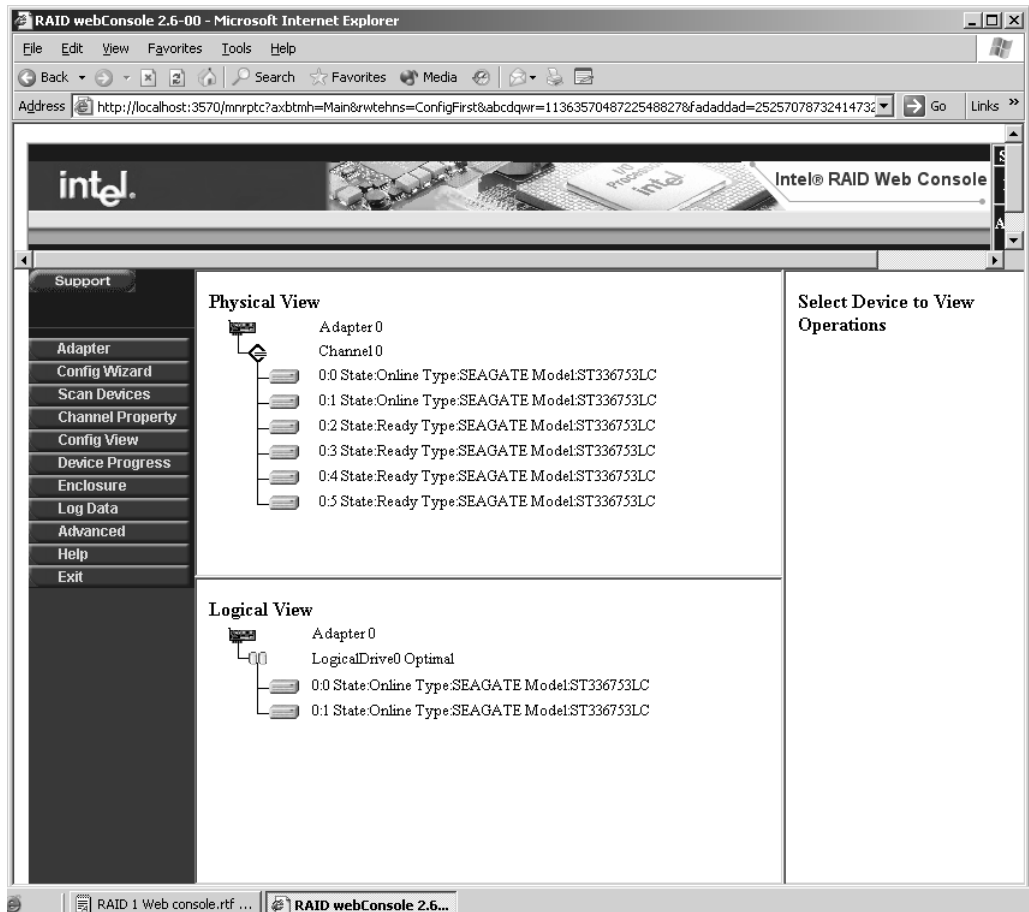
6.3.4   Configuring a RAID 5 Logical Drive

Follow the steps in Section 6.3.1, "Generating a Custom Configuration," if not aleady done.

1. Select three drives by holding down the <CTRL Key) and then select each drive with your mouse button. Once the three drives are properly highlighted, select the <AddToArray> Button. The three drives should be added to the right hand pane in a defined array as shown below. Select the <Accept> button to accept the array and hit the <Next> button to define the logical drive.
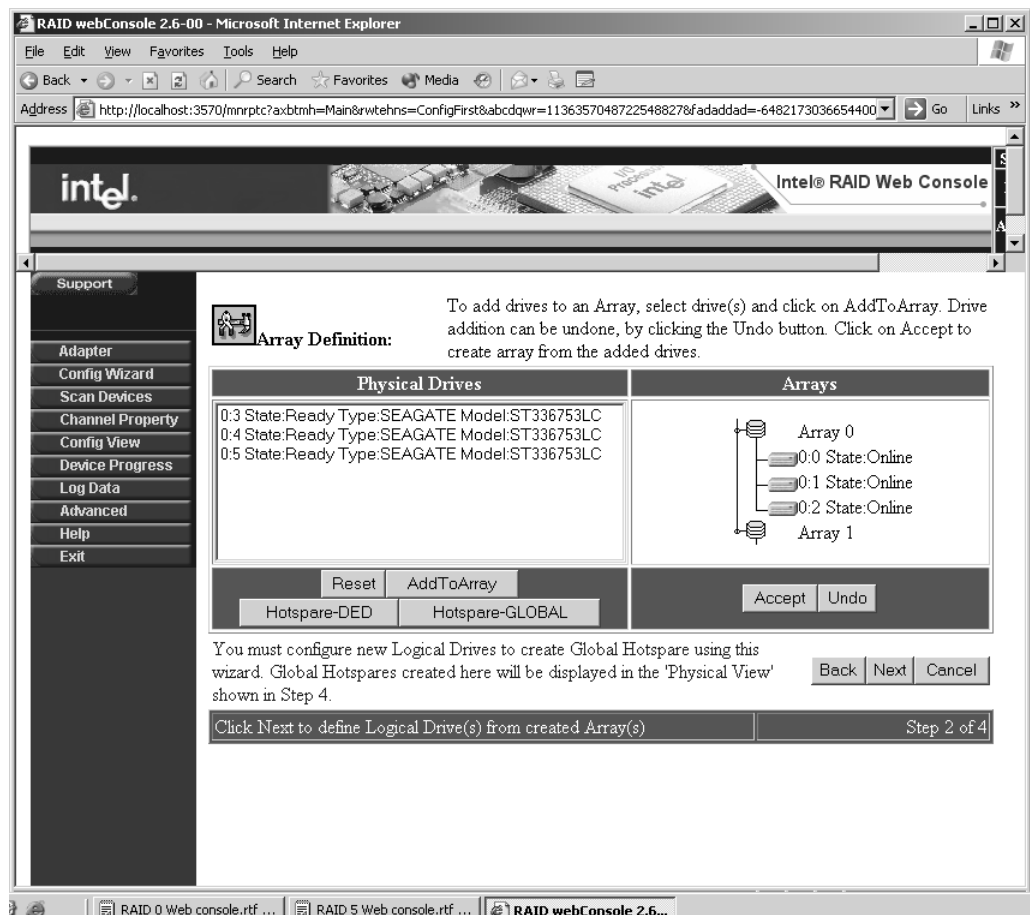
2. Select RAID 5 as the RAID Level and set the rest of the RAID parameters according to the needs of your application. For information on these parameters, refer to the Section "Setting logical drive parameters". Notice that the size of the logical drive for possible raid levels is listed in the table.

3. After setting the appropriate raid settings, hit the <Accept> button to define the logical drive with a RAID 5 configuration.

4.) Select the <Next> button to define the logical drives and to preview the configuration.
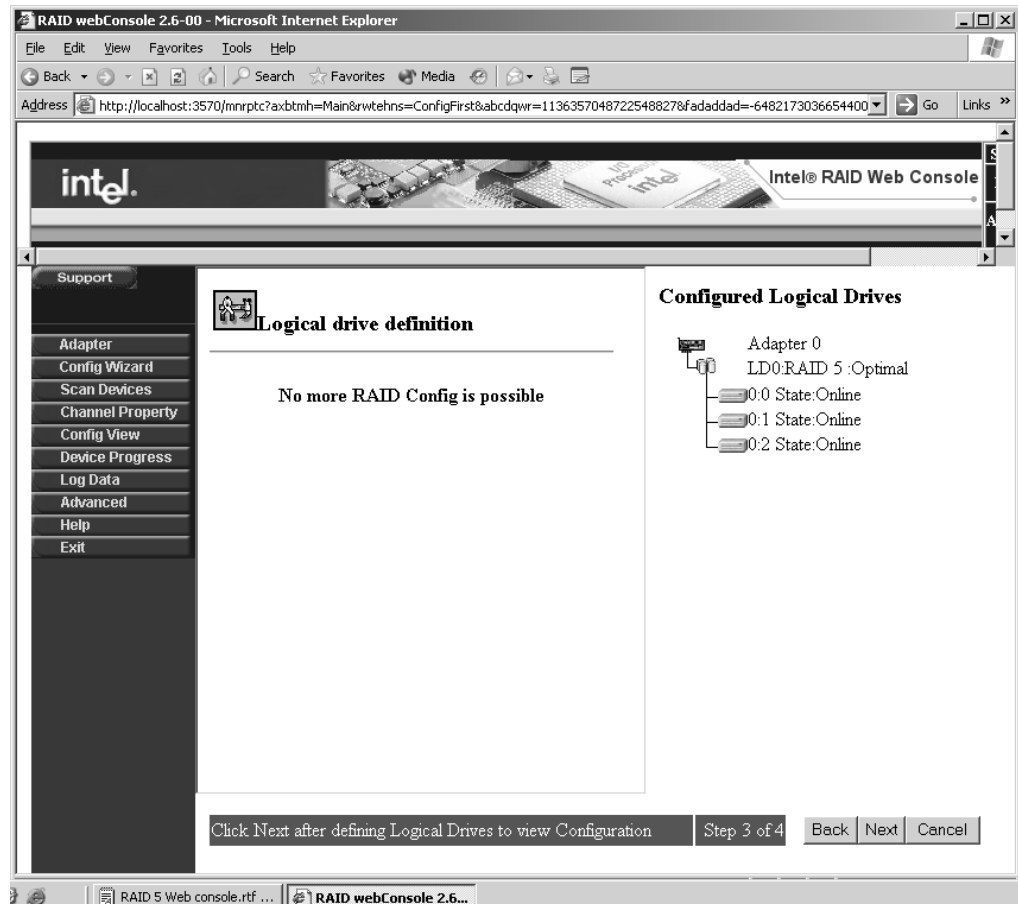
5. Hit the <Accept> button to initialize the drive with the new raid settings.
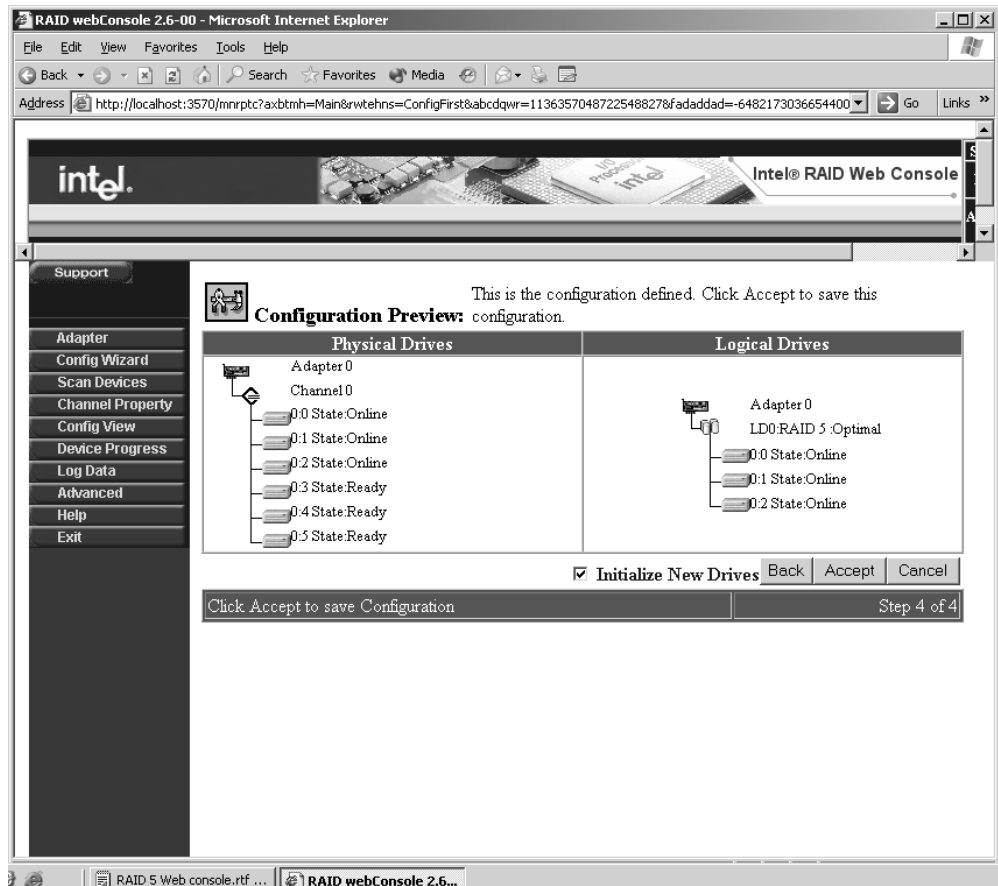
Configuring A Logical Drive with Intel® RAID Web Console

6. The application initializes the drive and shows the RAID 5 logical drive in the logical
    View pane as shown below.
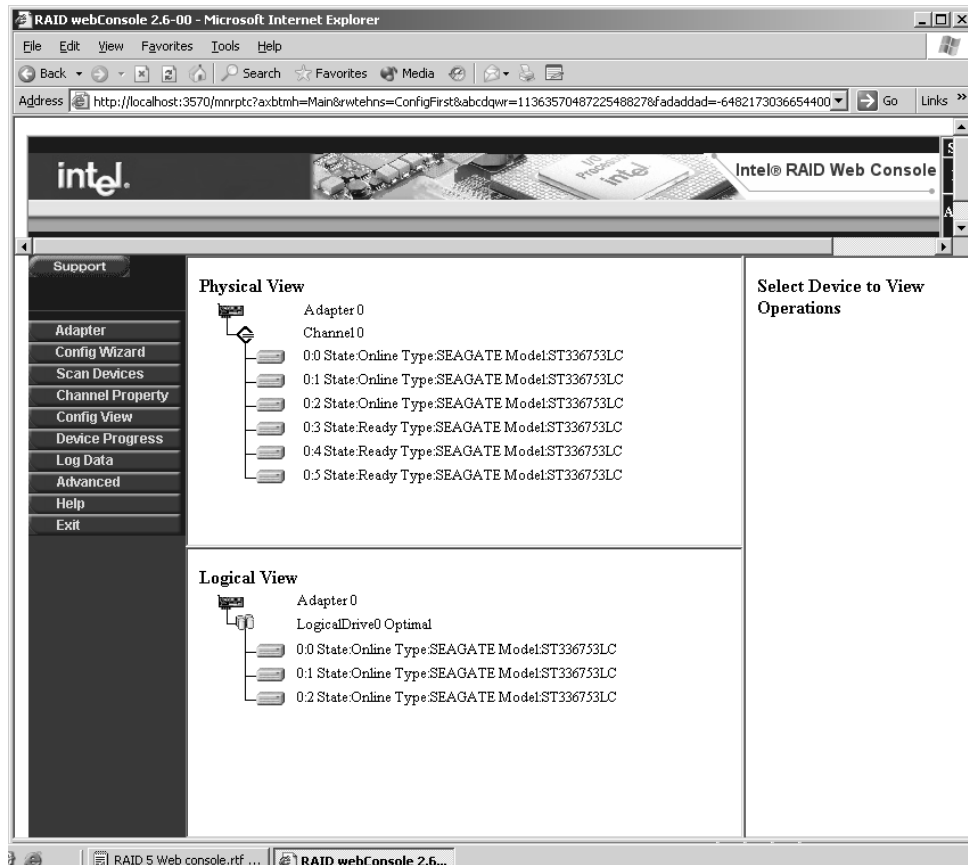
6.3.5   Configuring a RAID 10 Logical Drive

Follow the instructions in Section 6.3.1, "Generating a Custom Configuration," if not already done.

RAID 10 configurations do not support more than two drives in an array or an odd number of drives. A RAID 10 logical drive consists of at least two or up to eight spanned RAID 1 arrays with data striped across them. The logical drive can consist of up to 40 physical drives; although is limited to the physical capabilities of the controller. For example, and SRCS16 controller can accommodate up to 6 SATA drives and an SRCU42X controller can accommodate up to 30 SCSI drives. In the event of a single drive failure, data for that drive can be rebuilt from redundant information that is held on the other logical drive members. The advantage of RAID 10 is that in some conditions two members can be lost and data rebuilt. The condition is that only one drive per stripe can be lost. In this configuration, hot spare drives have great value. Hot spare drive creation is covered in the array definition screen in step 4.

1. RAID 10 includes redundancy and it is wise to create a hot spare drive, instructions for creating a hot spare drive are at the end of this document.

2. In the next screen which is the array definition window, select drives by holding the
    <CTRL> key and click on the drive icon so that the target drives are highlighted.
    RAID 10 is a special case where two drives are selected, and then additional drive
   arrays are selected and added to the right pane as well.
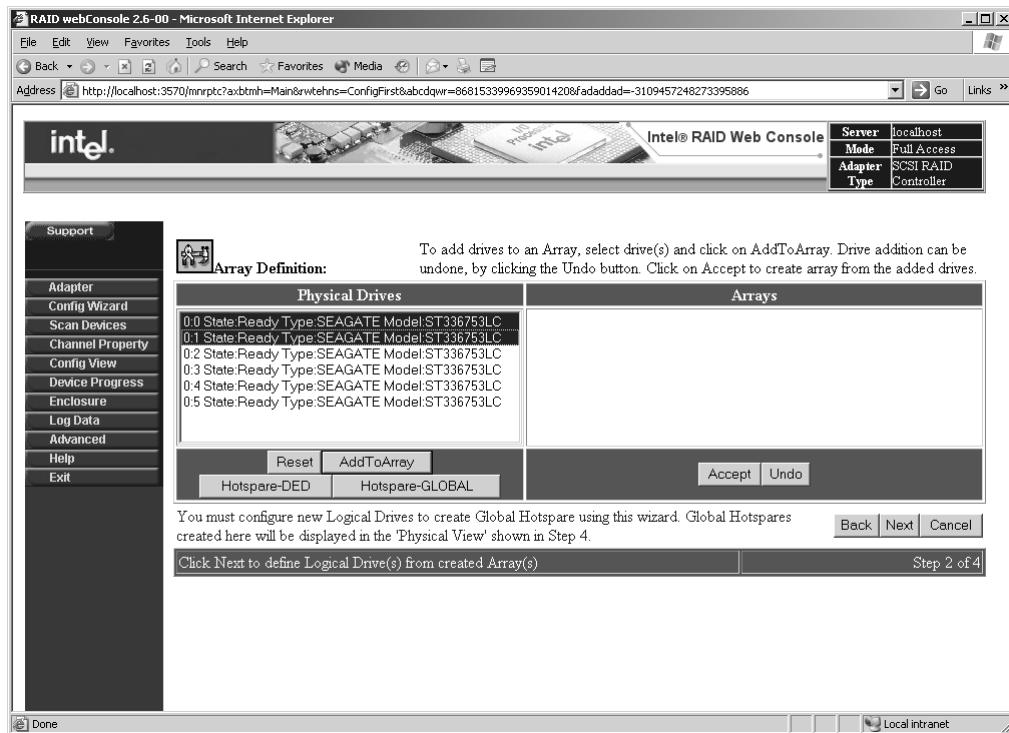
3. Hit the <Accept> array button to define the first array.
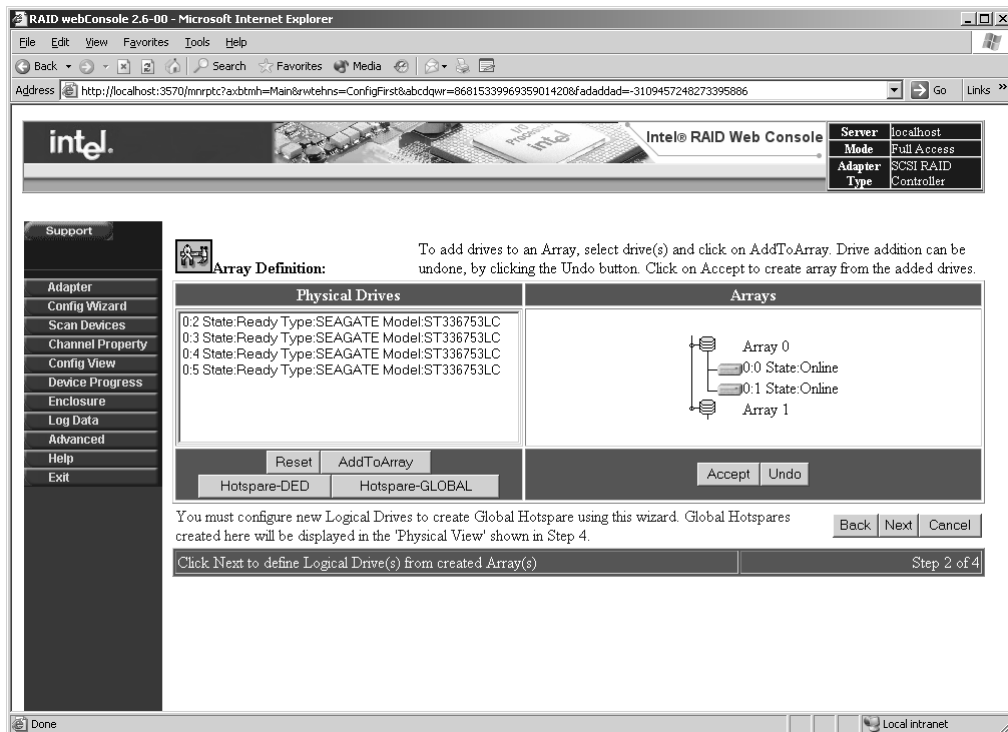
4. Create an additional array by holding the ctrl key and clicking on the two target drives, and then click on <AddToArray>. This method creates two arrays in the right pane that can then be spanned to create a raid 10 logical drive. Hit the <Accept> button to save the array. Additional arrays can be created and added to the right pane by selecting additional drives. However, each array must consist of only two drives and all the drives must be the same size in order to be spanned. Up to eight arrays can be added to the Arrays pane and spanned to create a RAID 10 logical drive. When two or more arrays have been defined in the right pane, click the <Next> button.

Note: To create a Hot spare select a drive in the Physical drive window and Select the button Hotspare=Global to define a hotspare to be used by any logical drive or Hotspare=DED if the hot spare is dedicated for this logical drive.
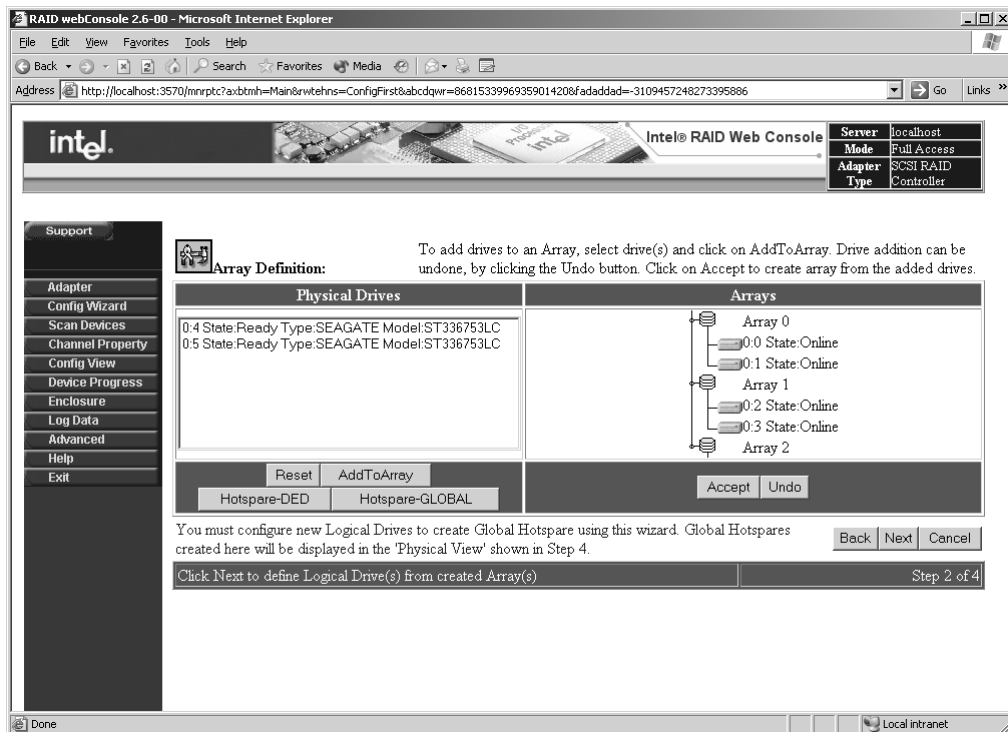
5. At the logical definition window, select RAID 10 as the RAID level. Enter any additional parameters according to the needs of your application. Refer to the section "Setting Logical Drive Parameters" for a description of each setting. Notice that the size of the logical drive for the acceptable raid levels is listed. Once the parameters are set hit the <Accept> button to add a logical drive.
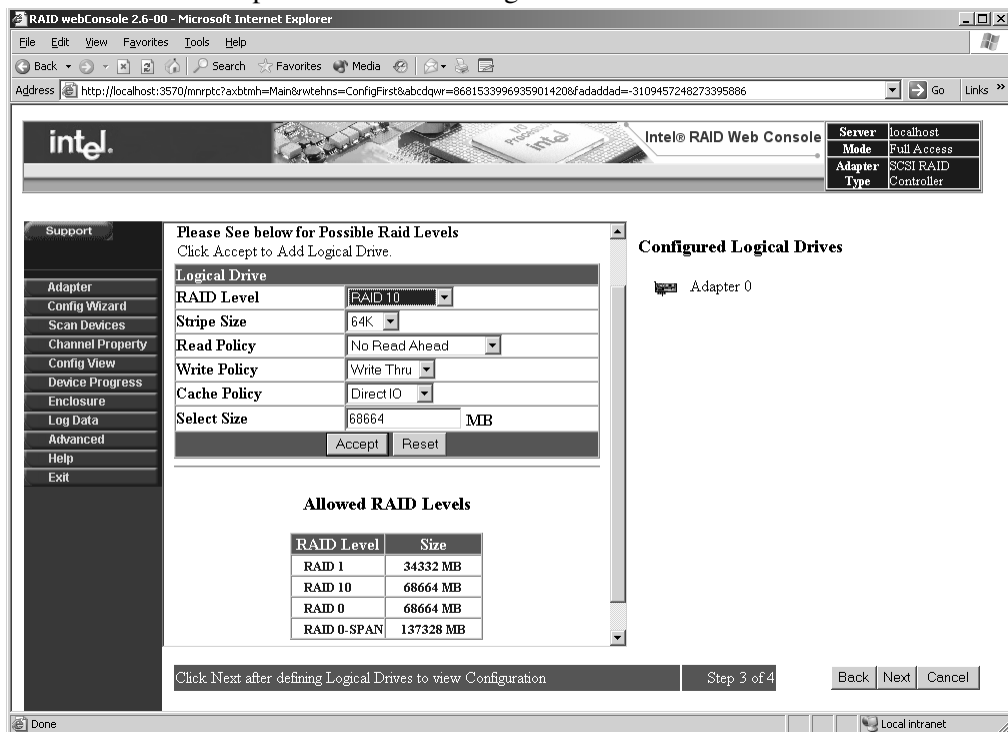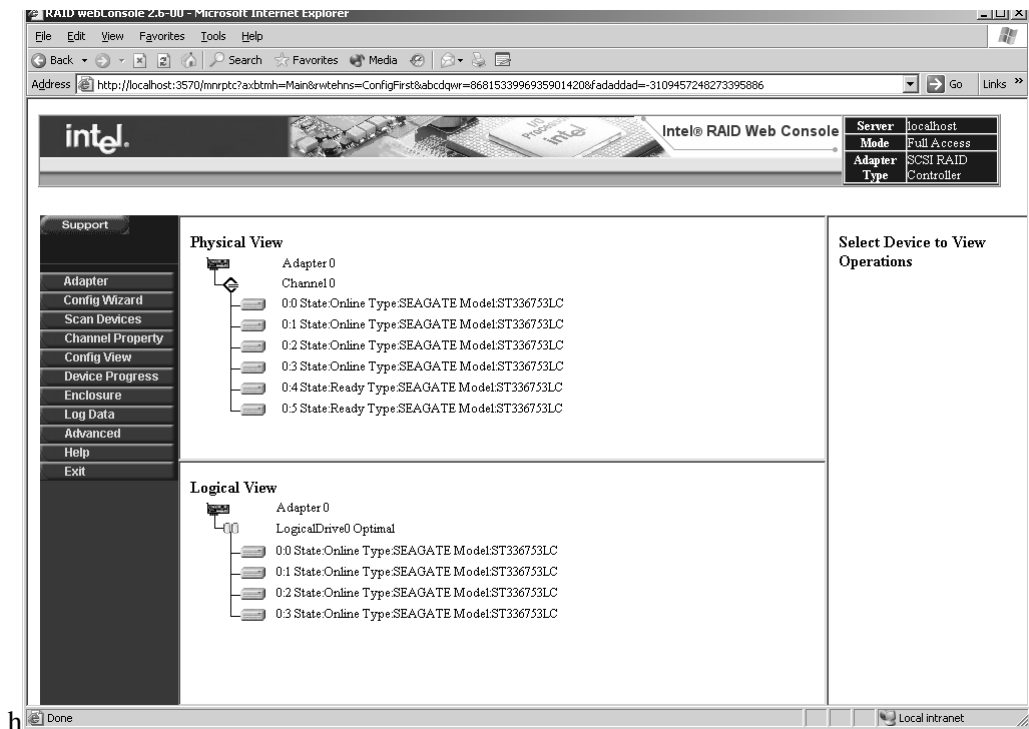
6. Click the <Next> button to preview the logical drive.
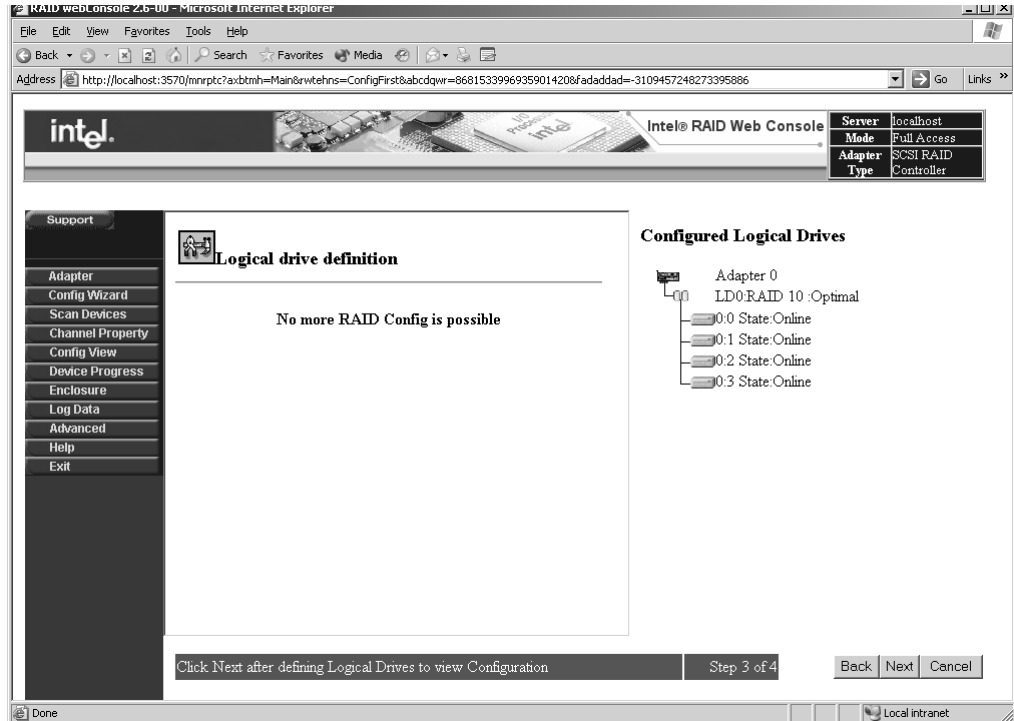
7. Hit the <Accept> button to initialize the drive with the new raid settings. The application initializes the drive and shows the RAID 10 logical drive in the logical View drive pane as shown below.
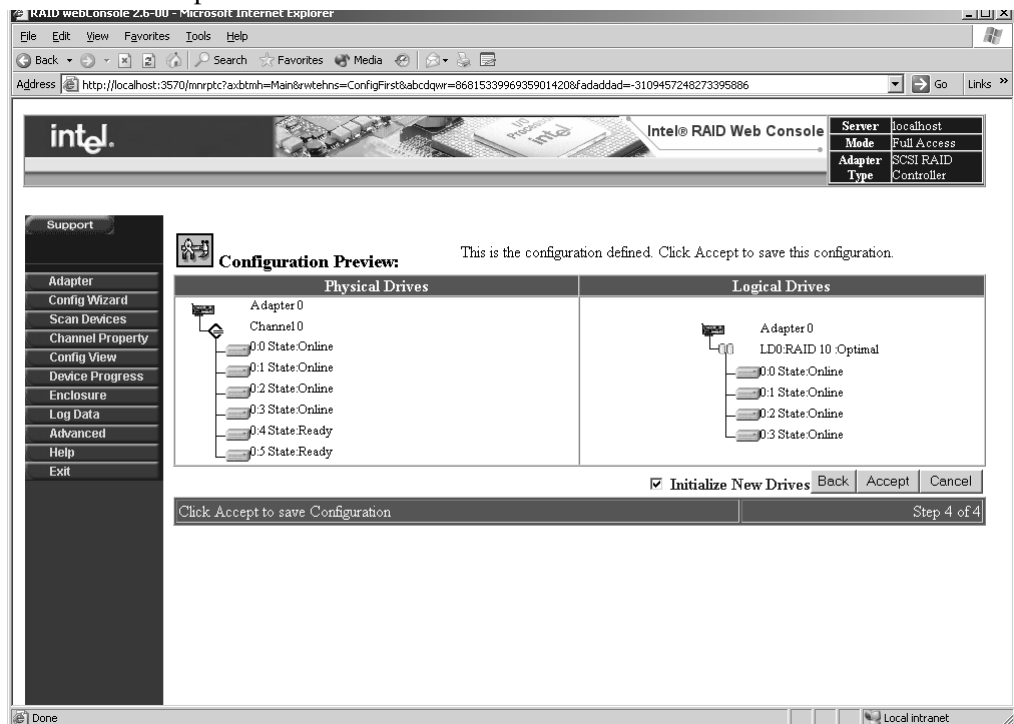


8. You should now see the logical drive in the main view.

6.3.6   Configuring a RAID 50 Logical Drive

Follow the instructions in Section 6.3.1, "Generating a Custom Configuration," if not already done.

1. In a RAID 50 configuration, two arrays of three drives must be defined. Create the first array by holding down the <CTRL> key and selecting each drive with your mouse. Once the three drives are properly highlighted, select the <AddToArray> Button. Hit the <accept> button to accept the first array of three drives.

2. Repeat the process with an additional set of three drives to create the second array. The two arrays with the six drives should look similar the array definition shown below. Select the <Accept> button to accept the arrays and hit the <Next> button to define the logical drive consisting of two arrays.
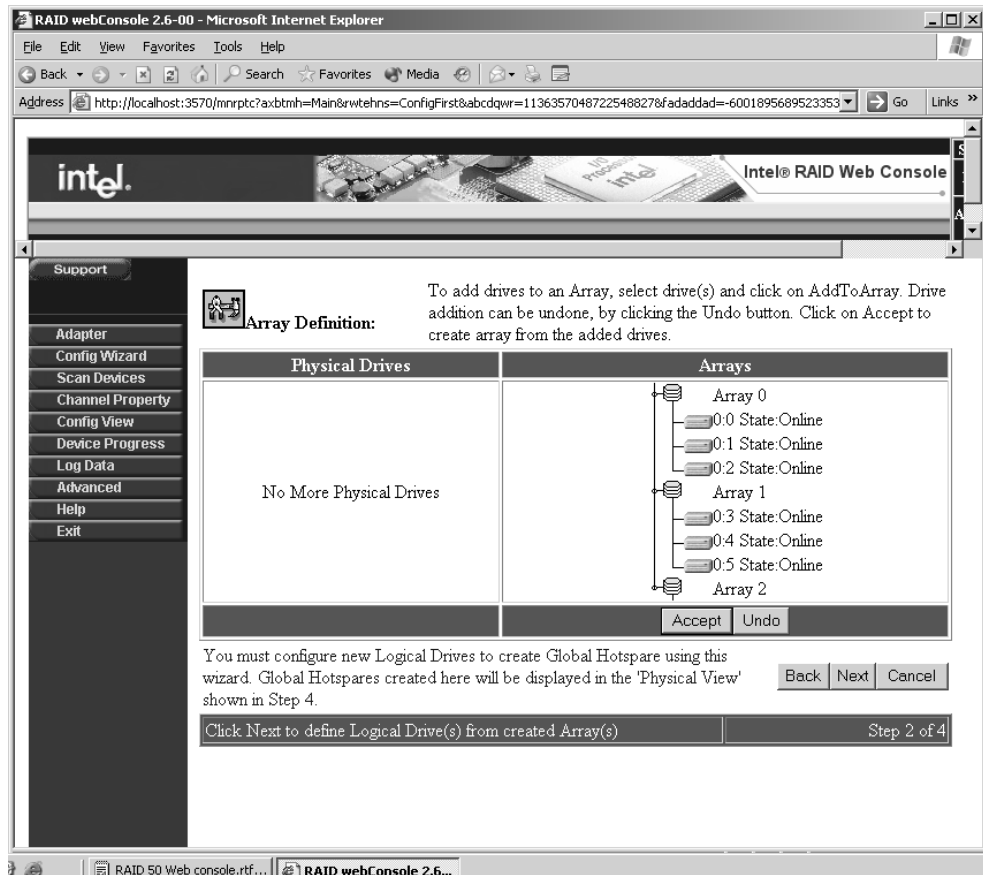
3. In the Logical drive definition screen, select RAID 50 as the array type and set the rest of the RAID parameters according to the needs of your application. For information on these parameters, refer to the Section "Setting RAID parameters". Notice that the size of the logical drive for acceptable raid levels is listed in the table.
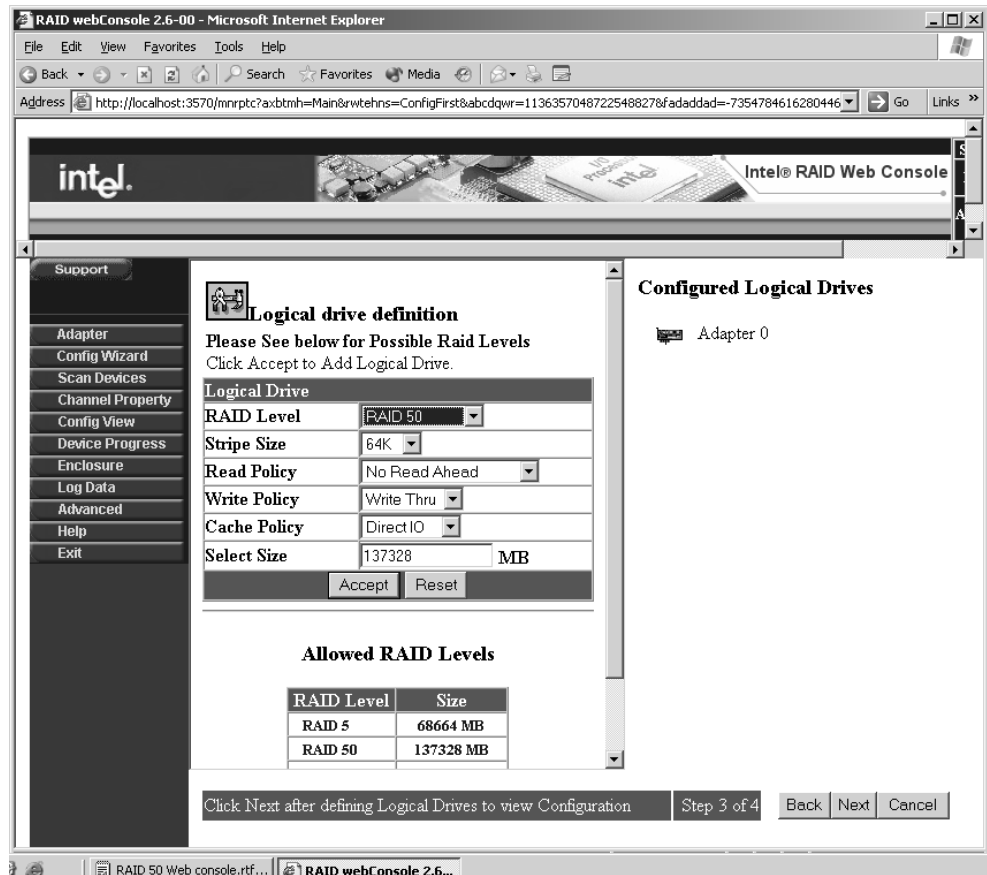
4. After setting the appropriate raid settings, hit the <Accept> button to define the logical drive as a RAID 50.

5. Select the <Next> button to define the logical drives and to preview the configuration.
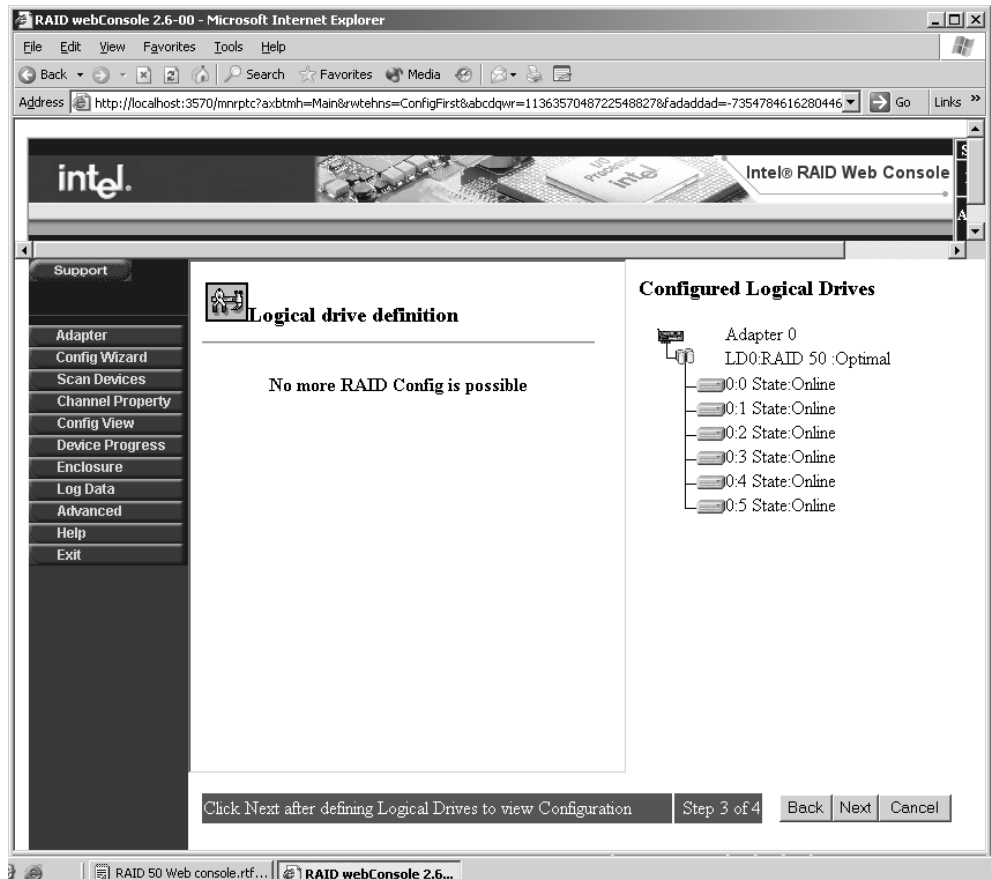
6. Hit the <Accept> button to save the configuration and initialize the drive with the new raid settings.
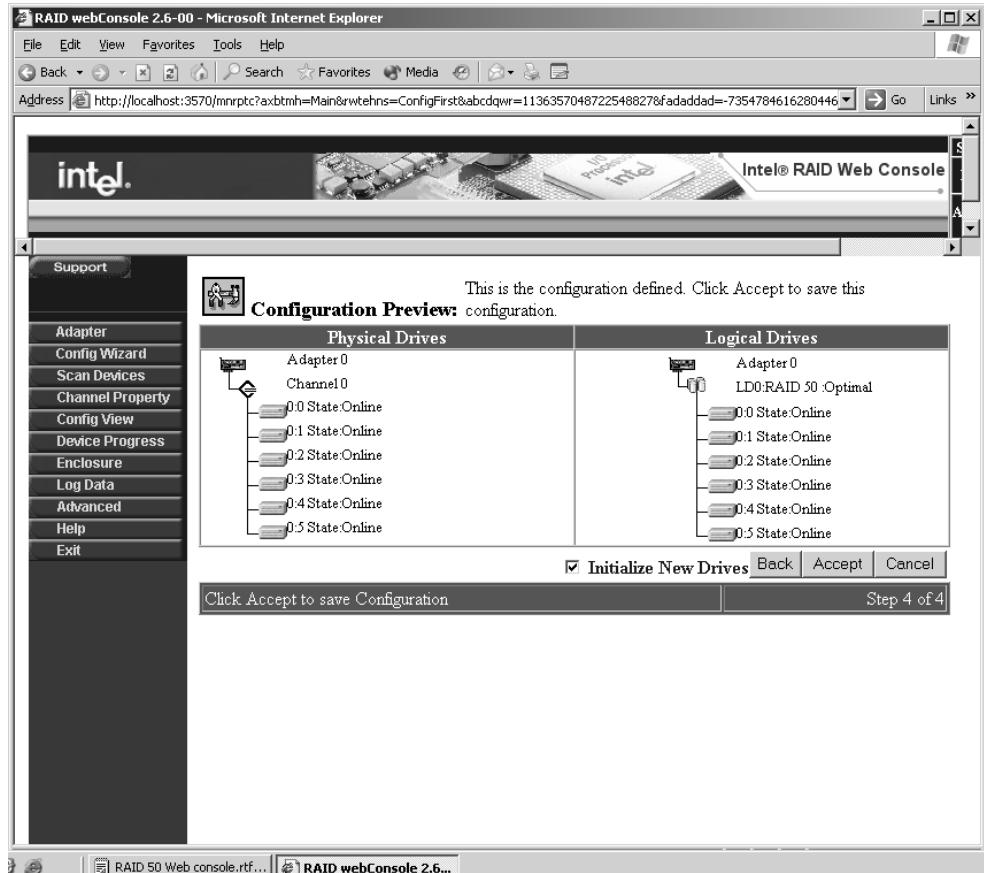
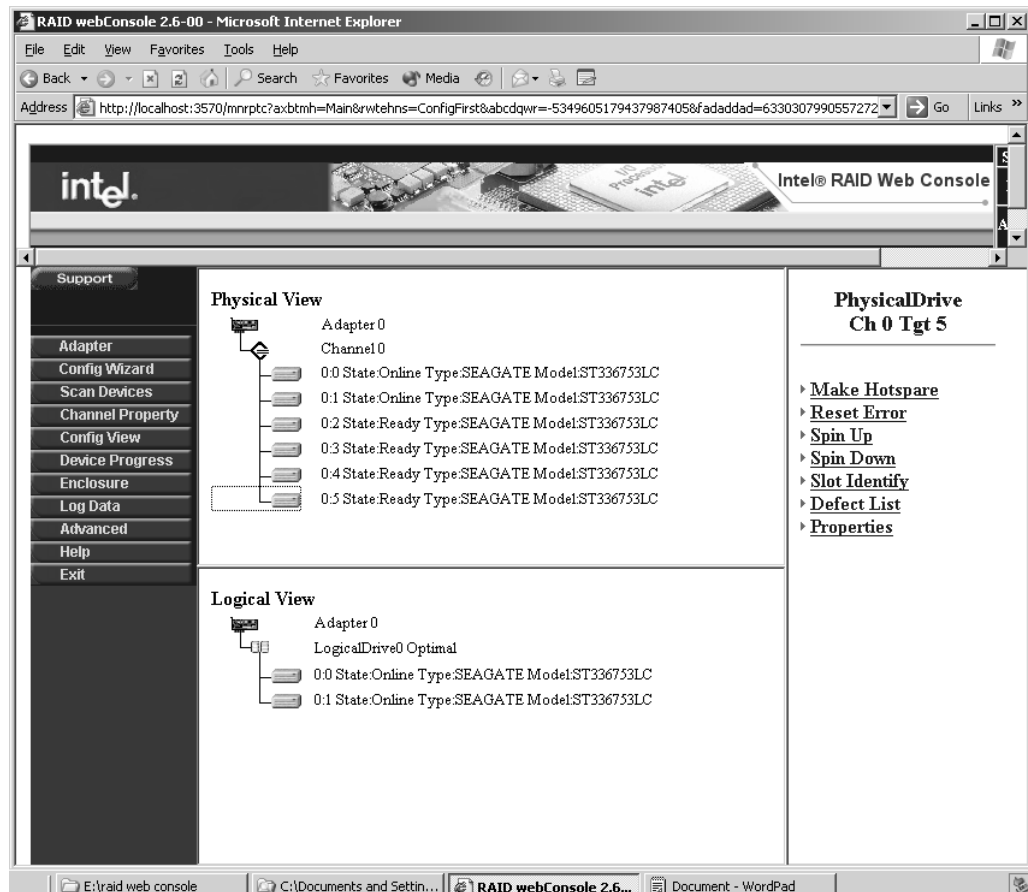7. The application will initialize the drive and show the configured drive in the logical View drive pane as shown below.
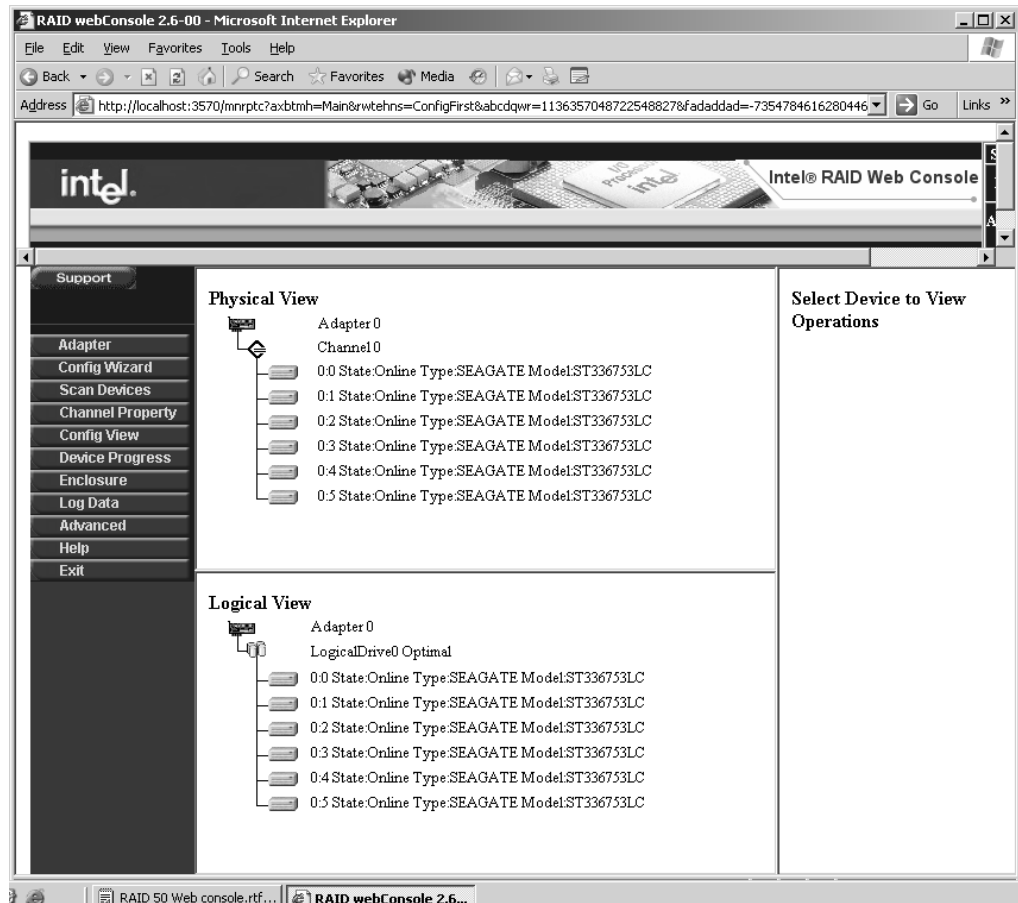
6.4   Creating a Hot Spare

1) Select the <Config View> on the left hand menu to get the physical view of all drives in your system.

2) Select a drive that is not configured in an array to pull up the menu of options for the drive.

3) Select the <Make Hotspare> link that is shown in the right hand pane.

RAID webConsole 2.6-00 - Microsoft Internet Explorer

Address http://localhost:3570/mnrptc?axbtmh=Main&rwtehns=ConfigFirst&abcdqwr=-53496051794379874058fadaddad=6330307990557272

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Physical View

Adapter 0
Channel 0
0:0 State:Online Type:SEAGATE Model:ST336753LC
0:1 State:Online Type:SEAGATE Model:ST336753LC
0:2 State:Ready Type:SEAGATE Model:ST336753LC
0:3 State:Ready Type:SEAGATE Model:ST336753LC
0:4 State:Ready Type:SEAGATE Model:ST336753LC
0:5 State:Ready Type:SEAGATE Model:ST336753LC

Logical View

Adapter 0
LogicalDrive0 Optimal
0:0 State:Online Type:SEAGATE Model:ST336753LC
0:1 State:Online Type:SEAGATE Model:ST336753LC

**PhysicalDrive
Ch 0 Tgt 5**

▸ Make Hotspare
▸ Reset Error
▸ Spin Up
▸ Spin Down
▸ Slot Identify
▸ Defect List
▸ Properties

Support
Adapter
Config Wizard
Scan Devices
Channel Property
Config View
Device Progress
Enclosure
Log Data
Advanced
Help
Exit

4) The Hotspare drive can then be selected to be a dedicated Hot Spare or Global Hot spare for any array that goes down. A dedicated hot spare may be warranted for applications where backing up and restoring a drive in case of failure is critical. In this case, we will set the drive to be a global spare for use when a single drive goes down in any defined logical drive.

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Chapter 7
Online Capacity Expansion

7.1 Adding Capacity

This section describes how to add disk capacity to a system running Windows 2000, 2003, or Novell Netware. You can add capacity or a hard disk drive to an existing array only if:

- There is only one configured logical drive per array (not per controller)
- You are adding the drives to RAID levels 0 or 5 arrays

7.1.1 Adding Hard Disks Using Web Console

Follow these steps to add hard disks using Web Console.

1) Physically connect your new drive(s) to the system.

2) On the main menu screen, verify that the newly attached drive(s) display on the appropriate channel or port.
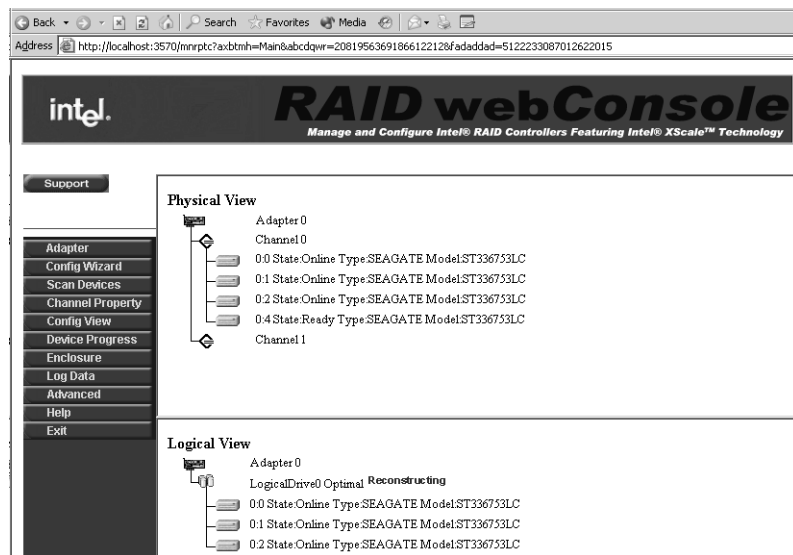
Figure 7.1   Web Console Main Screen
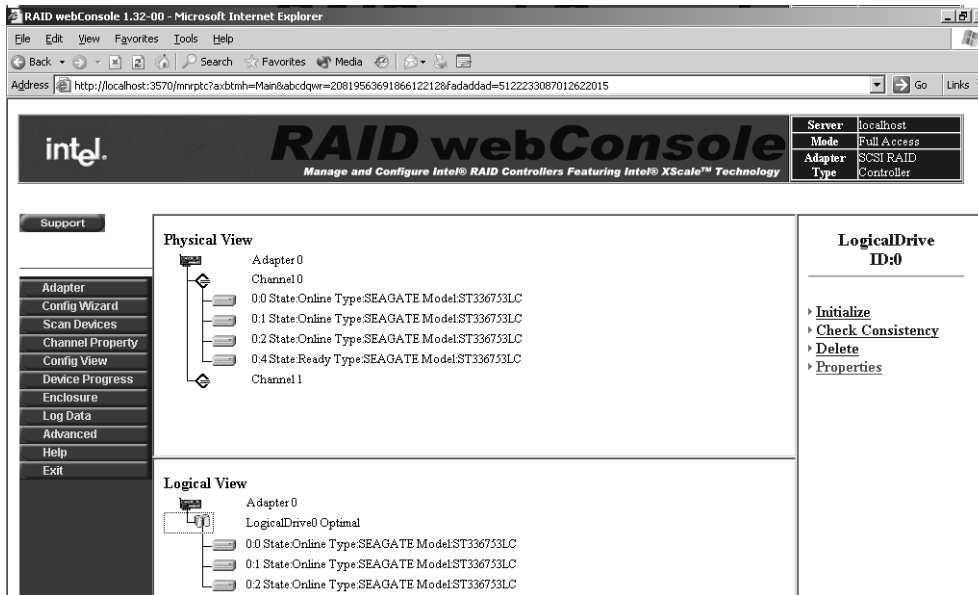
3) On the Config View, click on Logical Drive Properties. if an unassigned drive is available, it will be shown in a window. Click on the available drive and the Add to Array button.

Figure 7.2   Logical Drive Properties
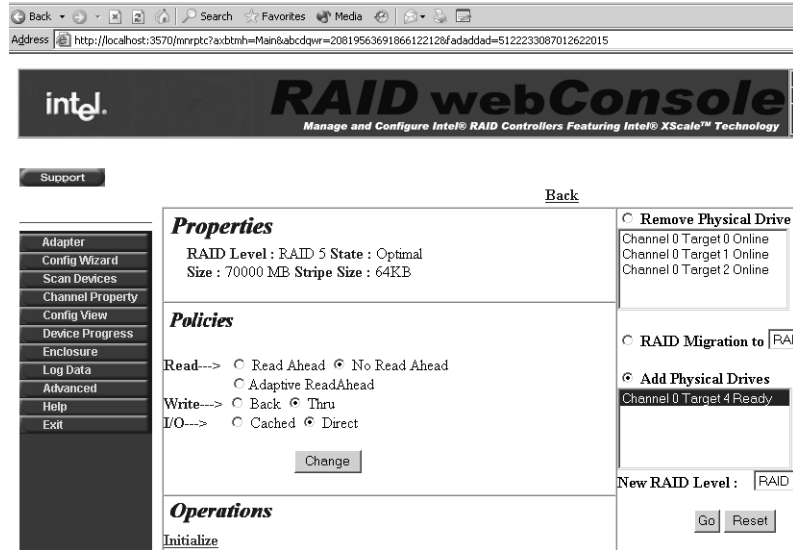
4) After the rebuild is complete, add the additional space to the Disk Administrator.

7.1.2   Applying Additional Space to Windows Disk Administrator

After the array rebuilds, go to the Disk Administrator utility. There are two ways to apply the new space to Disk Administrator:

*   Add a new logical drive using **Create** or **Create Extended Partition**. Refer to the Windows documentation for more information.

*   Add a new Logical Drive using **Extend Volume Set**. This option is available only on operating systems that use the NTFS format and is not available on operating system that use a File Allocation Table (FAT).

Follow these steps to add a disk using **Extend Volume Set**.

1) Click on **Existing Partition**.

2) Hold down the shift key and right click on **Available Space**.

3) From the pull down menu, select **Extend Volume Set**.

4) Enter the total space of both partitions, and the total size of the volume. For example, if the first partition is 500 Mbytes, and the new capacity of the array is 1000 Mbytes, then the volume space entered is 1500 Mbytes.

7.1.3   Adding Capacity to the NetWare Volume

Follow these steps to add capacity to the NetWare Volume.

1) Load `INSTALL.NLM`.

2) Highlight **VOLUME OPTIONS**.

3) Press <Enter>.

4) Press <Insert>.

5) Highlight the drive that has available space.

6) Press <Enter>.

7) Highlight the option **Make Segment Part of Another Volume** or **New Volume**.

8) Press <Enter>.

9) Highlight the existing volume to which you want to add, if you are adding to an existing volume.

10) Press <Enter>.

    NetWare displays the remaining FlexRAID free space.

11) Press <Enter> to modify the size of the new segment.

12) Under Disk Segment Parameters, type the size of the new drive to modify the disk segment size.

13) Press <Enter>.

14) Press <F10>.

15) Press <F10> again, to save the new information.

16) Press <Esc>.

17) Highlight **Yes** to save the changes.

18) Mount all the volumes.

The additional space is ready for use without rebooting the system.