Power Matters.™

Getting Started with your RAID Adapter, Part 2

University Training Module

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Introduction

In Part 1 of this training module, you learned how to physically install a RAID adapter and ZMCP module.

At the completion of this module, you should be able to:

- Describe the set-up steps to follow once a RAID adapter has been physically installed in your server.
- Explain how a hot spare adds a layer of protection to your RAID arrays.
- Understand the difference between a 'local' system and a 'remote' system on Adaptec maxView Storage Manager (MSM).
- Understand the two different configuration methods for building a logical drive in MSM.
- Explain why regular maintenance and monitoring of your storage space are important, and how to use MSM to help you do both.

In Part 2, you'll learn how to get your new server up and running so that your data and physically devices are safe and protected, and you've used your available storage capacity as efficiently as possible.

Planning Your Data Structure

Before continuing, you need to consider how you eventually want your data to be structured on the drives (in a 8-drive RAID 5 array, for example), and plan ahead for that structure.

How many arrays will you require? How many drives will you be using in each array, and how much storage capacity will each array comprise? Where will you install your operating system? (Remember that Windows® operating systems won't install on drives larger than 2 TB.)

Adaptec recommends using one of these two structures to avoid issues with operating system installation and maximize usable storage capacity:

- Use Hybrid RAID to create a mirror (RAID 1) on which to install your operating system, then build one or more arrays from the remaining disk drive space using whichever RAID level meets your requirements.
- Create a small partition across all drives on which to install your operating system, then build one or more arrays from the remaining disk drive space using whichever RAID level meets your requirements.

In the next two sections, you'll read examples of how these two solutions could be used to structure stored data on a large-capacity 8-bay server.

Example 1: The Hybrid RAID Solution

In this example, Hybrid RAID is used to make the maximum use of space while still gaining a fast-booting server.

> **Note:** You can read more about Hybrid RAID in the Adaptec University Training Module, *Hybrid RAID: An Introduction*. You can also refer to the Hybrid RAID white paper on the Microsemi Web site at www.microsemi.com.

The plan is to create a mirror (RAID 1 array, marked in red in the figure below) where the operating system will be installed, and a RAID 5 array (marked in blue) where the data will be stored, as shown in the next figure.

RAID 1

100GB
SSD

2TB HDD 2TB HDD 2TB HDD 2TB HDD 2TB HDD 2TB HDD 2TB HDD
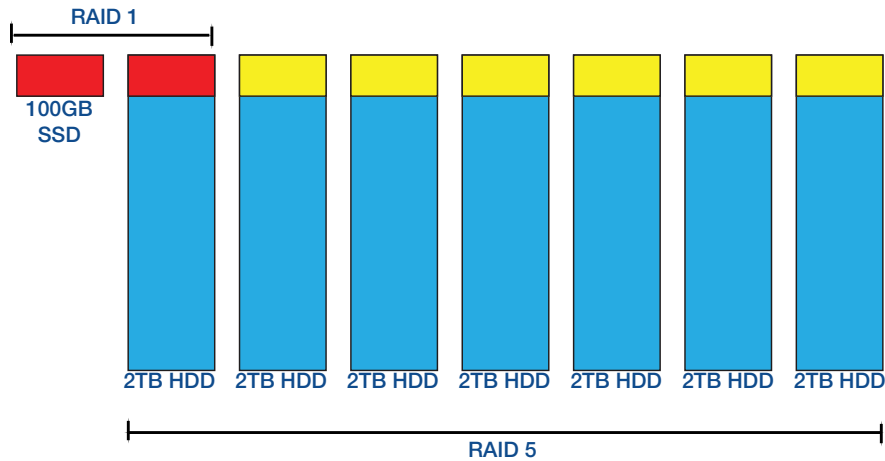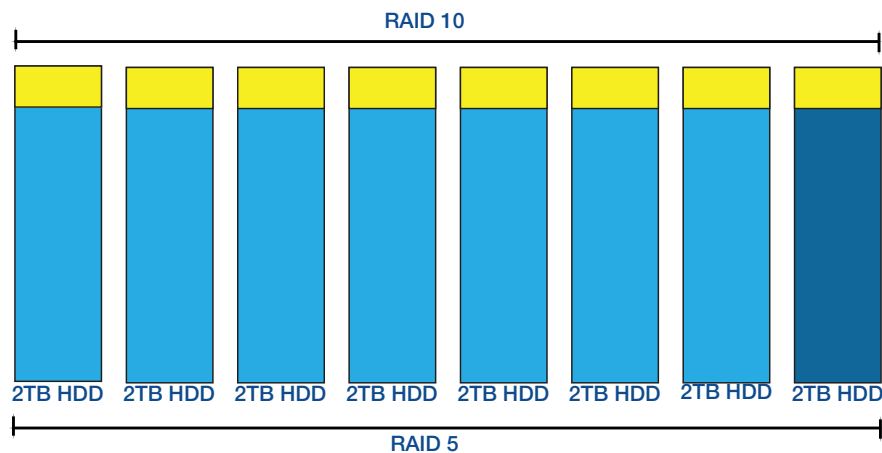
RAID 5

By using this particular Hybrid RAID solution, several benefits are realized:

1. Total server capacity is six times the usable capacity of each drive in the RAID 5 array.

2. The server will boot quickly as it is reading from an SSD during the boot process.

3. The unused disk space on each disk can be utilized in another array, if required.

4. A 500GB RAID 5 disk could be created across the six unused disk segments, if required.

Example 2: The Multiple Array Solution

In this example, a large-capacity 8-bay server is set up to make the maximum use of drive space while ensuring that the operating system will successfully install, with optimum performance.

The plan is to create a 100 GB RAID 10 array (marked in yellow in the figure below) that encompasses all eight drives, then create a RAID 5 array (marked in blue) using the remaining space from each drive. Using eight 2 TB drives, this will provide a data volume of approximately 13.5 TB of usable storage space (marked in light blue).

RAID 10

2TB HDD 2TB HDD 2TB HDD 2TB HDD 2TB HDD 2TB HDD 2TB HDD 2TB HDD

RAID 5

By using this solution, three benefits are realized:

1. The operating system runs on a RAID 10 array, which is recognized as the fastest redundant array without sacrificing very much drive space.

2. The data sits on a RAID 5 array, making the most use of the available storage space, minimizing the cost per GB of the server.

3. Each array suits the data types that are stored on them.

Step 1: Initializing Drives and Creating a Bootable Array

Now that you know how your data will be structured, you can initialize your drives and create your first RAID array (for your operating system). Because this is the first array on the RAID adapter, it is automatically made bootable by the adapter.

To do these tasks, use the Array Configuration Utility (ACU), which features BIOS-based menus and keyboard navigation.

1. Start the ACU by pressing **CTRL+A** when prompted.

2. Access the Array Configuration menu and initialize your drives. This only takes seconds but makes sure there is no old RAID information left on the drives to confuse your new build.

3. Use the initialized drives to create your first RAID array (for the operating system).

   Note: We recommend that you do not combine SAS and SATA drives within the same array. In fact, Adaptec maxView Storage Manager (MSM) displays a warning if you try to create a logical drive—the MSM term for an array—using a combination of SAS and SATA drives.

It may be necessary to set the boot order in your motherboard BIOS to allow the system to boot from the RAID array.

For detailed instructions on using the ACU, refer to the *Adaptec RAID Controller Installation and User's Guide*.

Step 2: Adding a Hot Spare (Optional)

You can also use the ACU to assign a hot spare to the RAID array (or arrays, if you've built more than one with the ACU).

A hot spare is a spare drive that automatically kicks in and rebuilds an array when a drive in that array fails. (The failed drive is replaced with the hot spare.) Such automatic replacement of a failed drive reduces the time that the system is vulnerable to a second drive failure, which would have catastrophic consequences.

When the failed drive is removed and replaced with a new drive, that new replacement drive should be designated as the hot spare.

   Note: In Adaptec maxView Storage Manager, an old hot spare drive (having been consumed into the array) will still be marked with a special hot spare icon that shows that the drive was previously a hot spare. You can right-click on that drive and select **Delete Hot Spare** to remove the icon.

For detailed instructions on creating a hot spare, refer to the *Adaptec RAID Controller Installation and User's Guide*.

Step 3: Installing the Driver and an Operating System

Once the bootable array is created, you can install your operating system.

1. Start by creating a driver disk.

   If you are installing an operating system such as Windows Vista, Windows Server 2008, or Windows 7, you don't need a separate driver disk; the driver is loaded from the Adaptec Installation DVD.

   Instructions for creating a driver disk are included in the *Adaptec RAID Controller Installation and User's Guide*.

   Note: Although some operating systems have built-in drivers, it's important to always use the most up-to-date driver available for your RAID adapter.
   Go to the Microsemi Web site at www.microsemi.com to find the latest RAID adapter drivers available for your operating system.

2. Install the operating system and the driver, following the instructions included in the *Adaptec RAID Controller Installation and User's Guide*, available on the Microsemi Web site at www.microsemi.com.

Step 4: Installing Adaptec maxView Storage Manager

After your operating system is installed, your next step is to install Adaptec maxView Storage Manager (MSM). MSM is a full-featured software application with a graphical user interface (GUI) that helps you manage your Adaptec RAID adapters, host bus adapters, drives, and data storage.

You can use MSM to create, modify, and monitor the direct-attached storage that you've built in your server. Additionally, if your storage space comprises multiple servers on a network, you can use MSM to manage all of them remotely from a single workstation.

Make sure the systems on which you're installing MSM meet all the basic requirements, which are listed in the *Adaptec maxView Storage Manager User's Guide*, available on the Microsemi Web site at www.microsemi.com.

Installation instructions for most operating systems are included in the *Adaptec maxView Storage Manager User's Guide*.

What's the difference between MSM and the MSM Agent?

MSM is the full software application. When you install MSM, the MSM Agent is also installed.

The MSM Agent is a service that's designed to run in the background, without user intervention, and its job is to monitor and manage system health, event notifications, task schedules, and other on-going processes on that system. It sends notices when tasks are completed successfully, and sounds an alarm when errors or failures occur on that system.

Where should I install MSM?

You must install MSM on every server built on an Adaptec RAID adapter or host bus adapter if you plan to manage those servers locally or remotely with the MSM GUI.

You can manage an individual server:

- Locally, by opening the MSM GUI on that server.
- Remotely, by 'adding' the server to the MSM GUI that's running on another server in your storage space. (You'll read more about adding servers to the GUI in the next section.)

You can manage all your servers:

- From a single management station on your network. (To create a management station, you open the MSM GUI locally on one server and add all your other servers to that GUI.)
- From a single management station that you access remotely from a laptop or workstation on your network or over the Internet.
- Individually, by running the MSM GUI on each one.

The steps described remainder of this module assume that the new server you've built is a single management station on your network.

Step 5: Logging into MSM and Adding Remote Systems

When MSM is installed on your server, open MSM and create a management station. Follow these basic steps:

1. On your new server, start MSM, following the instructions for your operating system.

2. Log in using your OS user name and password.

    Note: Before continuing, use MSM to check to make sure the RAID adapter you have installed is running the latest firmware. If the firmware is out of date, update it using MSM. For complete instructions, refer to the *Adaptec maxView Storage Manager User's Guide*.

3. Log in to—or add—all the other servers in your storage space to the MSM GUI using the Add Managed System wizard.

    Note: MSM can support up to 16 adapters (RAID adapters and/or host bus adapters) in a single storage space.

You can now work with all your RAID or host bus adapters, physical drives, and logical drives as if they were part of the local system.

Complete instructions are provided in the *Adaptec maxView Storage Manager User's Guide*.

Step 6: Building a Logical Drive

Once you have successfully logged in to MSM and added any remote systems, you can begin to configure and manage your storage space.

The first step is to create one or more logical drives for your data.

> **Note:** In the Adaptec University Training Modules that discuss RAID technology and Adaptec Unified Serial RAID, the term 'array' is used to describe a group of disk drives (or drive segments) treated as a single unit. In MSM, however, arrays are referred to as logical drives.

MSM has a wizard to help you create (or configure) logical drives, and offers two configuration methods to choose from, depending on your needs:

- **Express configuration (basic)**—Automatically creates logical drives by grouping together same-sized physical drives, and assigns RAID levels based on the number of physical disk drives in the logical drive.

  Use the express method when you want to use all available disk drives in the most efficient manner.

- **Custom configuration (advanced)**—Helps you group disk drives, set RAID levels, determine logical drive size, and configure advanced settings manually.

  Use the custom method when you want to create specific logical drives with any or all available disk drives and SSDs (Solid State Drives).

  > **Note:** We recommend that you not combine SAS and SATA disk drives within the same logical drive. Adaptec maxView Storage Manager displays a warning if you try to create a logical drive using a combination of SAS and SATA disk drives.

Build the logical drives that you require, using the configuration method you prefer and following the instructions provided in the *Adaptec maxView Storage Manager User's Guide*.

> **Note:** We strongly recommend using the defaults when it comes to building arrays, including stripe size and cache settings.

Why Regular Maintenance and Monitoring Are Important

You have built a storage space using RAID adapters because you want your data to be safe, secure, and available when you need it. However, it's important to understand the limitations of RAID, not just its benefits, and to avoid becoming complacent with maintenance and backups.

RAID cannot protect data against virus attack, human error, data deletion, or natural or unnatural disaster. RAID cannot protect data beyond its advertised disk drive redundancy (for RAID-1, RAID-10, and RAID-5 one drive failure, for RAID-6 two drive failures, for example).

A RAID adapter can't protect you from data loss when an array is left in a degraded state and an additional drive fails.

RAID's ability to protect data also becomes increasingly difficult with the exponential increase in drive capacities and the increased use of less reliable drives.

You need to make basic maintenance a routine by following these RAID best practices:

- Perform all recommended driver, RAID adapter firmware, and Adaptec maxView Storage Manager software updates.
- Monitor Adaptec maxView Storage Manager event logs (discussed in *Step 7: Setting Up Notifications on page 6*).

- Run regular consistency checks on the system (discussed in *Step 8: Setting Up Automatic 'Verify with Fix' on page 6*).
- Immediately replace drives that have either failed completely, or are starting to show signs of failing (medium errors, S.M.A.R.T. errors, and so on).
- Perform regular backups.

For further reading on RAID best practices and why they're important, refer to the Adaptec Support Knowledgebase (ASK) article, Maintenance Best Practices for Adaptec RAID Solutions, available on the Microsemi Web site at www.microsemi.com.

Step 7: Setting Up Notifications

MSM provides many ways to monitor the status of your storage space, from an event log and status icons on the GUI to event notifications that are broadcast to some or all users.

Event notifications are key to protecting your data and keeping your storage space running well because they alert you to problems and allow you to solve them as quickly as possible. They're especially important if your storage space is not managed by a dedicated person, or if that particular system is off-site or not connected to a monitor.

Email notifications in particular can help you monitor activity on your entire storage space from any location, and are especially useful in storage spaces that include multiple systems running the MSM Agent only.

Your next step should be to configure MSM to broadcast notifications in your choice of format to help you monitor these activities on local and remote systems:

- Changes in the status of physical components, such as RAID adapters and drives
- Changes to storage components, such as the expansion of a logical drive or the creation of a hot spare
- Progress of scheduled tasks, such as logical drive verifications.

MSM can broadcast notifications in these formats:

- By email to specified recipients
- By SNMP trap to specific IP addresses
- By event alerts to all logged in MSM users

By setting up notifications, you can be sure that even if you're not monitoring your storage space directly through the GUI, you will be alerted immediately any problem is detected.

For more information, and to learn how to set up notifications, refer to the Monitoring Status and Activity chapter of the *Adaptec maxView Storage Manager User's Guide*.

Step 8: Setting Up Automatic 'Verify with Fix'

Verification is designed to proactively detect drive defects while the logical drive is online and redundant.

The verification process issues commands to each drive in the array to test all sectors. When a bad sector is found, the RAID adapter instructs the drive to reassign the bad sector, and then reconstructs the data using the other drives. The affected drive then writes data to the newly assigned good sector. These operations continue so that all sectors of each configured drive are checked, including hot spares.

When verification takes place automatically and regularly, bad drive sectors are remapped before data loss occurs.

Verify with Fix is one of two verification modes in MSM, and is used to perform single checks of logical drives. (The other mode is Background Consistency Check, which runs continuously.) We recommend using the MSM Task Manager to set up a recurring Verify with Fix task to run once a week. Make sure you set the task to run during periods of low drive activity or during system maintenance, as it is a data-level check and requires more adapter resources to read and compare data.

To learn how to set up Verify with Fix as a recurring task in MSM, refer to the Scheduling Recurring or Resource-intensive Jobs chapter of the *Adaptec maxView Storage Manager User's Guide*.

Conclusion

Following the steps in these 'Getting Started' modules will ensure that the server and storage space that you've built will run smoothly. By adding an extra layer of protection with regular Verify with Fix tasks, you'll ensure that your system is less likely to have problems. By configuring notifications, you'll be sure to know right away if any problems do occur, even if you're not monitoring your system 24 hours a day. Set-up is officially complete.

Learn more about managing your RAID adapter, drives, logical drives, and more by reading the Adaptec University Training Module, *Introduction to Adaptec maxView Storage Manager*.

For the most recent updates to our product line and for detailed information and specifications, please call, email or visit our website:

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