# Xserve RAID

## Using RAID Admin 1.2 and Disk Utility

Includes instructions for creating RAID arrays and monitoring Xserve RAID systems

# Contents

# About Software for Xserve RAID Systems

## You can set up and manage an Xserve RAID system from a host computer or a remote computer.

You use three applications to configure and monitor your Xserve RAID system. Two of these applications, RAID Admin and Fibre Channel Utility, are included on a CD with the system. (In some instances, the CD with RAID Admin and Fibre Channel Utility is supplied with other systems or cards as well.) You also can download the latest version of RAID Admin and Fibre Channel Utility using Software Update in System Preferences.

The third application, Disk Utility, is part of Mac OS X and Mac OS X Server.

You use RAID Admin to set up the Xserve RAID hardware, including:
• Creating, deleting, and expanding RAID arrays (known as "hardware RAID")
• Monitoring the status of one or more Xserve RAID systems
• Adjusting settings, including system name and password, network address for each RAID controller, fibre channel communication speed, drive cache, and controller cache
• Setting up email notification for system alerts
• Implementing advanced features, such as dividing arrays into "slices," mapping arrays to specific host computers (LUN masking), and updating the firmware of an Xserve RAID system.

You use the Fibre Channel Utility to view and modify settings on the Apple Fibre Channel PCI Card, including:
• Identifying the World Wide Node Name (WWNN) and World Wide Port Name (WWPN) associated with each card port
• Setting the fibre channel speed from the host card
• Setting the fibre channel topology from the host card
• Setting the hard loop ID

You use Disk Utility for:
• Mounting arrays on the host system (which includes putting the file system on arrays and creating volumes)
• Implementing software RAID (striping or mirroring two or more RAID arrays)

This guide provides instructions for using RAID Admin and Fibre Channel Utility to configure and monitor Xserve RAID systems and using Disk Utility to enhance hardware RAID arrays. (For descriptions of RAID levels and the types of arrays you can set up on an Xserve RAID system, see Chapter 7, "RAID Overview," and Chapter 8, "Planning RAID Storage for the Xserve RAID System," in the *Xserve RAID User's Guide.)*

See Chapter 1, "Configuring an Xserve RAID System," on page 7 for details on configuring a system for the first time.

See Chapter 2, "Working With RAID Arrays," on page 15 for instructions on creating and deleting RAID arrays.

See Chapter 3, "Monitoring Status and Changing Settings," on page 25 for information on managing systems, changing settings, and getting details of a system alert.

See Chapter 4, "Using Advanced Features of RAID Admin," on page 35 for information on slicing arrays, expanding arrays, verifying or rebuilding parity, and LUN masking.

# Configuring an Xserve RAID System

**1**

## Use the RAID Admin application to configure or monitor one or more Xserve RAID systems.

You use RAID Admin to enter basic information, such as system name, access level and password, and network settings, on the Xserve RAID system. Monitoring buttons require the monitoring password; management buttons require the management password. (The default passwords are "public" for monitoring and "private" for management.)
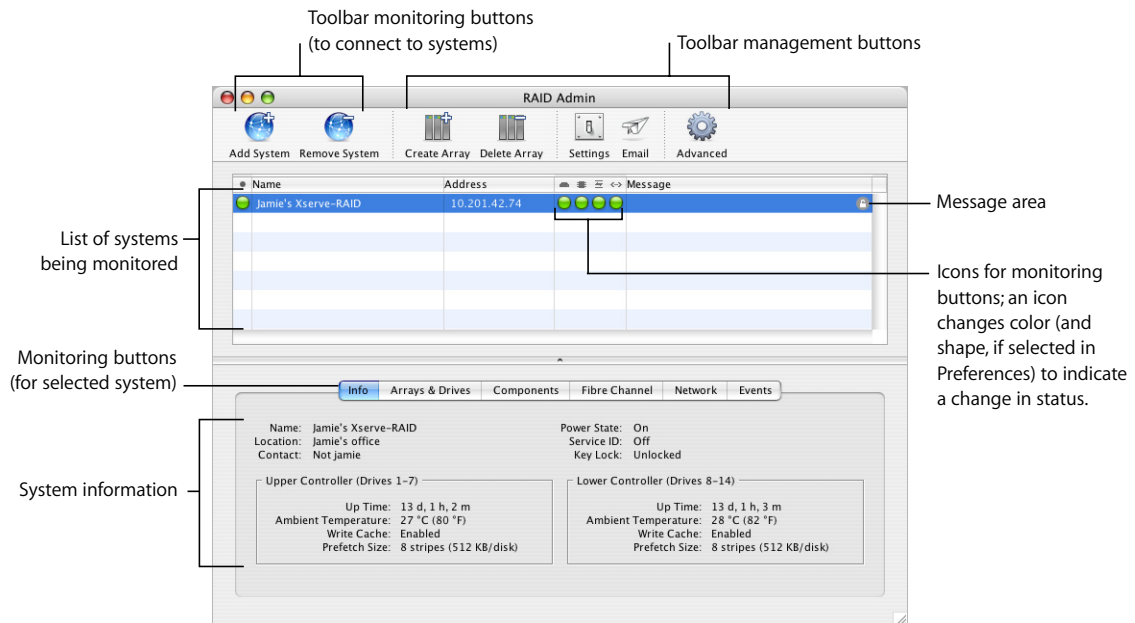


Before creating RAID arrays, it's a good idea to configure the system with the name, password, and network settings you want. You may need to get some information from the network administrator for your location.

Be sure to write down the information you enter for the system and keep that record in a safe place. If you plan to share your Xserve RAID system, other users will need to know some or all of these details.

## Installing the RAID Admin Application

You must install RAID Admin on all computers that you want to use to monitor or administer Xserve RAID systems. Each monitoring computer must be using Java 1.3.1 or a more recent version. (Java 1.3.1 is supported in Mac OS X v10.2 and later versions.)

**To install or update RAID Admin on a monitoring computer, do one of the following:**
• Insert the *Xserve RAID Admin Tools* disc in the optical drive of the monitoring computer and copy the folder "RAID Admin" to that computer.
• Use Software Update in System Preferences to update a version already installed on the computer.

You can also copy the software folder from a remote system or server if the computer you want to use for monitoring does not have an optical drive.

*Note:* When you update the software, be sure to read the "Read Me" files associated with each new version.

## Connecting to the System

RAID Admin uses Rendezvous discovery to simplify connecting to an Xserve RAID system the first time. The application lists the IP addresses of the systems on the same subnet as your monitoring computer.

The system's default configuration is to use DHCP for a network address. If no DHCP server is available, the system will automatically use a link local address of 169.254.x.x.

*Important:* The first time you configure an Xserve RAID system, you must use RAID Admin on a computer that is on the same subnet as the system. By doing so, you can connect to the system without knowing the IP address of the system.

**To connect to an Xserve RAID system:**

1 Turn on the Xserve RAID system.

   *Note:* The drives on the Xserve RAID have been preconfigured at the factory into a RAID Level 5 array with RAID Now background initialization in effect. When you turn on the system, the drives will begin initializing the array. This process will take a number of hours. You can use the default RAID Level 5 array (or arrays, depending on the number of drives in the system) immediately (as the drives are initializing) or delete the preconfigured arrays and configure the drives as you wish. Connecting during initialization and deleting an array will not harm the system. If you have written any data on an array, deleting that array will cause that data to be lost.

2 Start RAID Admin on a computer that is on the same subnet as the system and click Add System.

List of systems on subnet — (Rendezvous names)
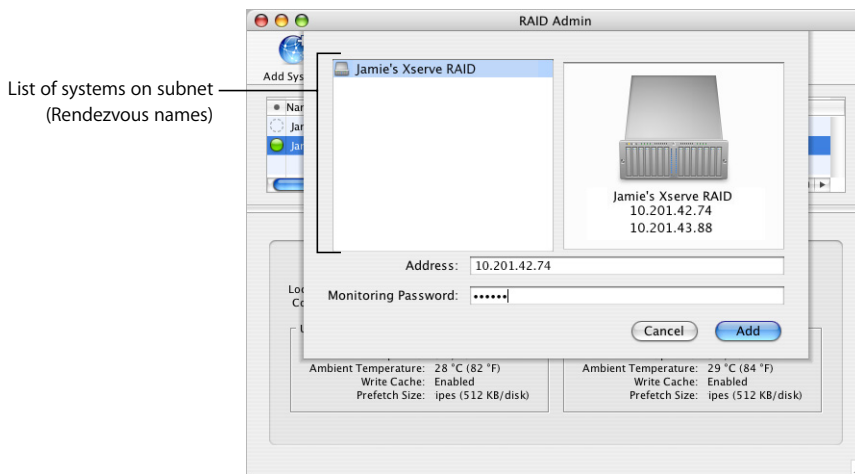


3 In the Add window, select the system you want from the list or type the IP address of the system in the Address field.

4 Type the Monitoring Password.

   Monitoring access allows you to monitor a system but not make changes. When you want to create an array or make other changes, the software asks you to enter the management password.

   *Note:* The default monitoring password is "public." The default management password is "private."

5 Click Add.

6 Select the system in the list to display its settings and information in the monitoring panes.

# Entering Basic Settings for an Xserve RAID System

You can enter or change a number of settings for the Xserve RAID system. These include:

- System name
- Location of the system and key contact
- Management or monitoring password
- System time synchronization with the monitoring computer or a network server
- Audible alarm on or off; automatic restart after power outage on or off
- Network address configuration
- Fibre channel options for transmission speed and connection type
- Turning drive cache on or off for each array and controller cache on or off (for each RAID controller)
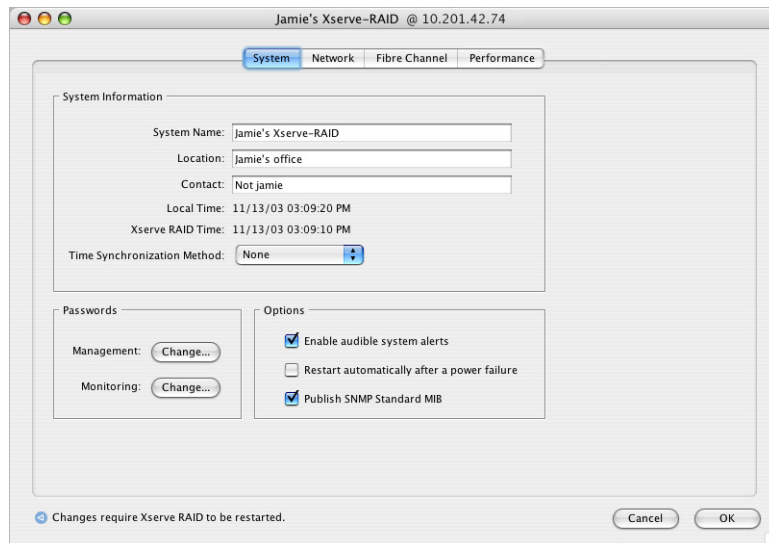
Changing some settings will cause the Xserve RAID system to restart.

## System Identity and Access

You use the Settings window in RAID Admin to add or change most information for your Xserve RAID system.

**To open the Settings window:**

1  In the RAID Admin window, click the Settings button.

2  If necessary, enter the management password and click OK.

*Note:* You can save the management password for a system (until you quit RAID Admin) by checking "Remember management password" when you enter the password. A small lock icon appears at the right side of the message area for the system in RAID Admin's main window. Any subsequent tasks requiring the management password will authenticate using the saved password without prompting you. For security, you can delete the saved password by choosing Forget Management Password from RAID Admin's System menu.

### System Name and Contact Information

Use the System pane in the Settings window to enter or change the system name. (The default name Xserve RAID is set at the factory.) You can also enter reference information, including the physical location of the Xserve RAID system and the primary contact for that system.

Choose an option from the Time Synchronization Method pop-up menu. You can synchronize the system's time with the host computer or a network time server (for which you enter the name).

You can change the password for management or monitoring access using the appropriate Change button. When setting up the system, you may want to change both passwords. Be sure to write them down and make them available to anyone else who is authorized to make changes (management) or monitor system status (monitoring).

The option for audible alerts is turned on by default.

The option for SNMP access is turned on by default. This option allows SNMP community "public" access.

### Network Address

You use the Network pane of the Settings window to set the IP address for each RAID controller in the system.
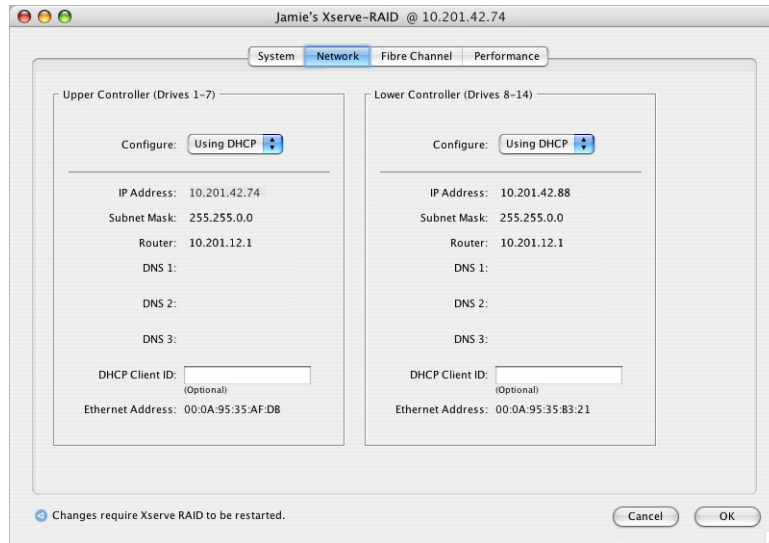


- If you have one or two static IP addresses, choose Manually from the Configure pop-up menu and type the address, subnet mask, and router information.
- If you don't have a static IP address, choose Using DHCP from the Configure pop-up menu. (DHCP is the default setting for the system.)

For specific information about the IP address and other network details for your system, check with the network administrator at your location.

### Email Notification

The Xserve RAID system sends email messages whenever it detects an error condition. You can add as many email addresses as you wish for notification; separate the names with commas.

**To set up email notification:**

1 In the RAID Admin window, click the Email button.

2 If necessary, enter the management password and click OK.

3 In the Email Notification window, click Add.

4 Enter one or more email addresses in the text field and click OK.
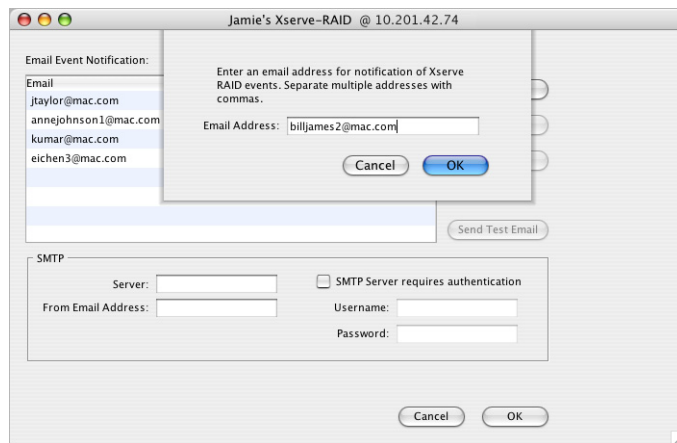


5 Enter the address of the SMTP server and the sender's email address. You can use your own address or create a new address on the SMTP server with a name such as "Xserve RAID 3 alert" to identify the system and the purpose of the email message. (The address you use must be a valid one on the SMTP server.)

6 If the SMTP server requires authentication, click the authentication checkbox and enter the appropriate user name and password.

You can use the Send Test Email button to verify that notification is working.

7 Click OK.

## Configuring Additional Systems

If you plan to configure multiple Xserve RAID systems, you must enter the information and choose settings for each system individually.

If the other systems you want to set up are on the same subnet, you can add each one to the monitoring list and then add name and contact information, change passwords, and enter IP addresses for each system. Each time you begin a management task, you have to enter the management password for that system, unless you have previously saved it in RAID Admin Preferences.

If you need to configure a system for the first time that is not on the same subnet with your monitoring computer, you must find out its IP address or use RAID Admin on another computer on the subnet with that system. Once you know the IP address of the systems you want to monitor, you can connect to them from any location with TCP/IP access.

Once you've configured the system with basic settings, you can begin using the RAID Level 5 arrays preconfigured at the factory, or you can create other RAID arrays and begin storing data on the system.

# Working With RAID Arrays

# 2

## Use RAID Admin and Disk Utility to configure arrays and volumes and use Fibre Channel Utility to refine fibre channel performance.

Once you've configured the Xserve RAID system with basic settings, you can create RAID arrays (also known as RAID sets). For explanations of RAID levels and combinations offered by the Xserve RAID system, see Chapter 7, "RAID Overview," and Chapter 8, "Planning RAID Storage for the Xserve RAID System," in the *Xserve RAID User's Guide.*

### Creating a RAID Array

You use the Create Array window of RAID Admin to set up an array. This window lists the hardware RAID levels you can create and displays a picture of the system's front panel so that you can easily choose the drives to include in each array. A checkbox is on each available drive in the picture.

*Note:* The Xserve RAID system uses two RAID controllers. The upper controller manages drives 1 through 7 on the left side of the system (when viewed from the front); the lower controller manages drives 8 through 14 on the right side. If your system has fewer than 14 drives, you may want to rearrange the drive modules to take advantage of both RAID controllers, which provide greater performance and redundancy.

You cannot create a RAID array that spans both controllers. (You can use Disk Utility to add software RAID to two or more arrays, however; see "Adding Software RAID to Two or More Arrays" on page 21 for details.)

*Important:* Do not remove drive modules when the Xserve RAID system is powered. When the system is powered on and you remove a drive module that is a member of a RAID array, the array will either become degraded or will be lost if the RAID level is unprotected.

Any drives not used in an array are treated as global spares (also called "hot spares") for all arrays on that controller.

*Important:* Once you create an array, you cannot change its type or remove drives from it. Be sure to plan the arrays carefully to avoid having to remove an array later. You can expand an array by adding one or more drives to it. See "Expanding an Array" on page 38 for more information.

As you plan your arrays, keep in mind that each RAID controller can have up to three arrays.

**To create a RAID array:**

1 In the RAID Admin window, click Create Array.

2 If necessary, enter the management password and click OK.

3 In the Create Array window, select the RAID level you want to use.

This window provides brief details about each RAID level or drive when you click the button for a RAID level or put the pointer on the picture of a drive module.
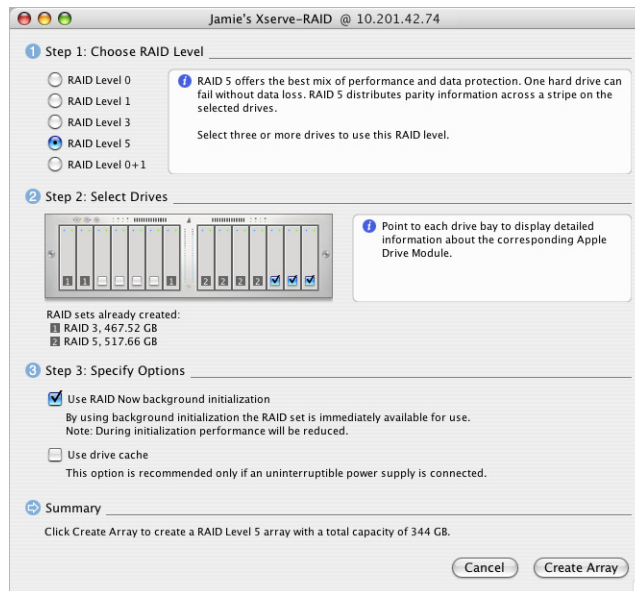


4 Click the box on each drive you want to include in the array.

5 Choose the options you want.

• "Use RAID Now background initialization" lets you use the RAID array without waiting for initialization to finish. While the array is being initialized, data read and write speeds will be somewhat reduced. If this option is off, initialization takes place before the array is visible on the host system.

*Note:* The array cannot be seen by the host computer before initialization is complete unless RAID Now is used.

- "Use drive cache" enables the built-in write cache on each drive in the array. This option improves efficiency and speed of data transfer, but the drive cache contents will be lost if power to the system fails, unless you are using an uninterruptible power supply (UPS).

  *Important:* It is recommended that you use a UPS when you have drive cache enabled. Without UPS backup, you could lose data in the event of a power failure.

  In the event of a power failure, the system detects UPS power, immediately flushes the data in the drive cache on a drive, and then turns off the cache. When AC power is restored, the system turns on the drive cache again.

6  Check the summary of the array you've chosen and click Create Array.

  *Note:* The RAID controller automatically treats any drive not assigned to an array as a global hot spare for all arrays on that controller.

## About Spare Drives

A spare drive is any drive that has not been assigned to an array. On the Xserve RAID system, an unassigned drive is "hot" (always spinning and ready for use) and global (available to any array on its controller). A spare drive is used automatically by the RAID controller for its group of drives (either drives 1 to 7 or drives 8 to 14) whenever a drive within an array fails. (A controller can only use available drives on its side of the system; it cannot treat a drive on the other side as a hot spare.)

When you assign a previously unused drive to a new array, it no longer serves as a hot spare.

## Modifying a RAID Array

Once a RAID array is established, you can expand it by adding one or more drives to it. Expanding an array preserves the data on the original array. Be sure that your file system supports expansion. See "Expanding an Array" on page 38 for details on expanding an array.

You can also subdivide, or "slice," an array into as many as six parts. Slicing an array erases any data on it. See "Slicing an Array" on page 35 for details on slicing.

*Note:* You cannot change an array's type or remove drives from it. You can turn the drive cache on or off.

Should you want to make any change except adding available drives to an array or slicing it, you must back up all data in the array, delete the array, and create a new array with the parameters you want.

## Rebuilding a RAID Array

If a drive fails and the array RAID level is 1, 3, 5, or 0+1, data availability will be unaffected, but the data is no longer protected. The array is in a degraded state. The RAID controller that controls the affected array will automatically attempt to reconstruct the data in order to return the system to a protected state. For example, if a hot spare drive is available when a drive fails in an array, the controller takes the available drive and integrates it into the array. The controller then rebuilds the RAID array using the new drive.

Array performance will be diminished until the drive is rebuilt. During this rebuilding process, an indicator on the drive module being added to the array alternately flashes amber and green. The system displays a warning signal (yellow) in the main RAID Admin when an array is degraded. Rebuilding progress is shown in the Arrays & Drives monitoring pane.

The Xserve RAID system automatically rebuilds a RAID array in certain instances.
• If you have created a protected array (RAID 1, 3, 5, or 0+1) and you have an unassigned drive (a hot spare), each RAID controller automatically uses the spare drive to rebuild the array if a drive in the array fails.
• If no hot spare drive is available on the RAID controller, the array operates in a degraded state until you replace the failed drive.
• If you have a RAID 0 array, the system cannot rebuild the array in the event of a drive failure or other interruption. All data on the array will be lost.

## Deleting a RAID Array

You delete a RAID array in the Delete Array window.

> *Warning:* Be sure to back up all data before you delete an array. If you delete an array without first backing up all the data stored on the array, you will lose that data with no possibility of recovery.

**To delete an array:**

1 In the RAID Admin window, click Delete Array.

2 If necessary, enter the management password and click OK.

3 In the Delete Array window, click the button for the array you want to delete.

The drives for that array turn red in the picture of the system.
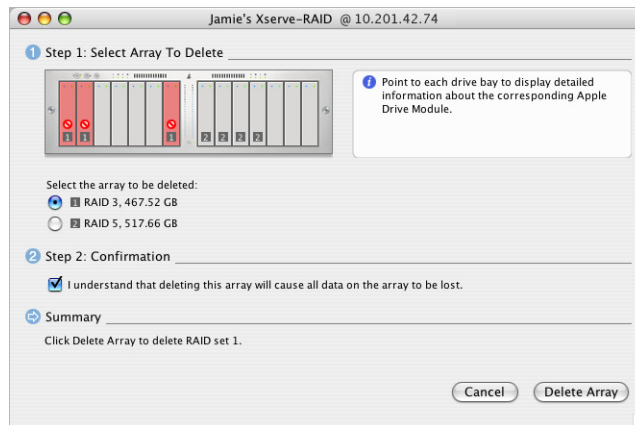


4 Click the confirmation checkbox to confirm that you want to remove the array.

5 Click Delete Array (or click Cancel if you don't want to delete the array).

## Formatting and Mounting Arrays on a Host System

Creating an array creates a virtual device without a file system. You add a file system to each RAID array on the host system using Disk Utility. The array appears in Disk Utility as an unformatted disk.

Disk Utility is part of Mac OS X (or Mac OS X Server) and is stored in the Utilities folder inside the Applications folder.

*Important:* You must use Disk Utility on the host system to format arrays and mount them. This procedure can be done remotely with the diskutil command-line tool. Refer to the diskutil man page for more information.

**To format and mount an array on the host system:**

1   Restart the host system.

In some instances, restarting the host system may not be necessary, but if you are creating or adding arrays, you generally must restart before the arrays are visible in Disk Utility.

2   Open Disk Utility on the host system.

3   Select the array in the list at the left side of the window.
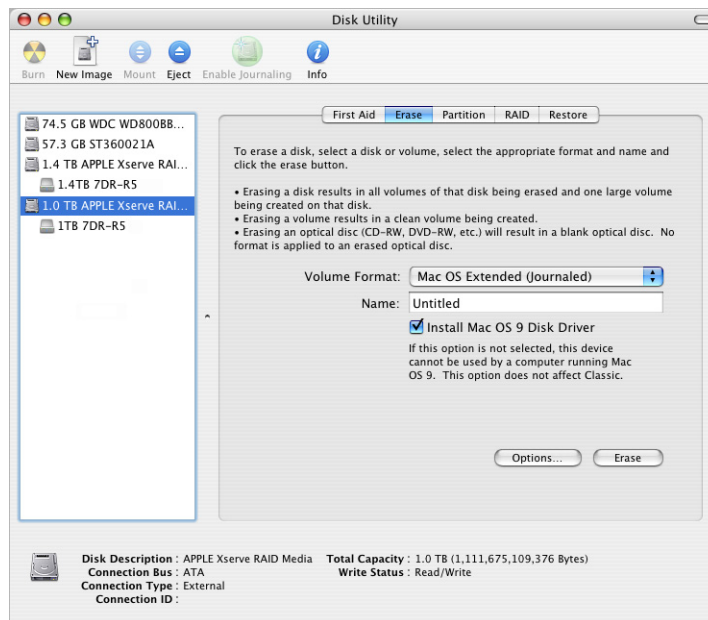


4   Click the Erase button.

5   Choose a format for the array from the Volume Format pop-up menu.

*Note:* You can take advantage of disk journaling by using the journaled volume format in Mac OS X Server. Journaling is a technique that helps protect the integrity of HFS+ disks in RAID arrays. It limits the exposure for data loss and expedites repair if the volume gets into an inconsistent state. Performance diminishes slightly when journaling is on.

When you enable journaling on a volume, a continuous record of changes to files on the volume is maintained in the journal. If your system stops running because of a power failure or some other problem, when you restart the system the journal is used to restore the volume to a known good state. Although you may experience loss of user data that was buffered at the time of the failure, the file system is returned to a consistent state. In addition, restarting the system is much faster.

You can also turn journaling on or off for a volume at any time in the Information section of Disk Utility.

6   Type a name for the volume.

7   Click Erase and confirm your decision by clicking Erase again.

Once formatting is complete, the volume mounts on the host system.

Repeat this procedure for each new volume.

*Note:* If you want to add software RAID to two or more arrays, you can skip this formatting procedure and instead use the RAID section of Disk Utility to stripe or mirror the arrays together in a volume. This procedure also formats and mounts the resulting volume. See "Adding Software RAID to Two or More Arrays" on page 21 for details.

## Adding Software RAID to Two or More Arrays

Once you've set up arrays with RAID Admin, you can either stripe or mirror two or more arrays using the Disk Utility application. Disk Utility is part of Mac OS X (or Mac OS X Server) and is stored in the Utilities folder inside the Applications folder.

Use software stripe on RAID arrays to combine array capacities and improve performance by taking advantage of multiple RAID controllers.

Use software mirror on RAID arrays to increase data protection through redundancy.

*Note:* You must use Disk Utility on the host computer to add software RAID to two or more arrays.

**To add software RAID to two or more arrays:**

1 Open Disk Utility on the host system and click the RAID tab.

2 Drag the arrays you want to stripe or mirror from the left side of the window to the Disk list at the center of the window.

   *Note:* You must use two or more arrays to create a software RAID set.
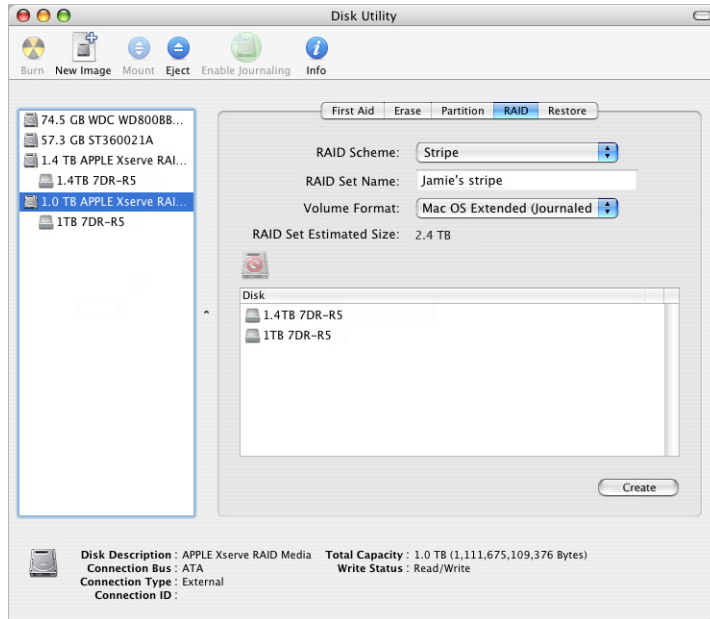


3 Select the arrays in the Disk list.

4 Choose Stripe or Mirror from the RAID Scheme pop-up menu.

5 Enter a name for the new software RAID volume.

6   Choose a format for the array.

*Note:* You can take advantage of disk journaling by using the journaled volume format in Mac OS X Server. Journaling is a technique that helps protect the integrity of HFS+ disks in RAID arrays. It limits the exposure for data loss and expedites repair if the volume gets into an inconsistent state.

When you enable journaling on an array, a continuous record of changes to files on the volume is maintained in the journal. If your system stops running because of a power failure or some other problem, when you restart the system the journal is used to restore the volume to a known good state. Although you may experience loss of user data that was buffered at the time of the failure, the file system is returned to a consistent state. In addition, restarting the system is much faster.

You can also turn journaling on or off for a volume at any time in the Information section of Disk Utility.

7   Click Create.

Once you've created your RAID arrays, you can use RAID Admin to monitor the Xserve RAID system.

# Monitoring Status and Changing Settings

# 3

Use RAID Admin to check the status and to change the settings of one or more Xserve RAID systems.

You monitor the status of your Xserve RAID system with the RAID Admin application. You can also adjust most settings with this software.

## Monitoring System Status

RAID Admin displays a variety of information about your system as it is operating.

### Adding a System to the Monitoring List

You can monitor many systems at the same time. You simply need to add each one to the monitoring list.

See "Connecting to the System" on page 8 for details on adding a system to the list.

### Getting System Information

To get details about the system's operation, open RAID Admin and add the system to the monitoring list. Click a monitoring button to display information for that category.

#### Using Contextual Menus in RAID Admin

Many menu and toolbar operations are available from a contextual menu in the monitoring list.

**To use the contextual menu:**
▪ Hold down the Control key while pressing the mouse button, then choose the option you want from the menu.

The items in a contextual menu vary according to the status of the system being monitored.

- *Info* reports system name, lock status, controller details, and whether there is a problem or power failure.
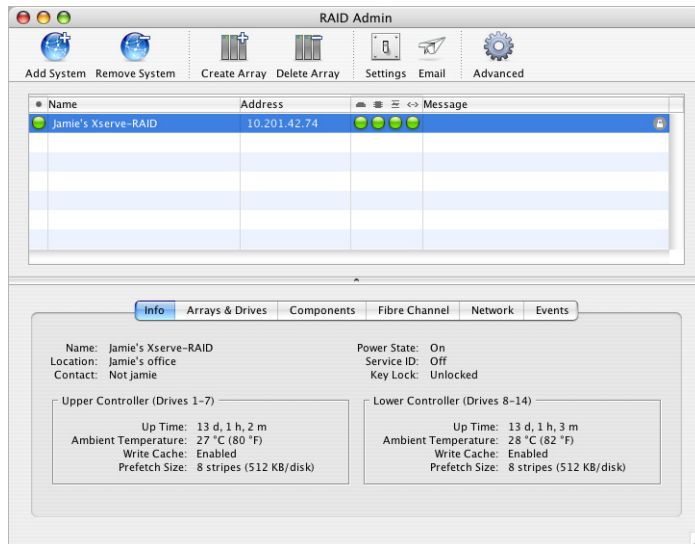


- *Arrays & Drives* shows details of each array and the drives in use and available. Click Show Arrays and then click an array in the picture to see details of the array. Click Show Drives and then click a drive to see details of that drive.
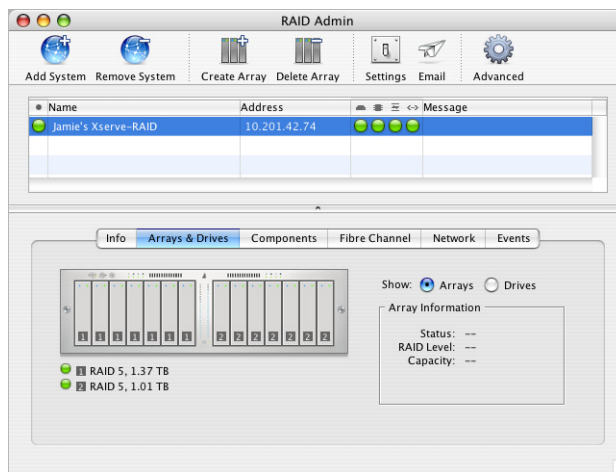
- *Components* shows the operating information about the power supplies, RAID controllers, cooling modules, and cache backup batteries. You click the component to view its details.
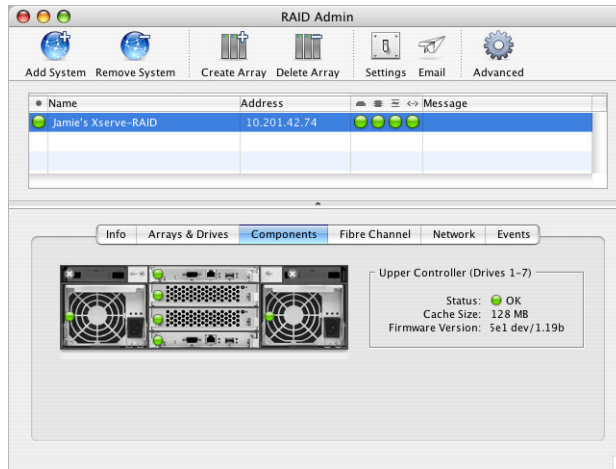


- *Fibre Channel* shows information about each RAID controller and the type of fibre channel connection in use. Topology and Speed show the actual operating setting and the configured setting (configured is in parentheses).
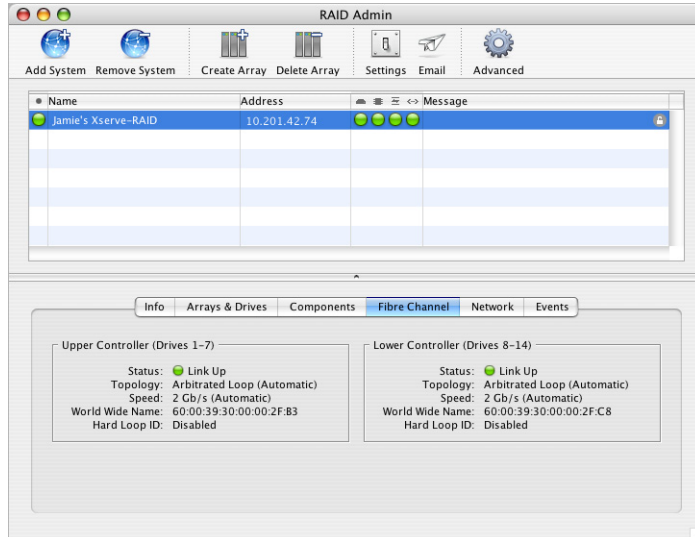
*Note:* On Xserve RAID systems, the World Wide Node Name (WWNN) and the World Wide Port Name (WWPN) are the same for each controller. The World Wide Name field shows both the WWNN and the WWPN. The Xserve RAID WWPN (shown in RAID Admin) identifies the target device and is not for use in LUN Masking. See "Masking RAID Volumes on Multiple Host Systems (LUN Masking)" on page 39 for information about LUN masking and WWPN.

• *Network* displays the IP address and related network details for each RAID controller.
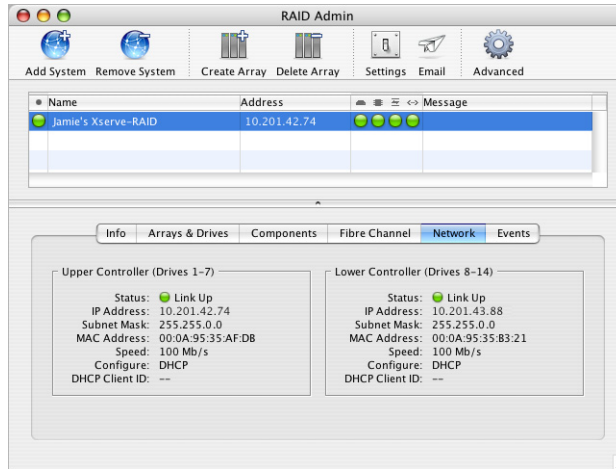


• *Events* displays a list of events that have occurred for both RAID controllers, in chronological order.  Each event has a color symbol indicating the severity, a time stamp, and a description.
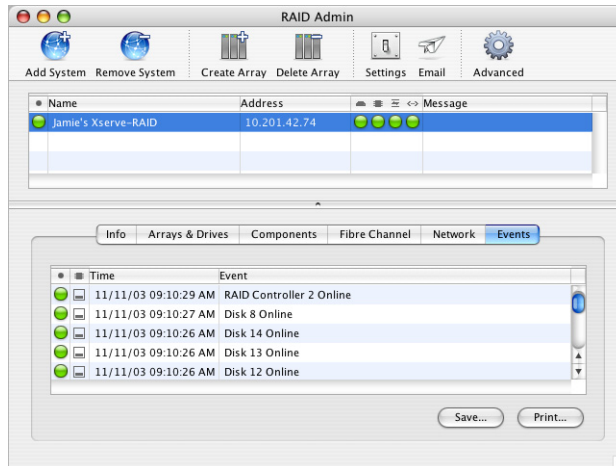
## Removing a System From the Monitoring List

You can take a system off the monitoring list when you've finished adjusting or monitoring it.

*Note:* If you remove a system, you must supply its IP address and monitoring password when you add it again.

▪ To remove a system from the monitoring list, select it in the list and click Remove System.

## Changing RAID Admin Preferences

You can change status buttons to shapes in the main RAID Admin window and change the time display to a 24-hour clock using the application's preferences.

**To use shapes or buttons to indicate system status:**

1  Choose RAID Admin Preferences.

2  Check or uncheck "Use shapes to indicate status" to use shapes in addition to color for status indicators, then click OK.

Use the "shapes to indicate status" option if you have difficulty distinguishing between the different colored status indicators. When shapes are turned on, you see a green circle for OK, a yellow triangle for warning, and a red square for failure status.

**To adjust time settings for the event log:**

1  Choose RAID Admin Preferences.

2  Click either "12-hour clock" or "24-hour clock" and click OK.

## Changing System Settings

You can adjust most settings for the Xserve RAID system while the system is operating. In a few instances, the Xserve RAID system must restart for a change to take effect, temporarily disrupting data availability.

### Revising Basic Information and Network Settings

See "System Name and Contact Information" on page 11 for instructions on adjusting basic system settings, including changing passwords for management and monitoring access.

See "Network Address" on page 12 for instructions on adjusting the network information.

## Setting Fibre Channel Speed and Topology

The default settings for fibre channel speed and topology are auto-negotiation and auto-topology. If you have a requirement for fixed settings, you can use RAID Admin to adjust settings on Xserve RAID systems and Fibre Channel Utility to adjust settings on a Macintosh or Xserve host.

**To adjust the fibre channel settings for an Xserve RAID system:**

1  Open RAID Admin and click Settings.

2  If necessary, enter the management password and click OK.

3  In the Settings window, click the Fibre Channel button.
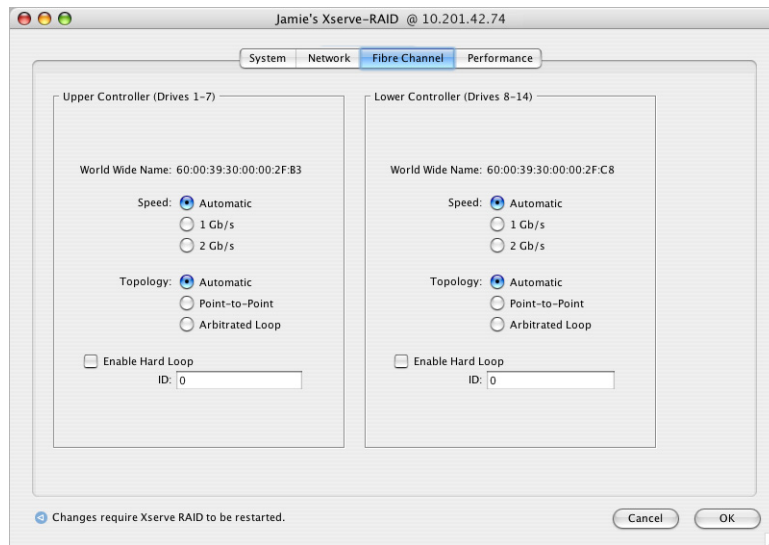


4  Click the buttons for the settings you want to change.

- Change the Speed setting for auto-negotiate or a fixed speed.
- Change the Topology setting for auto-topology or a fixed topology. Consult your network administrator if you aren't sure whether to change this setting.

5  Click OK.

6  In the confirmation window, click OK.

*Note:* The fibre channel changes take effect when the Xserve RAID system restarts. Data availability will be interrupted during the RAID controller's restart.

**To adjust fibre channel settings for a host computer:**

1 Open Fibre Channel Utility on the host computer for which you want to adjust settings.

2 Click the lock icon, enter the admin password for the system, and click OK.

3 Select the port for which you want to adjust speed or topology.

4 Choose a speed or topology setting from the appropriate pop-up menu.

5 Select Enable Hard Loop ID if you must assign a fixed address on your fibre channel loop. Check with your network administrator if you need more information about this setting.

6 Click Apply.

7 Click the lock icon to prevent further changes.

*Note:* You must restart the host computer for the change in fibre channel settings to take effect.

## Setting Up Drive Cache and Controller Cache

RAID Admin lets you turn on two separate types of cache to enhance performance of your Xserve RAID system.

• *Drive cache* enables the built-in write cache on each drive in the array. This option improves efficiency and speed of data transfer, but the drive cache is not backed up should the system lose power unless you are using an uninterruptible power supply (UPS).

  *Important:* It is recommended that you use a UPS when you have drive cache enabled. Without UPS backup, you could lose data in the drive cache in the event of a power failure.

• *Controller cache* is a write cache used by the RAID controller. This cache is backed up by the optional Xserve RAID Cache Backup Battery Modules.

  *Important:* It is recommended that you have the optional controller cache backup battery modules installed if you use controller cache. Using controller cache with no battery backup could result in data loss in the controller cache if there is a power failure.

*Note:* Using a UPS and cache backup battery modules lessens the potential for data loss, but these safeguards are not a guarantee against data loss. See your system administrator or other expert for advice on preventing data loss.

**To set up drive cache and controller cache:**

1 Open RAID Admin and click Settings.

2 If necessary, enter the management password and click OK.

3 Click the Performance button.
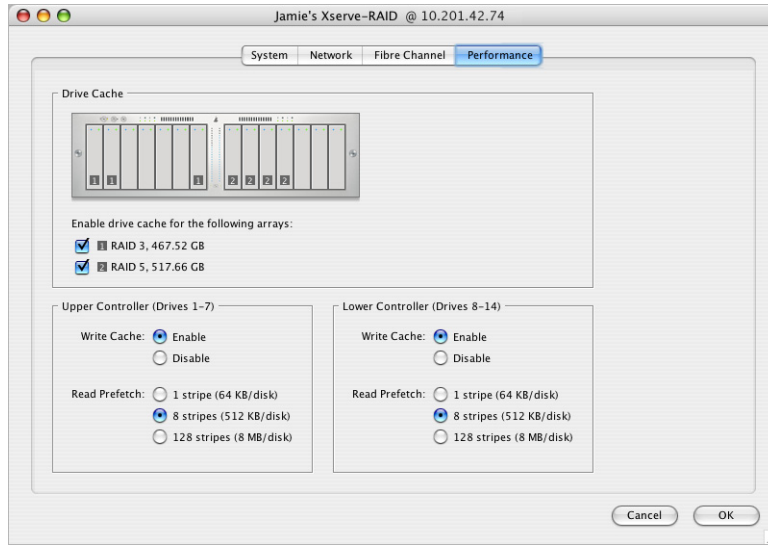


4 To set up drive cache, click checkbox for the array for which you want to enable or disable the drive cache.

5 To set up controller cache, click the button you want for Write Cache and Read Prefetch for each controller.

- *Write Cache* is used to complete data transactions from the host computer before actually writing the data to the drives.
- *Read Prefetch* anticipates that data should be retrieved from the arrays in sequential order and "reads ahead." In general, a large Read Prefetch setting is recommended for video playback, and a small Read Prefetch setting is recommended for database applications. Tuning the Read Prefetch setting may be required for optimal performance, depending on your actual data.

6 Click OK.

7 In the confirmation window that appears, click OK.

*Note:* Drive cache and controller write cache are required for applications that have a very high throughput, such as high-resolution video editing. UPS backup for drive cache is highly recommended.

## Using System Commands

System commands are useful for system installation, maintenance, and troubleshooting. These commands are located in the System menu of RAID Admin.

The system commands include:
- Shutdown, which puts the system into standby power mode. When you shut down a system, the data held in all caches is safely written to disk before the system powers off.

  *Note:* Use the Shutdown command or the Power button on the Xserve RAID system to safely write all data in the caches to disk and power off the system. If you power off the system by removing power (unplugging a cord, for example), the data in the caches is not written to disk and you can experience data loss. Also, if the optional cache backup batteries are installed, removing power will cause the system to think there is a power failure and begin discharging the batteries that protect the contents of the controller cache.

- Power Up, which starts up the system when it is in standby mode.
- Restart the Upper or Lower RAID Controller. These commands should only be used when troubleshooting the RAID controller. Restarting the RAID controller will disrupt the availability of your data.
- Restart the Upper or Lower Management Coprocessor. These commands should only be used when troubleshooting communications problems between RAID Admin and the Xserve RAID system. Restarting a coprocessor will not affect data availability.

  *Important:* Restarting both the upper and lower coprocessors within 30 seconds of each other may cause your Xserve RAID system to go into standby power mode. If you ever need to restart both coprocessors, wait at least 30 seconds after restarting the first to restart the second.

  *Note:* Use the Restart system commands with care, because any of them may disrupt the orderly transmission and storage of data.

- Clear Error Status. This command clears the alarm indicator on an Xserve RAID system after it has detected a problem and the problem has been corrected. When a problem is detected, the Xserve RAID system blinks the system identifier light, sounds the audible alarm (if enabled), and sends an email notification (if enabled). Until the error status is cleared, by either choosing Clear Error Status or pressing the system identifier button on the system, the Xserve RAID system will not send further email notifications or sound the alarm for problems of the same type or with the same component.
- Clear Event Log. This command clears the contents of the event log.
- Forget Management Password. This command deletes the saved management password.
- Update Now. This command gets the current status for the system and its components.

### Turning the System Identifier On or Off

You can use RAID Admin to turn on the system identifier light should you want to locate a particular Xserve RAID system or assist another administrator in finding that system. You can also turn off the system identifier when it's on.

**To turn the system identifier on or off:**

1  Choose System > Turn Service ID On or Turn Service ID Off.

2  If necessary, enter the management password and click OK.

### Updating System Firmware

You can use RAID Admin to update the firmware of the Xserve RAID system. Firmware updates may be available to add new features or to fix problems. Apple recommends that you update to the latest firmware available.

Xserve RAID firmware updates are available as a single file with both coprocessor and RAID controller firmware images.

Check the Xserve RAID website regularly for news about your system and any updates to firmware or software. Use your browser to go to www.info.apple.com and search Downloads for Xserve.

**To update the firmware of your system:**

1  Download the firmware update file from the Xserve website, if necessary.

2  Unmount all Xserve RAID volumes on the host computer.

3  Open RAID Admin on the host or a monitoring computer for your Xserve RAID system.

4  Choose System > Update Firmware.

5  If necessary, enter the management password and click OK.

   The default management password is "private."

6  Select the firmware file you want to use and click Open.

   Firmware update files have the extension "xfb."

7  Click Update to begin the update process.

   A progress bar indicates when the update is complete. The system restarts at the end of this process.

# Using Advanced Features of RAID Admin

# 4

The advanced features of RAID Admin give you several options as you work with RAID arrays.

With RAID Admin's advanced features you can:
*   Subdivide arrays into as many as six "slices"
*   Merge multiple slices into one slice
*   Expand array capacity by adding drives
*   Verify or rebuild parity in a protected RAID array (RAID 3 and 5)
*   Specify which arrays are visible on host systems (LUN masking)
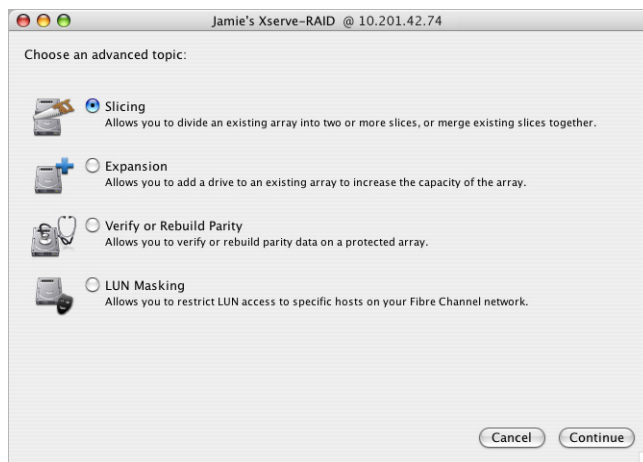


## Slicing an Array

You can subdivide a RAID array into segments, or slices. These slices are effectively hardware partitions of all drives on the array. Each slice is a separate LUN and appears as a separate volume on a host computer.

On an Xserve RAID system, you can create up to six slices on a controller. There is a limitation of eight LUNs on each controller, so the total number of unique arrays and slices cannot exceed eight.

The example in the illustration below shows six slices in a RAID 5 array that contains four drives. (All slices are the same size.)
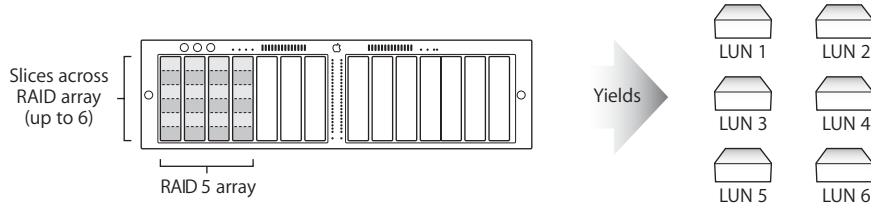


Because slices are partitions of the several drives in an array, they provide a way to manage storage as separate LUNs without having to create an array for each LUN.

*Important:* When you create slices in an array, all data on the drives in that array will be erased.

**To slice a RAID array:**

1 In the RAID Admin window, click Advanced.

2 If necessary, enter the management password and click OK.

3 Select Slicing in the Advanced window and click Continue.

4 In the Slicing window, select the array you want to slice.

This window provides brief details about each RAID level or drive when you click the button for a RAID level or put the pointer on the picture of a drive module.
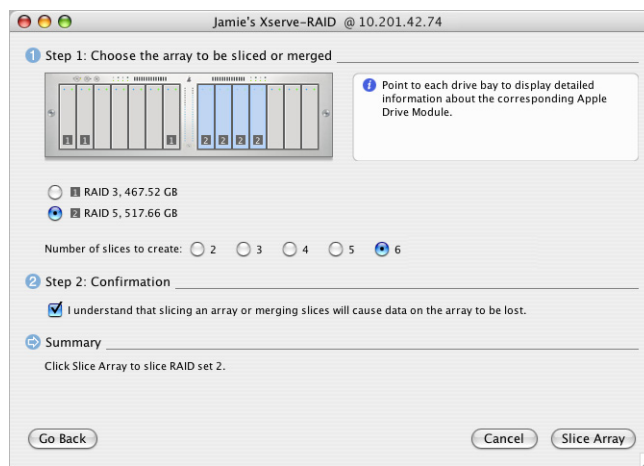
**5** Select the number of slices into which you want to divide the array.

All slices are the same size, ranging from one-half to one-sixth of the total capacity of the array, depending on the number you choose.

*Note:* If the chosen array has already been sliced, you will only be able to merge the slices. See "Merging Slices in an Array" below to details.

**6** Click the Confirmation checkbox to confirm that you want to slice the array.

Any data on the array will be lost when the array is sliced.

**7** Click Slice Array.

### Merging Slices in an Array

Merging allows you to collapse all the slices in an array into a single slice. Data on every slice except the first one will be lost when you merge slices. Merging is the second of two steps that you must do when you expand an array.

**To merge slices in a RAID array:**

**1** In the RAID Admin window, click Advanced.

**2** If necessary, enter the management password and click OK.

**3** Select Slicing in the Advanced window and click Continue.

**4** In the Slicing window, select the array on which you want to merge slices.

All slices on the array will be merged into one.
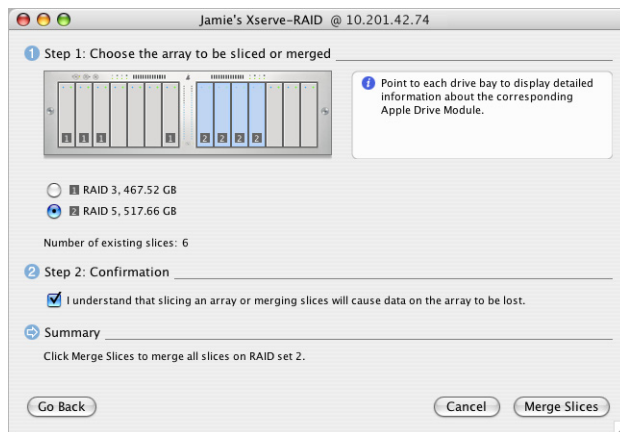


**5** Click the Confirmation checkbox to confirm that you want to merge the slices.

**6** Click Merge Slices.

# Expanding an Array

You can easily add one or more available drives to an array. The drives must be on the same controller as the array.

Expanding an array is a two-stage procedure. These stages are:
• Using the Expansion window to add one or more drives to an array
• Using the Slicing window to merge the slices in that array

*Important:* Only expand an array that has not been sliced previously. If you expand an array that already has slices on it, all the data on the array will be erased when you merge the slices in the array.

Any data on a drive will be erased when you add that drive to an array.

**To expand a RAID array:**

1 In the RAID Admin window, click Advanced.

2 If necessary, enter the management password and click OK.

3 Click Expansion in the Advanced window and click Continue.

4 In the Expansion window, select the array you want to expand.

This window provides brief details about each RAID level or drive when you click the button for a RAID level or put the pointer on the picture of a drive module.
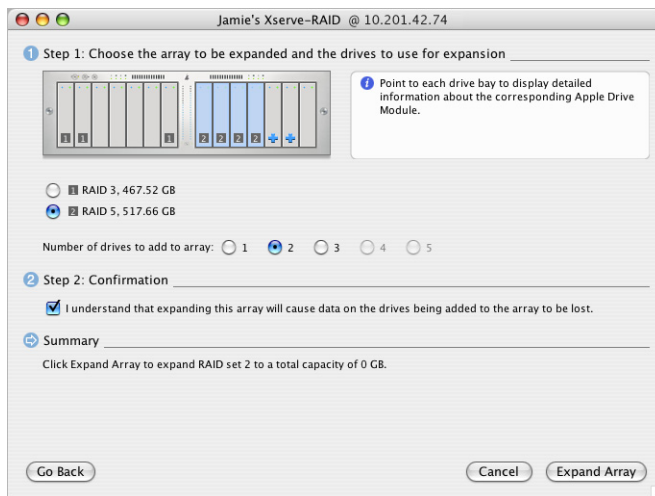


5 Select the number of drives you want to add to the array.

The controller automatically selects available drives to add to the array.

6 Click the Confirmation checkbox to confirm that you want to expand the array.

7 Click Expand Array.

The RAID controller begins restriping data across all the drives. The added drives' capacity is added to the array as an unmapped slice. To make the added drive or drives available to the array, merge the slices on that array.

**To complete the expansion procedure by merging:**
▪ Return to the Advanced window, select Slicing, and merge the slices on the array that you just expanded.

See "Merging Slices in an Array" on page 37 for details on merging slices.

## Masking RAID Volumes on Multiple Host Systems (LUN Masking)

If you have two or more host computers connected to an Xserve RAID system through a switch, you must "map" each LUN to a specific host computer. Mapping a LUN to a particular host will "mask" that LUN so it is not visible on any other host. This feature is called "LUN masking."

You use RAID Admin to map LUNs to host computers. LUN is an acronym for "logical unit number," which is a device-addressing scheme associated with arrays and slices.

*Note:* The Xserve RAID system displays arrays or slices as LUNs on a host computer.

By LUN-masking arrays and slices, you avoid the possibility that more than one host user could write data on an array and possibly corrupt the array or otherwise lose data.

### About the World Wide Port Name

LUN-masking an array requires identifying the host by using the World Wide Port Name (WWPN) of the host's fibre channel port. This name is a unique 16-character identifier assigned to each of the two ports on the Apple Fibre Channel PCI Card. The specific WWPN you need for an array is the one for the port on the card that is connected to the RAID controller for your array. (For more information about the Apple Fibre Channel PCI Card and its connections to the Xserve RAID system, see Chapter 4, "Connecting Xserve RAID to a Host System and a Network," in the *Xserve RAID User's Guide.*)

You use the Fibre Channel Utility application provided on the *Xserve RAID Admin Tools* disc (or use Software Update in System Preferences to update the software) to locate the WWPN for each port on the Apple Fibre Channel PCI Card.

*Note:* Fibre Channel Utility replaces the application Fibre Channel Info, used previously.

**Locating the WWPN With Fibre Channel Utility**

To find the WWPN for a port on your host system's fibre channel card using Fibre Channel Utility:

1 Copy the Fibre Channel Utility application from the "Mac OS X Utilities" folder on the *Xserve RAID Admin Tools* disc to your host computer, or use Software Update to get the latest version of the application.

   *Note:* You must use this application on the host computer to locate the WWPN for each port on the Apple Fibre Channel PCI Card in that computer.

2 Open Fibre Channel Utility on the host computer.

3 Select the port for which you want the WWPN in the list on the left side of the window.

   The application displays the World Wide Port Name (on the right side of the window), as well as the node name and the slot in which the fibre channel card is installed.
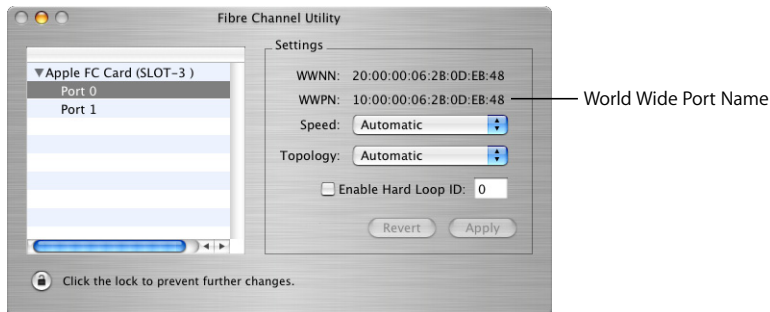


*Note:* The application locates a WWPN for each of the two ports on the fibre channel card. You may need to experiment by using both of these names to map the arrays you want to show on certain host computers and mask the arrays you want to hide.

## Setting Up LUN Masking With RAID Admin

Once you have the WWPN, you enter it in the LUN Masking window of RAID Admin.

**To set up LUN masking:**

1 In RAID Admin, click Advanced.

2 If necessary, enter the management password and click OK.

3 Select LUN Masking and click Continue.

WWPN for the fibre channel port connected to host computer
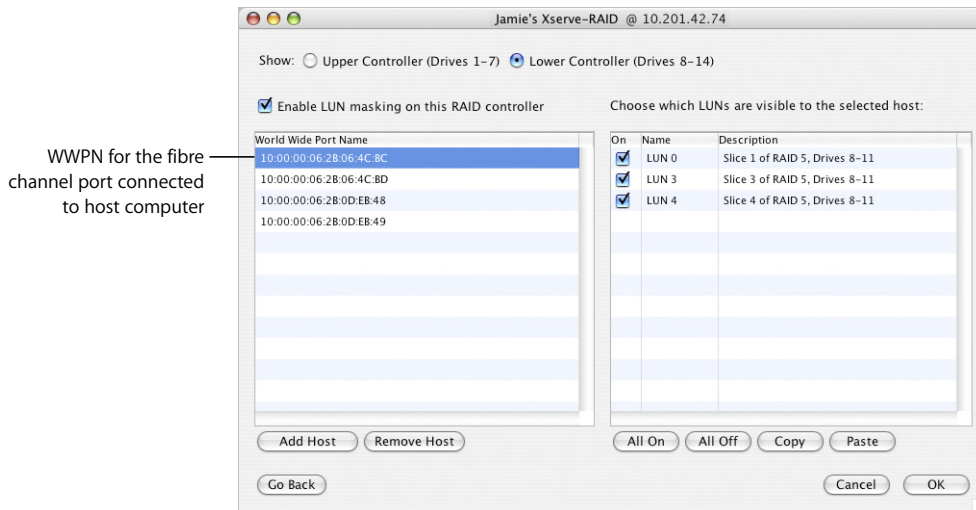


4 Select Upper or Lower Controller for the RAID controller for which you want to manage LUNs.

5 In the LUN Masking window, click "Enable LUN masking on this RAID controller."

Enabling LUN masking will mask any LUN not mapped to a corresponding WWPN.

6 Enter the WWPN for the desired port on the fibre channel card in your host system.

7 Select one or more of the LUN checkboxes for the arrays you want to map to the host system associated with that WWPN. Checked LUNs are mapped to the host computer connected to the fibre channel port with that WWPN and will be visible on that computer. LUNs that are not checked are masked from that host computer.

- A LUN is the same as an array (or a RAID set) or a slice.
- If a LUN number is checked, that LUN is mapped to the host computer associated with the corresponding WWPN (and is masked, or hidden, from other host computers).
- If a LUN checkbox is dimmed, no corresponding array has been set up.

*Note:* You can create up to eight LUNs on each controller; they are numbered LUN 0 to LUN 7.

8   Repeat this procedure for all LUNs and hosts you want to map, using the Add Host button to enter a new WWPN for that host.

9   You can make other adjustments in LUN masking with the buttons below the list of LUNs on the right. These adjustments include:
    • All On:  maps all LUNs to the selected host
    • All Off:  maps no LUNs to the selected host
    • Copy:  copies LUN map settings for the selected host
    • Paste:  applies the previously copied LUN map settings to the selected host

10  Click OK.

The LUN masking takes effect when the Xserve RAID system restarts.

## Verifying or Rebuilding Parity for an Array

You can verify the integrity of an array that uses parity (RAID 3 or 5) on an Xserve RAID system. If necessary, you can also rebuild the parity data for an array.

*Note:* Verifying or rebuilding parity on an array does not affect the file system or the data on the array. These procedures make sure the array's data is protected and verify the integrity of the RAID set.

When you verify or rebuild parity for an array, the operation takes several hours and the results are reported in the list of events (in the Events pane of the RAID Admin window).

**To verify or rebuild parity for a RAID array:**

1  In the RAID Admin window, click Advanced.

2  If necessary, enter the management password and click OK.

3  Select Verify or Rebuild Parity and click Continue.

4  In the Verify or Rebuild window, select the array for which you want to verify or rebuild parity data.
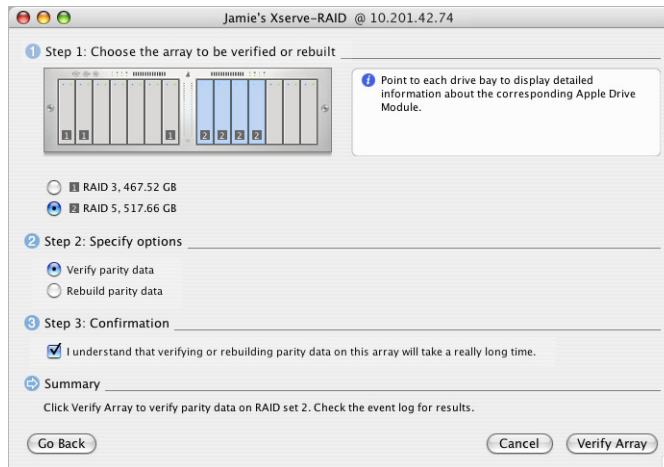


5  Select Verify or Rebuild.

The controller automatically selects available drives to add to the array.

6  Click the confirmation checkbox to confirm that you want to verify or rebuild.

7  Click Verify Array or Rebuild Array.

*Note:* The verification or rebuilding procedure takes a number of hours. You can continue to use the array during this procedure.

If verifying parity data detects a problem, the recommended procedure for repair is as follows:
• Perform an integrity check of the file system in the Finder.
• Verify data on the volumes.
• Use the rebuild function to rebuild the array's parity data.

Rebuilding parity on an array does not repair any problems with the data on the array. Rather, the data that is present on the array is used to create new parity data.