Agilent Modular Products
Connecting and Configuring JMR RAID to Work with the Agilent M9392A Vector Signal Analyzer System

White Paper

Abstract

This document describes the key steps to connect and configure a JMR RAID solution for use with the M9392A Vector Signal Analyzer. It assumes that the reader has a working Agilent M9392A system and has basic familiarity with computer administrative management tasks. It refers the user to other installation documents as applicable.

Introduction

The Agilent M9392A is a flexible microwave vector signal analyzer. In some measurement applications, it is necessary to capture long durations of gap-free data for post capture analysis. The M9392A has the capability to stream up to 100 MHz RF BW. This requires a high-data bandwidth connection to a high performance RAID device. The M9392A has been designed to work with a JMR Bluestore RAID storage solution. The JMR RAID uses a LSI MegaRAID SAS 9265-8i RAID controller. The following instructions provide general guidance on the steps necessary to connect the RAID, configure the computer, and if necessary configure the RAID to work with the M9392A.

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Instructions

It is recommended that you read through this entire procedure before beginning the system setup. This procedure is meant to augment the standard documentation provided by the computer vendor, JMR (the RAID vendor), and LSI (RAID controller vendor). More recent information may be found on the agilent.com website.

This document assumes that you have a working M9392A solution and you are now ready to connect the JMR RAID.

- **STEPS 1-6**   Essential steps for setup.
- **STEPS 7-12**   Describe how to manage virtual drives and check the BIOS should the computer have a problem detecting the RAID system.

Topics

1.
Agilent Supported JMR RAID Configurations

There are 4 supported JMR RAID configurations:

- **Agil-G4-8T**   Eight 1TB HDDs. Short stroked to 75% of the total capacity.
- **Agil-G4-16T**   Sixteen 1TB HDDs. Short stroked to 75% of the total capacity.
- **Agil-G4-32T**   Sixteen 2TB HDDs. Short stroked to 75% of the total capacity.
- **Agil-G4-0.4T**   Eight SLC SSDs.

The configurations will have a JMR RAID chassis and front panel, LXI MegaRaid 9265-8i controller already installed, rack mount rail kit, relevant number and type of disk drives, 2m x8 PCIe® cable, and dual port PCIe host adapter card.

These configurations will come preconfigured as RAID 0 with a single virtual drive. After installing the appropriate RAID driver onto the supported computer, as described below, the RAID should be ready for usage.

These configurations have been tested with the M9392A Vector Signal Analyzer to ensure they are capable of gapless, 100 MHz RF bandwidth data capture provided that the systems are operated in the appropriate temperature range. There are a few system related restrictions.

The operating range temperature for a HDD (Hard Disk Drive) is typically 5 °C to 55 °C. However, at low temperatures, the mechanical HDD mechanisms are not guaranteed by their manufacturers to maintain the highest write performance. Agilent testing has shown that the ambient temperature should be above 10 °C in order to meet the 100 MHz RF data transfer. SSDs (Solid State Disk) do not have this temperature range restriction.

The M9392A uses the computer memory as a temporary buffer when transferring captured data from the digitizer to the RAID. This rate of data transfer can be affected by processor loading from computer applications running simultaneously with the data transfer. This is a complex topic because there are many factors involved; therefore, it is recommended that during data capture no other computer intensive applications be running.

2.
Supported Computers and BIOS

Adding a RAID to your computer will affect the number of PCIe devices that need to be enumerated. A computer's BIOS will limit the maximum number of PCI devices that it can enumerate. Since a PXI system makes extensive use of the PCI and PCIe busses it is important to use the latest BIOS version which ensures that your computer will support the maximum possible devices. Please review the Test Computer List Technical Note available at **http://cp.literature.agilent.com/litweb/pdf/5990-7632EN.pdf**

This document identifies the tested computers and associated BIOS that are compatible with Agilent Technologies PXI and AXIe chassis.

It is recommended that for an M9392A streaming configuration that you use a DELL model T3500, T5500, T7500, or the Agilent M9036A Embedded Controller.

A laptop is not recommended for M9392A streaming applications. All laptops provide a single x1 Gen 1 PCIe data connection from the chassis to the computer. The maximum theoretical data rate of the x1 data connection is 250 MB/s—this is significantly less than what is needed to capture 100 MHz RF BW using the M9392A.

The M9036A embedded computer will not require a BIOS update as Agilent ships a solution already configured for the maximum number of supported PCIe devices.

3.
Updating the DELL BIOS

To update the BIOS, follow the directions associated with your computer.

The latest BIOS from Dell for Agilent supported computers are located on

//ftp.agilent.com/pub/mpusup/BIOS

Note: when updating the BIOS, the M9018A chassis and the RAID should not be connected to the computer.

Be sure to read the README files included on the ftp site.

The BIOS provided can be run within Windows to re-flash the NVRAM.

Figure 1. BIOS FTP directory


```
FTP directory /pub/mpusup/BIOS at ftp.agilent.com

To view this FTP site in Windows Explorer, click Page, and then click Open FTP Site in Windows Explorer.

Up to higher level directory

07/01/2010  12:00AM        Directory Dell
06/16/2010  12:00AM              498 README.txt
06/02/2010  12:00AM            2,396 READMEconnect.txt
```

4.
Connecting the JMR RAID to the M9018A PXIe Chassis

1. Install a M9021A Cable Interface module into the M9018A Chassis.

    • Follow the M9021A Gen 2, x8 PCIe Cable Interface Module installation instructions located under the Document Library tab at **www.agilent.com/find/M9021A**

    • Ensure that the module is configured in the Host mode.

    • Ensure that the module is installed in a x8 PXIe slot in the chassis.

2. Connect the JMR RAID to the M9021A using the supplied 2m x8 PCIe cable.

    • The PCIe connection is located on the back of the RAID.

3. Both the M9018A and JMR RAID need to be powered approximately 10 seconds before turning on the computer.

4. During the boot process, the computer should recognize the JMR RAID and should display messages indicating that the BIOS has identified a RAID.

5.
Installing the JMR RAID Software

This document does not provide a complete tutorial on how to use the LSI MegaRAID Storage Manager. Refer to the LSI documentation for complete instructions if necessary. The following instructions were written based on MegaRAID Storage Manager version 11.06.00-03.

The JMR RAID is a group of multiple independent physical drives that provide high data throughput. For the M9392A, the RAID drive group typically appears to the host computer as a single storage unit.

The supported JMR RAID configurations have all been preconfigured to support a single channel M9392A,streaming at a maximum rate of 500 MB/s (100 MHz RF BW) in a RAID 0 format. The M9392A computer needs to have the necessary software installed in order to support the RAID. In addition to the RAID software, the following instructions assume that the most recent M9392A software has been previously installed.

The RAID uses a single LSI MegaRAID SAS 9265-8i RAID controller. This controller is installed in slot 1 of the JMR Bluestore PCIe expander backplane. Internally, it is connected to the dual SAS expanders. This allows control of up to sixteen 3.5″ or 2.5″ disks. The MegaRAID SAS RAID controller provides reliable, high performance disk management.

The M9392A only supports Agilent specified RAID configurations. Even though the JMR RAID system can support a wide range of disk drives and configurations, Agilent will only support those disk drives and those configurations that are preconfigured by JMR for the M9392A system.

1. Both the LSI 9265-8i device driver and the MegaRAID Storage Manager Software need to be installed. They can be downloaded from the **www.isi.com** website. On the website, find the page for the MegaRAID SAS 9265-8i.

Both the MegaRAID device driver and storage manager are located under the "Support & Downloads" tab which is organized by Driver, Firmware, and Miscellaneous categories. The device driver is located under the Driver category and the storage manager software is located under the Miscellaneous category.

Figure 2. LSI 9265-8i product page

The 9265-8i Windows device driver version 5.1.112 or later should be installed. The ZIP file will contain device drivers for both the 32 and 64 bit versions of Windows 7 which are both supported by the M9392A options V05 and V10.

• Download the file to a system computer location that you will be able to easily find.

• Several different operating systems are supported. You will need to search the list for the Windows Unsigned version.

Figure 3. LSI 9265-8i device driver

- Extract the appropriate driver version for your operating system: Win7_64 for the 64-bit version or Win7_x86 for the 32-bit version. Extract the files to a location that you can easily find.

- Go to Windows Device Manager and right click on the RAID Controller and select "Update Driver Software."

- Using the Windows control panel Administrative Tools -> Computer Management, enter the Computer Management window. Device Manager will be one of the system tools.

- The RAID controllers will be located under the "Other Devices" entry.

Figure 4. Other devices

- If the drivers for the LSI MegaRAID SAS 9265-8i have already been installed you will see them under the "Storage controllers" entry.

- If you don't see any hardware in these locations, then the hardware is not working correctly.

- After selecting "Update Driver Software," in the dialog popup select "Browse my computer." Find/select the driver directory where you unzipped the driver files.

- Follow the installation instructions from LSI. Close when complete. The installation may require the computer to be rebooted.

- After installing the driver, the RAID controllers should be displayed under the "Storage controllers" entry.

2. The MegaRAID Storage Manager software is used to create storage configurations, to monitor storage devices, and to maintain storage configurations. Windows version 11.06.00-03 or later should be installed.

Figure 5. LSI MegaRAID storage manager

 The software requires at least 50 MB free space on the computer disk drive. Generally, this software will not be needed because the JMR systems come preconfigured. This software will only be used if the preconfigured state needs to be changed (e.g. change from RAID 0 to RAID 5).

- Download the ZIP file to a system computer location that you can easily find. You will need to perform two extractions to get the files out of the compressed ZIP file.

- After extracting the files, double click on the "setup.exe" file.

- Follow the instructions provided by LSI. You should be able to use all the default settings.

The JMR RAID solution will come preconfigured as a single RAID 0 virtual drive.

6.
Adding the JMR RAID to Windows

If this is the first time the RAID has been connected to the computer then the new virtual drive will probably need to be added to the Windows environment. Windows may attempt to use a previous volume identifier if the virtual drive is not different from a previous configuration.

1. Using the Windows control panel Administrative Tools -> Computer Management, enter the Computer Management window.

2. Left click on Disk Management. This will display all drives connected to the system. Note that the new virtual drive, in this case Disk 1 (this will vary depending on your computer), is not yet fully recognized by the operating system. If this is the first time this RAID has been connected to the system, Disk 1 may be identified as a Foreign disk. If it is not classified as Foreign, then you can skip the next few steps to import a foreign disk.

Figure 6. Dynamic, foreign drive
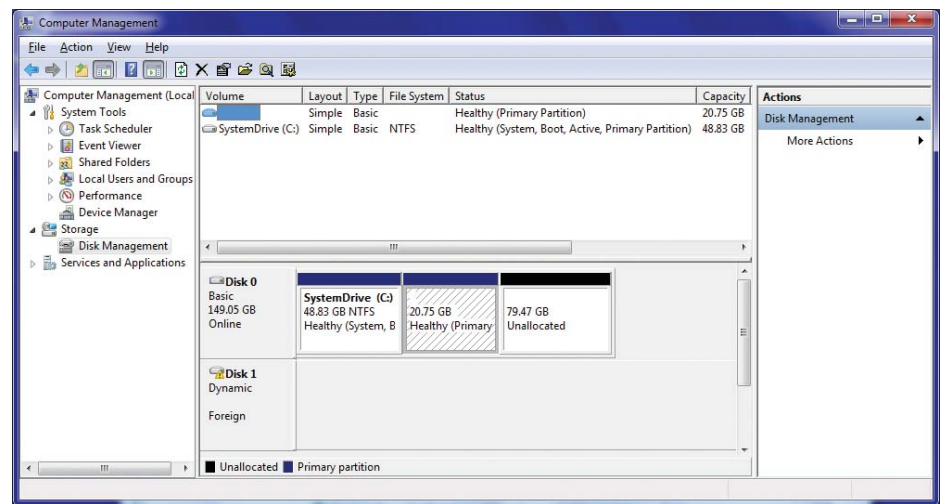
3. If it is a Foreign Disk then right click on the text "Disk 1." Select the "Import Foreign Disks" option.

Figure 7. Import foreign disks
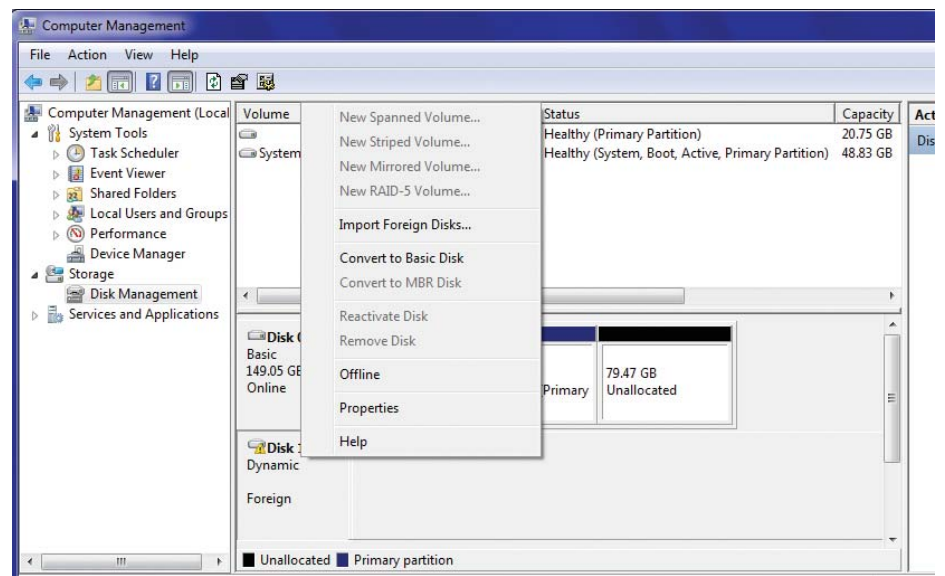
4. In the next two windows, press "OK" when asked.

Figure 8. Disk groups
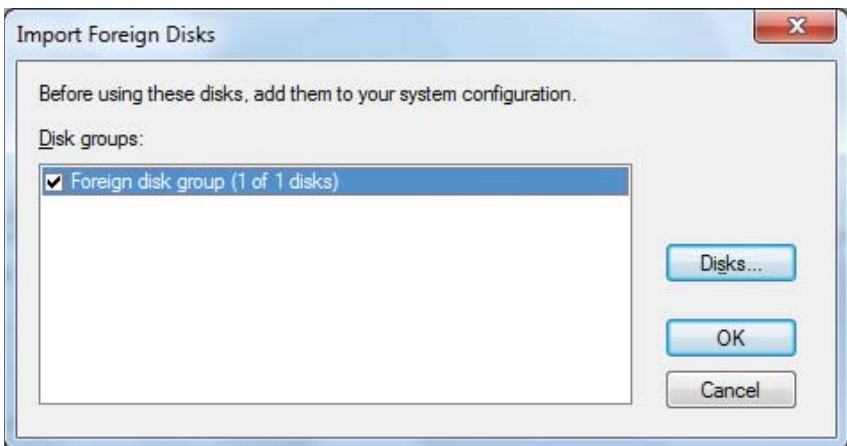
Figure 9. Disk volumes
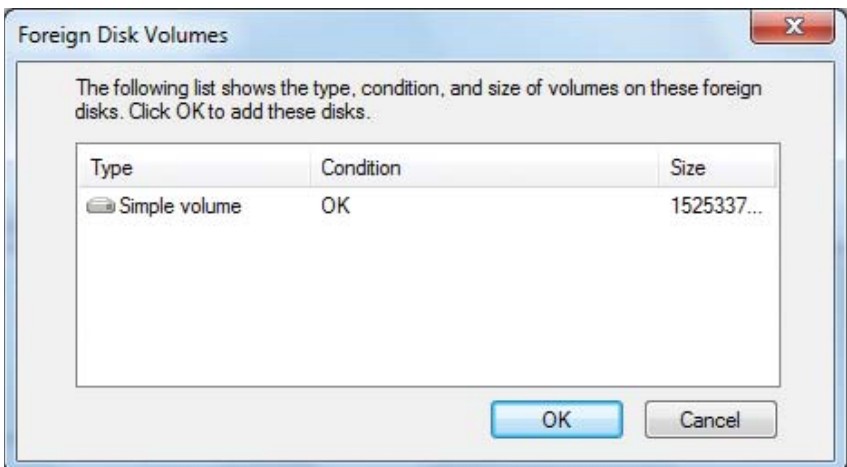
5. The Disk may be classified as "Basic" or "Dynamic." If "Dynamic" skip the next few steps. If "Basic" then you need to convert it to a "Dynamic" disk. Do this by right clicking on the "Disk 1" text.

    • Select the "Convert to Dynamic Disk..." option.

Figure 10. Convert basic to dynamic disk
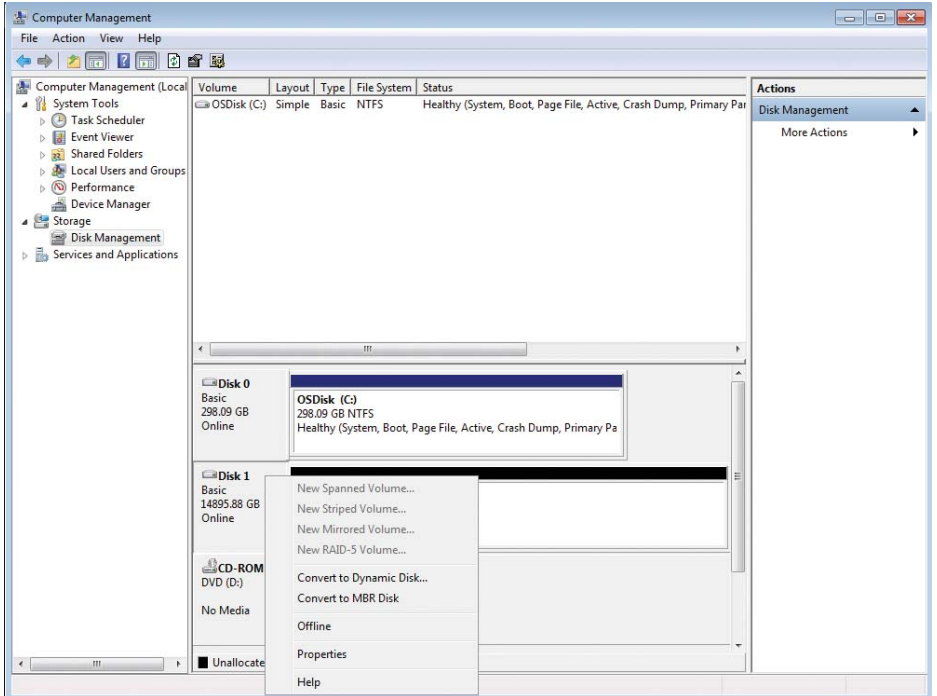
6. Ensure that the correct Disk is checked and then press "OK." This may take a few minutes to complete.

Figure 11. Select the RAID disk only
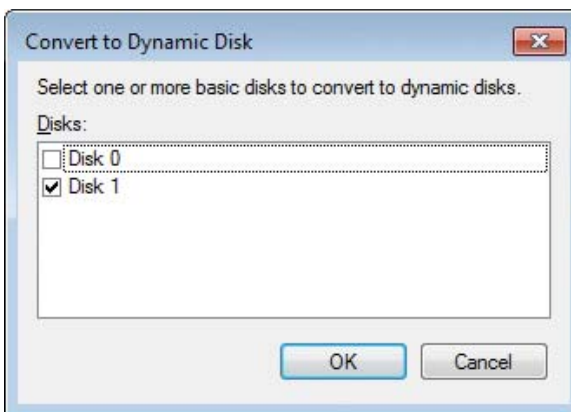
7. If the disk is automatically allocated as a new Volume and given a drive identifier (such as E:) then skip the steps for creating the volume. Otherwise, right click on the right part of the 'Disk 1' area (the Unallocated area shaded with diagonal lines) and select 'New Simple Volume...'.

Figure 12. Select new simple volume
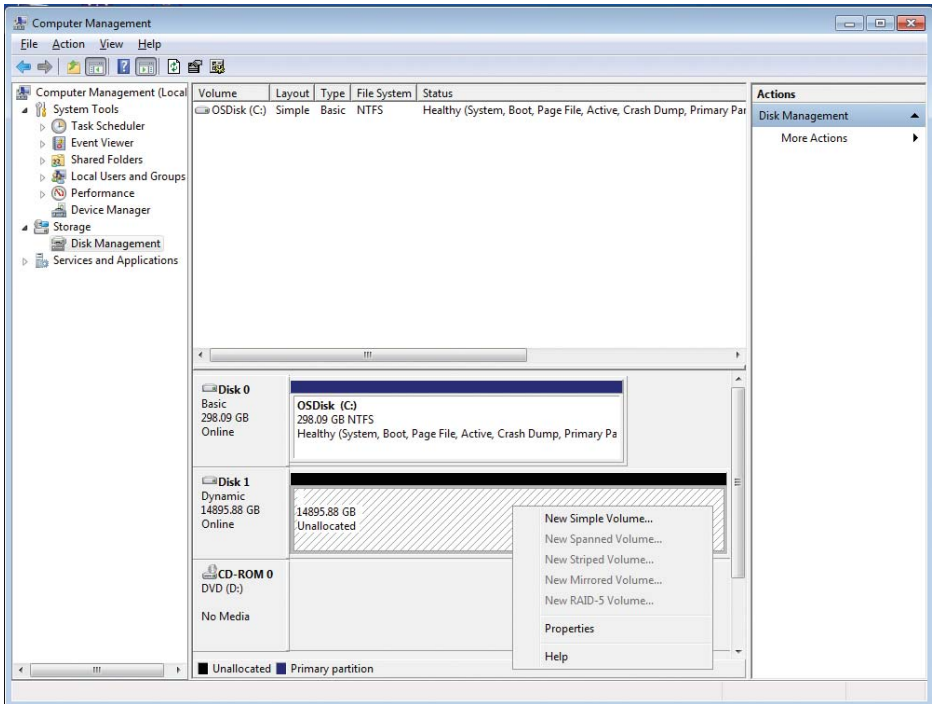
8. This wizard will walk through the various steps to create the volume in Windows. You can accept all the defaults but you may want to specify an appropriate volume label for the new drive. Press "Next."

Figure 13. New simple volume wizard
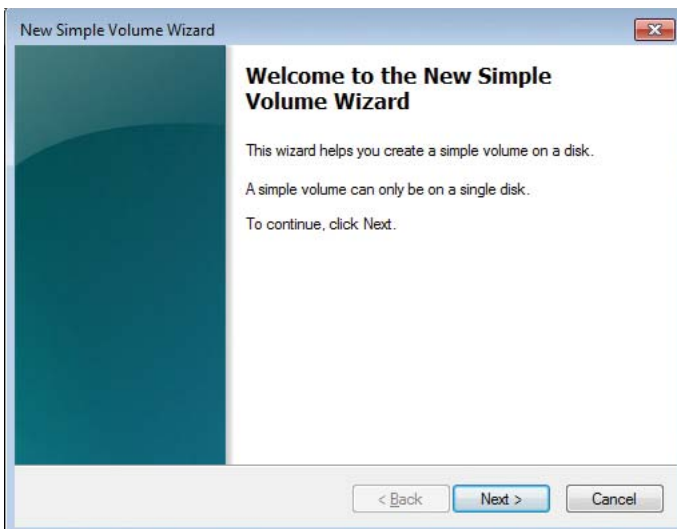
9. After finishing the wizard, the new volume has been added to the operating system and it should be visible in Windows Explorer. In this case, the new drive labeled E.

Once the drive is configured correctly within the operating system, the RAID should now be ready for use with the M9392A. This virtual drive should be visible using Windows Explorer. Unless you want to change the RAID configuration, which is not recommended, then you should be ready to use the RAID with the M9392A system.

Figure 14. New volume has been added to computer disks
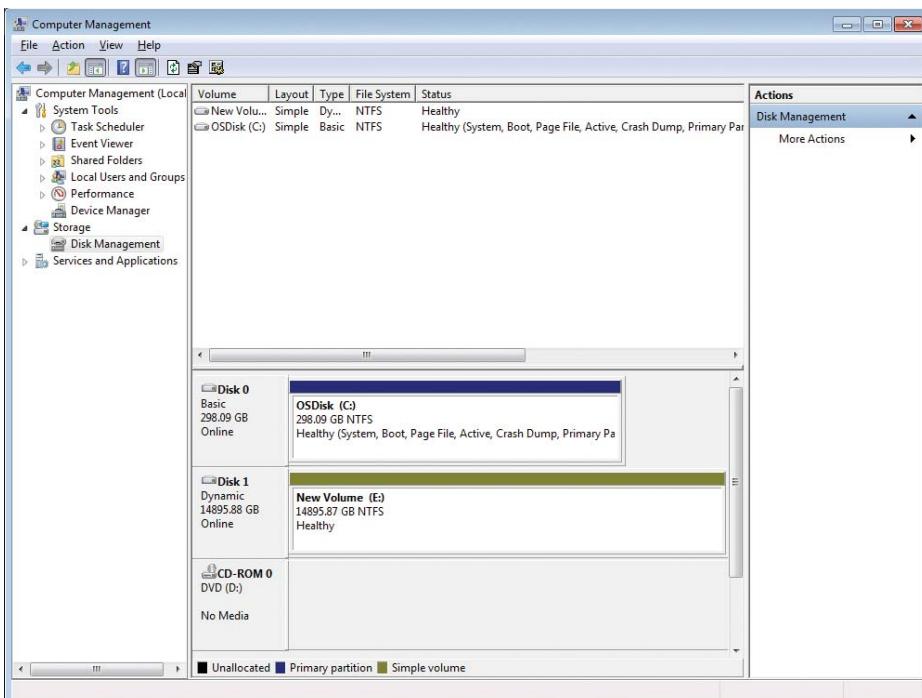
7.
MegaRAID Storage Manager Introduction

The MegaRAID Storage Manager will only need to be used if you reconfigure the RAID. Any changes to the preconfigured systems may affect the overall system performance and you should check with Agilent before reconfiguring the RAID. The tool would primarily be used to setup virtual drives. An example of when you might need a new virtual drive would be if you choose to remove the existing drives for archival purposes and then use new drives in the RAID.

This document is not meant to replace the LSI documentation. Please refer to that documentation for complete details of MegaRAID Storage Manager usage.

1. The first step is to start the MegaRAID Storage Manager.

• From the initial screen, you will select the Server that is hosting the RAID. This is the computer controlling the M9392A. Use the mouse to click on the Host name. There should only be a single server in the Host list.

Figure 15. MegaRAID computer selection window
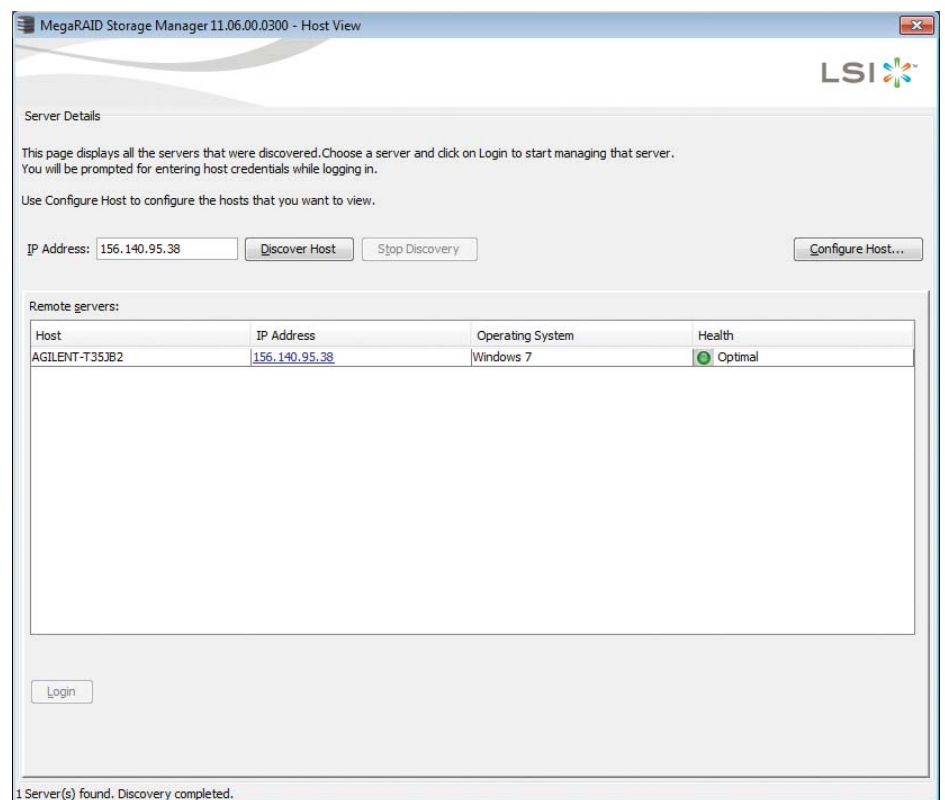
2. After selecting the Host name, notice that the Login button near the bottom of the pane is now active. Press the Login button. You will be prompted to enter your Windows user logon and password.

3. Once logged in, the next screen will show 3 different views: Dashboard, Physical, and Logical.

*   The "Dashboard" tab will show the LSI 9625-8i status. If you have one 9625-8i in the system then there will only be one shown. If there are two, then there will be two status bars. In this case, there are two LSI 9625-8i RAID controllers installed in the RAID. Only one status summary is shown at a time. The status shows details such as: number of physical drives, number of virtual drives, total capacity, etc.

Figure 17. MegaRAID main window: Dashboard

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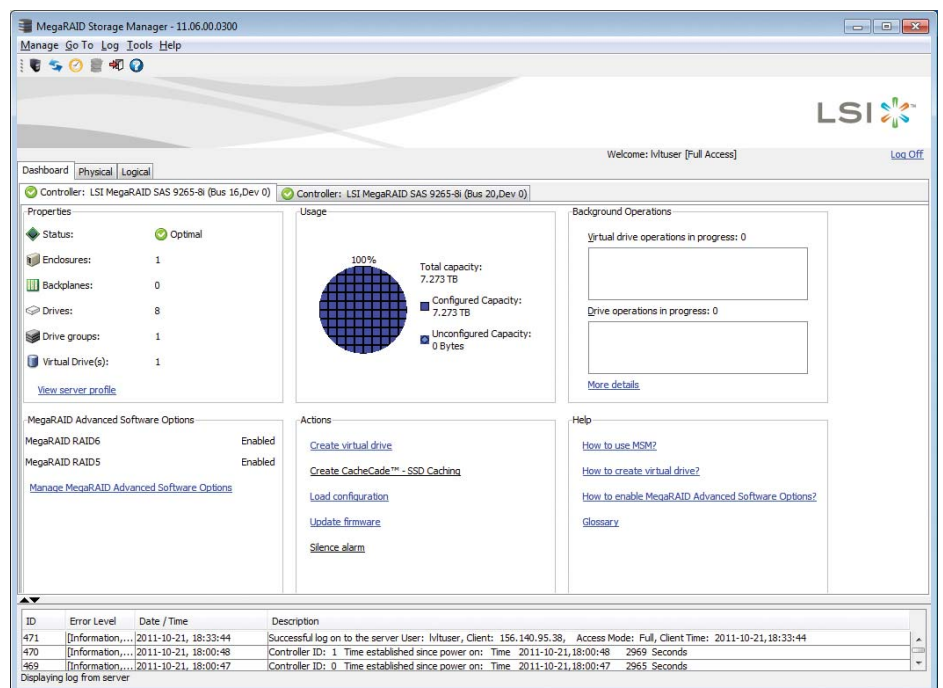
- The "Physical" display shows the hierarchy of physical devices in the system. The properties of the various drives that are attached to the ports can be displayed.

Figure 18. MegaRAID main window: Physical

- The "Logical" tab shows the hierarchy of the virtual drive groupings. In this case, there are two Virtual Drives. The selected drive shows the settings for the RAID level, IO and Cache Policies, Write Policy, Access Policy, and Power State Properties. These settings will be covered later.

Figure 19. MegaRAID main window: Logical

- If there are no virtual drives created, then the Logical tab of the main screen should show all the RAID controllers and the unconfigured disk drives that have not yet been assigned to a virtual drive as shown in the following figure. In this display, you can see that there are 16 drives in the RAID. In this example, each RAID controller has 8 drives connected to it. For a single channel M9392A system, then the RAID will come configured with a RAID 0 single virtual drive. You should not be required to change any settings.

Figure 20. Multiple RAID controllers: No virtual drives
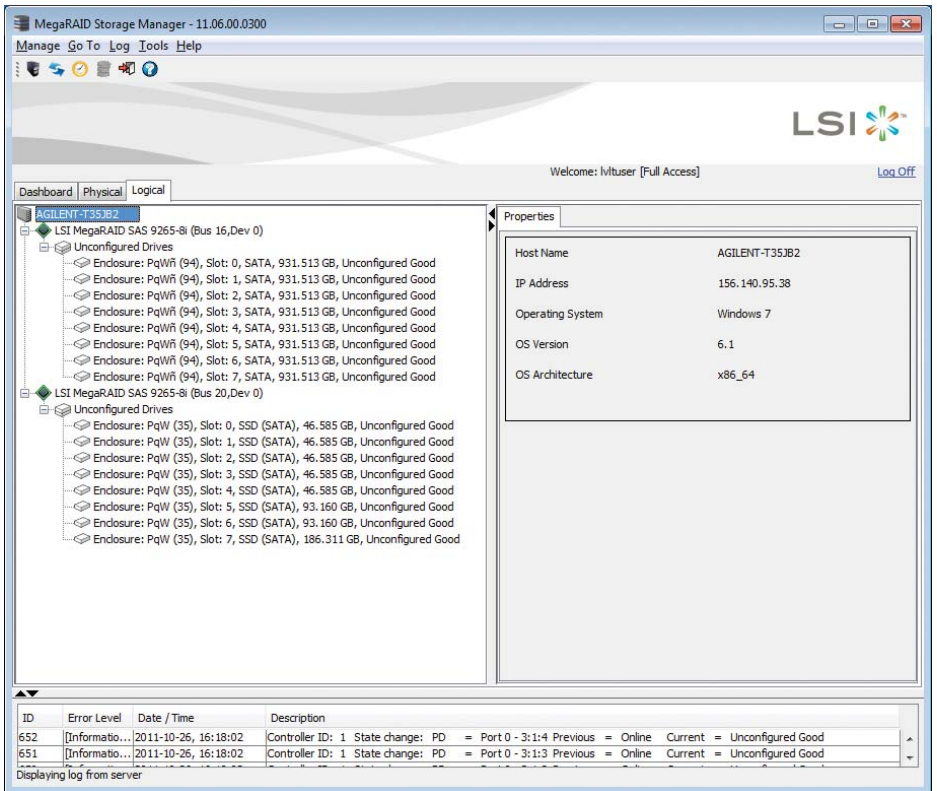
8.
Create a Virtual Drive on an 8-drive Configuration

The RAID comes configured with a single virtual drive. If you change the disc drives you may need to reconfigure the virtual drive.

1. In the window pane on the upper left side, right click on the "LSI MegaRAID SAS 9625-8i."

2. Select "Create Virtual Drive" from the pull down. This will start a wizard that will walk you through the process.

Figure 21. Create virtual drive
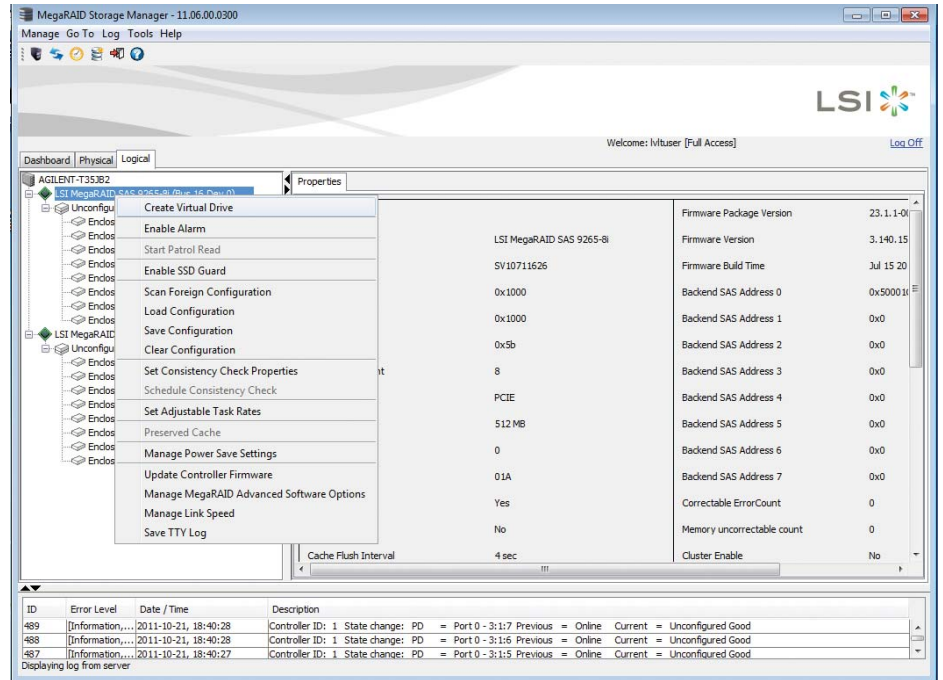
3. In the wizard, select the "Advanced" option and press "Next."

Figure 22. Create virtual drive mode

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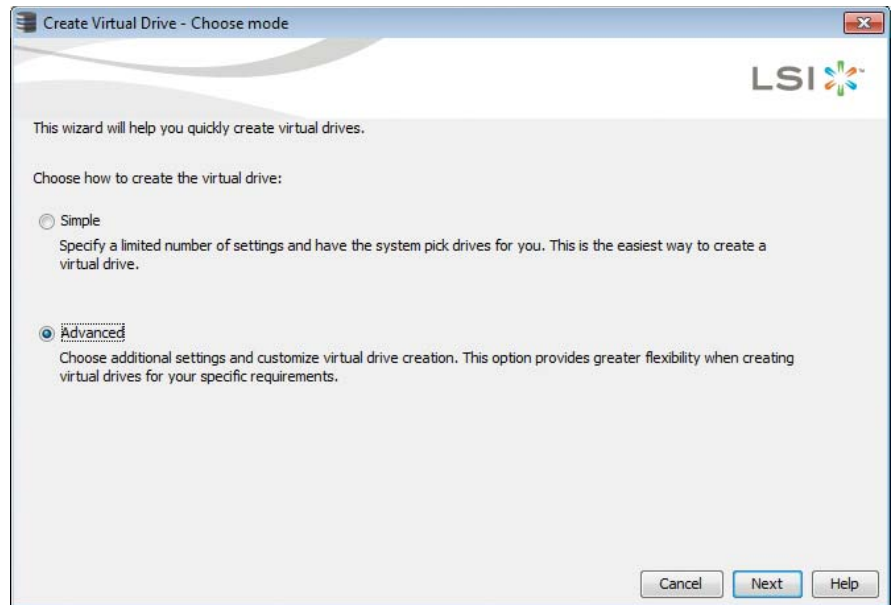
4. In the next window, you will specify the drive group settings.

Select the RAID Level from the pull down. Typically, this will be "RAID 0."

- Select the power save mode. This should be "none."
- Select all the unconfigured drives that are connected to the RAID controller. This can be done one drive at a time or you can select all the drives using standard Windows procedures (Shift+Click).
- Press the "Add" button to add the drives to the drive grouping.
- Press the "Create Drive Group" button.
- Press "Next."

Figure 23. Assign unconfigured drives
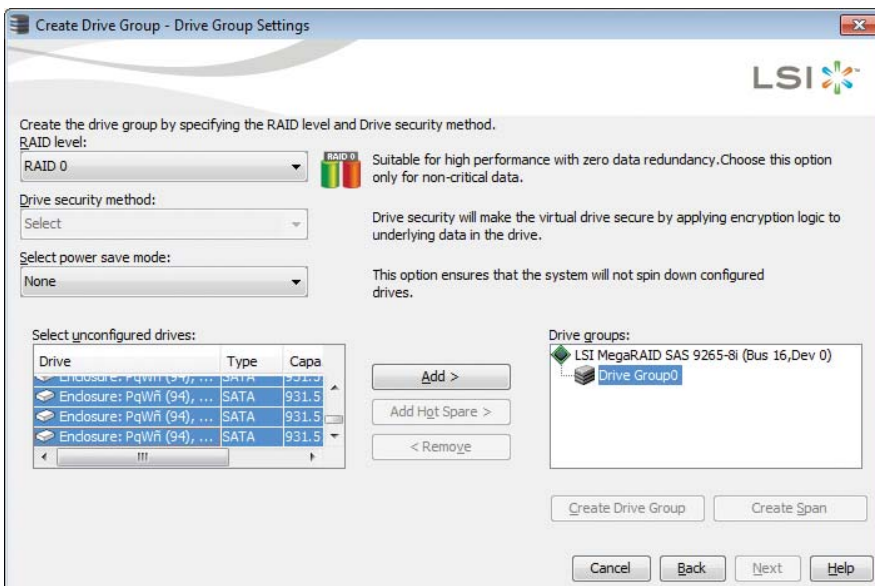
5. The next window will be the Virtual Drive settings. Select the settings as follows:

- Virtual drive name: Use default

- Capacity: By default this will be the total of all the drive capacity. For HDD, since we are short stroking the drives, change this number to a value of 75% of what is displayed as total capacity. For example: If you have a 16 TB capacity, you would enter 12 TB as the capacity value. For SDDs no short stroking is necessary nor is it recommended.

- Initialization state: No Initialization

- Strip size: 64 kB

- Read policy: No Read Ahead

- Write policy: Always Write Back

- I/O policy: Direct I/O

- Access policy: Read Write

- Disk cache policy: Enabled

Figure 24. Set group parameters
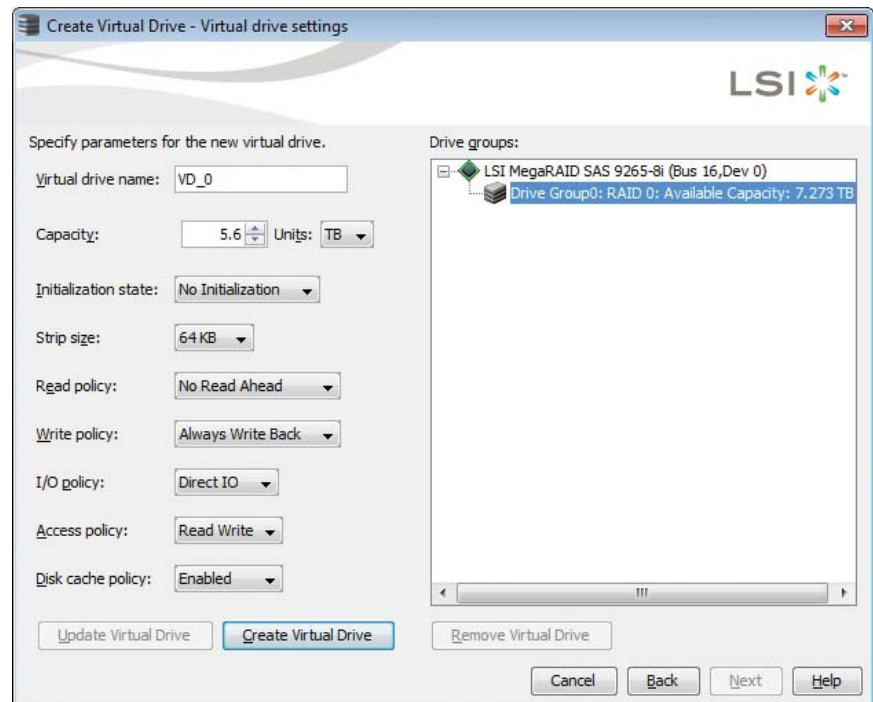
6. Press "Create Virtual Drive."

7. Answer "Yes" to question about "Always Write Back" mode.

Figure 25. Always write back
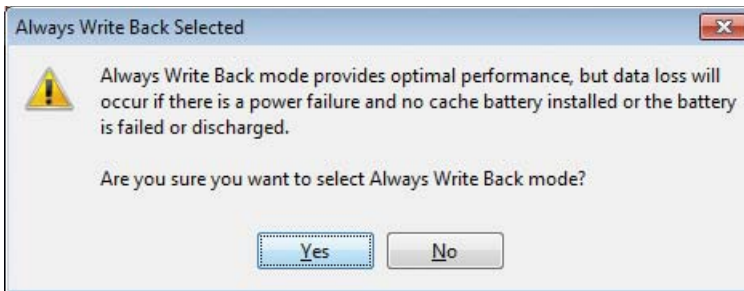
8. Press "Next." A summary of the virtual drive should be displayed at this point.

Figure 26. Virtual drive summary
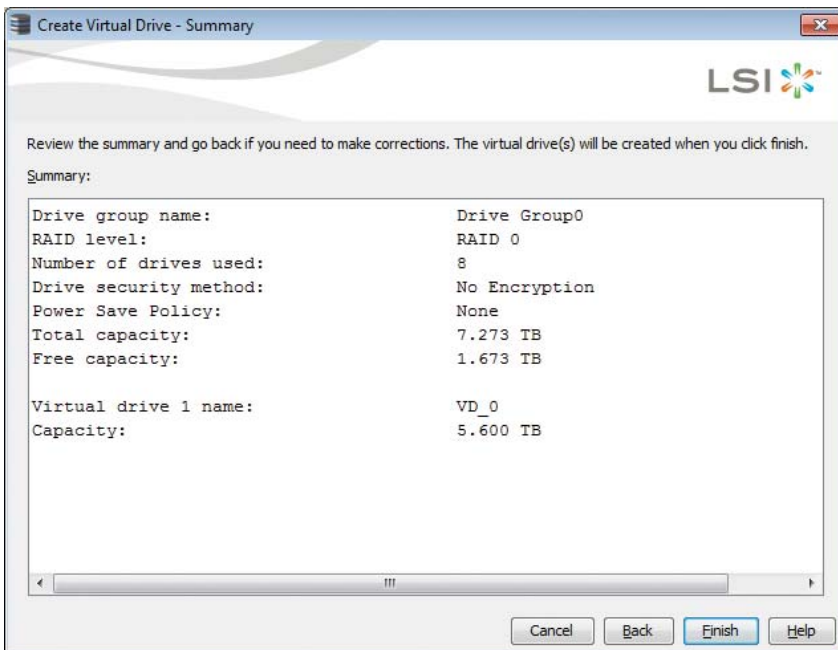
9. Press "Finish" and then "OK."

- It will then take a few seconds to create the virtual drive. The Logical display tab will show the properties that were defined in the previous steps.

Figure 27. Drive setup complete
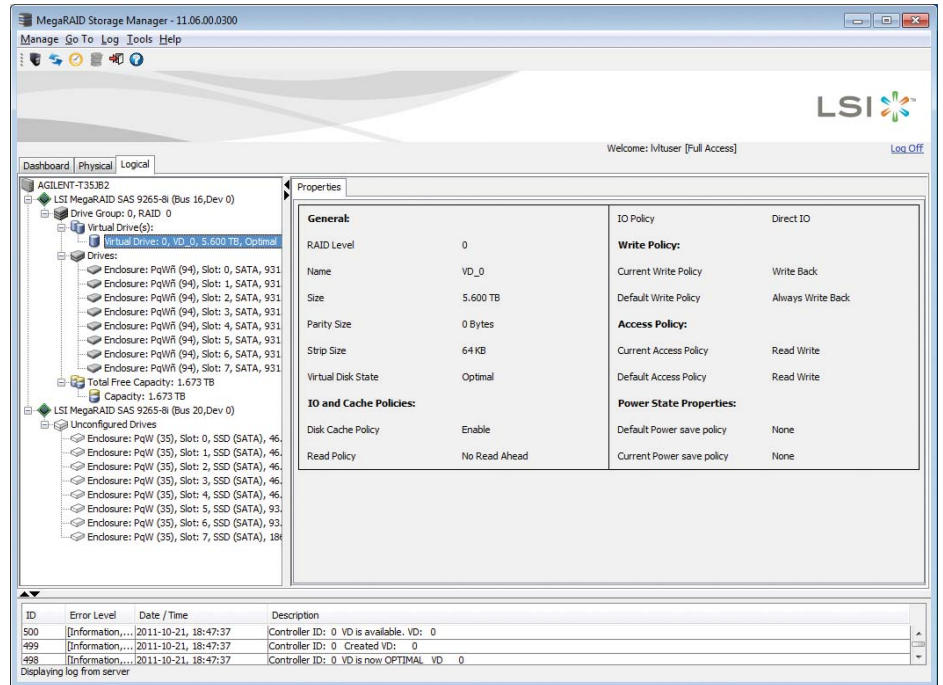
9.
Create a Virtual Drive on a 16-drive Configuration

The system will come configured with a single virtual drive using all 16 drives. It will be configured in two spans. If you change the disc drives you may need to reconfigured the virtual drive.

1. In the window pane on the upper left side, right click on the "LSI MegaRAID SAS 9625-8i."

2. Select "Create Virtual Drive" from the pull down. This will start a wizard that will walk you through the process.

Figure 28. Create virtual drive for 16-drive configuration
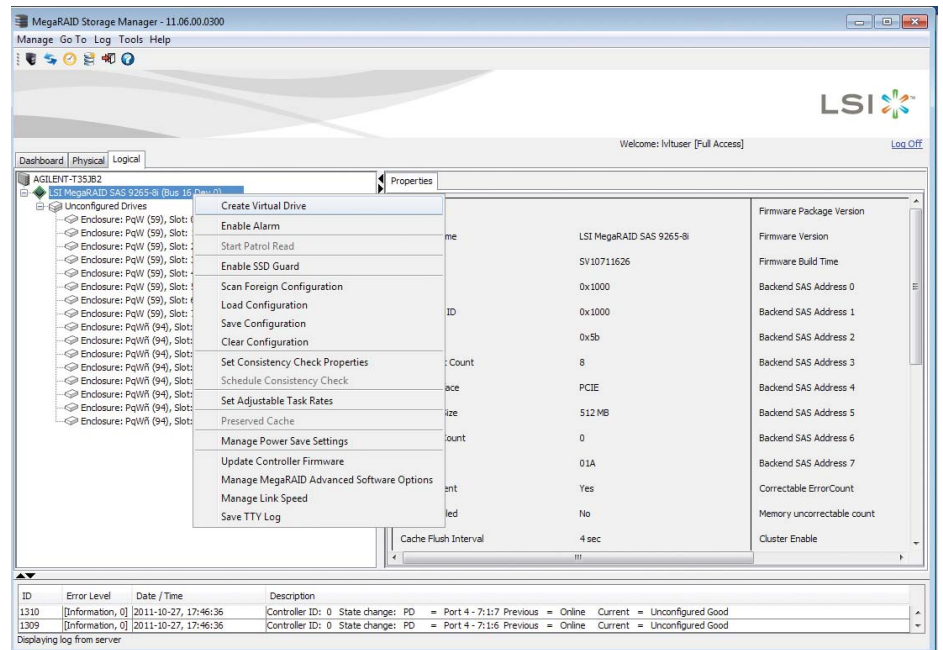
3. In the wizard, select the "Advanced" option and press "Next."

Figure 29. Create virtual drive mode
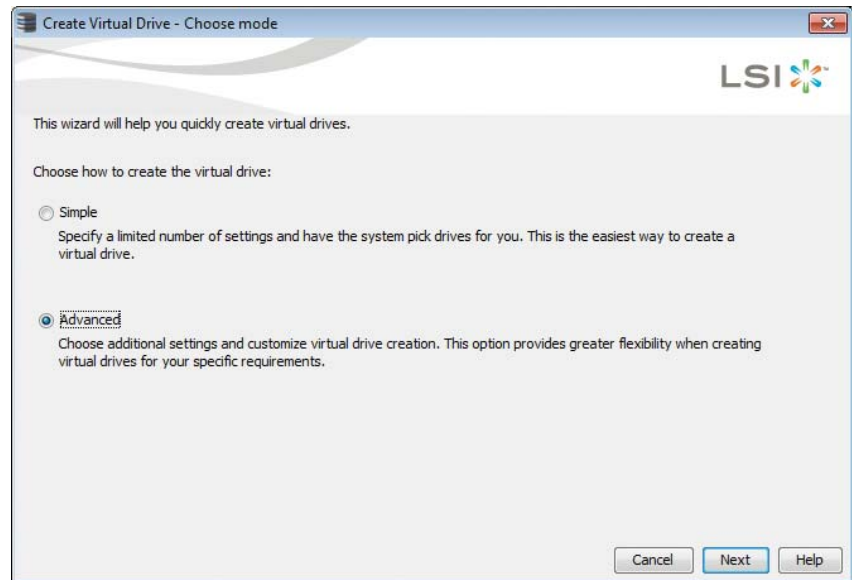
4. In the next window, you will specify define the drive group settings.

Select the RAID 00 – Spanned Drive Group from the pull down.

- Power save mode should be set to "none."
- Select the first 8 unconfigured drives.
- Press the "Add" button to add the drives to the drive grouping.
- Press the "Create Span."
- Select the second 8 unconfigured drives and Press "Add."
- Press "Create Drive Group" button.
- Press "Next."

Figure 30. 16-drive group settings
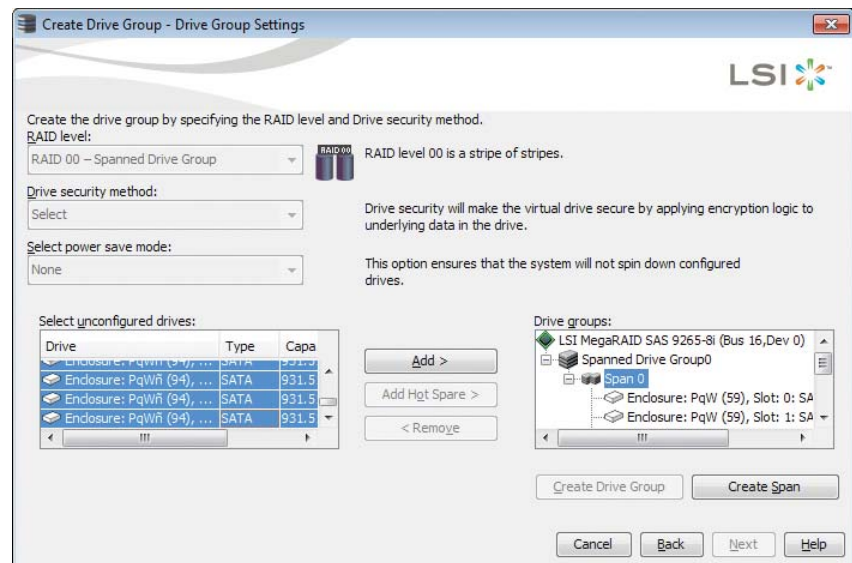
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5. The next window will be the Virtual Drive settings. Select the settings as follows:

- Virtual drive name: Use default

- Capacity: By default this will be the total of all the drive capacity. For HDD, since we are short stroking the drives, change this number to a value of 75% of what is displayed. For SDDs no short stroking is necessary.

- Initialization state: No Initialization

- Strip size: 64 kB

- Read policy: No Read Ahead

- Write policy: Always Write Back

- I/O policy: Direct I/O

- Access policy: Read Write

- Disk cache policy: Enabled

Figure 31. Virtual drive settings
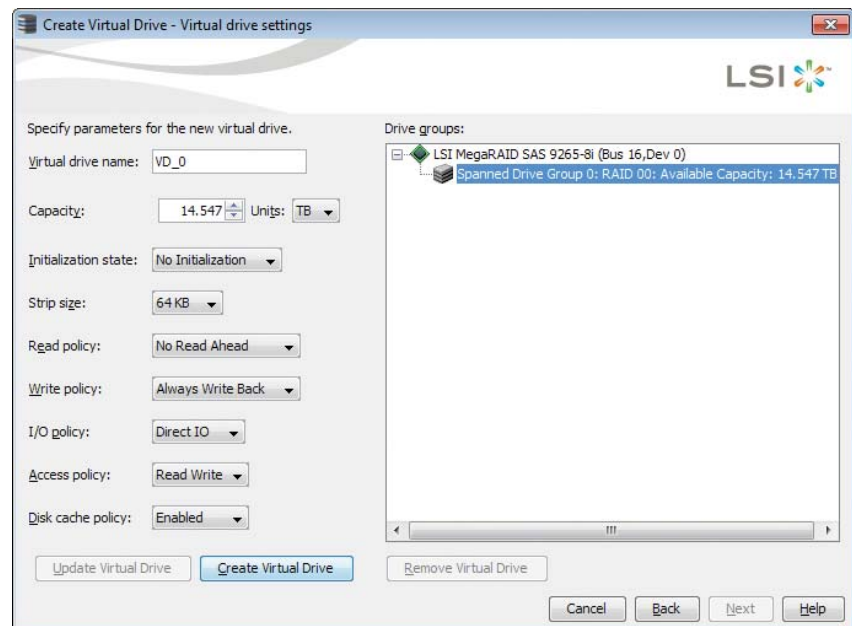
6. Press "Create Virtual Drive."

7. Answer "Yes" to question about "Always Write Back" mode.

8. Press "Next." A summary of the virtual drive should be displayed at this point.

Figure 32. 16-drive summary
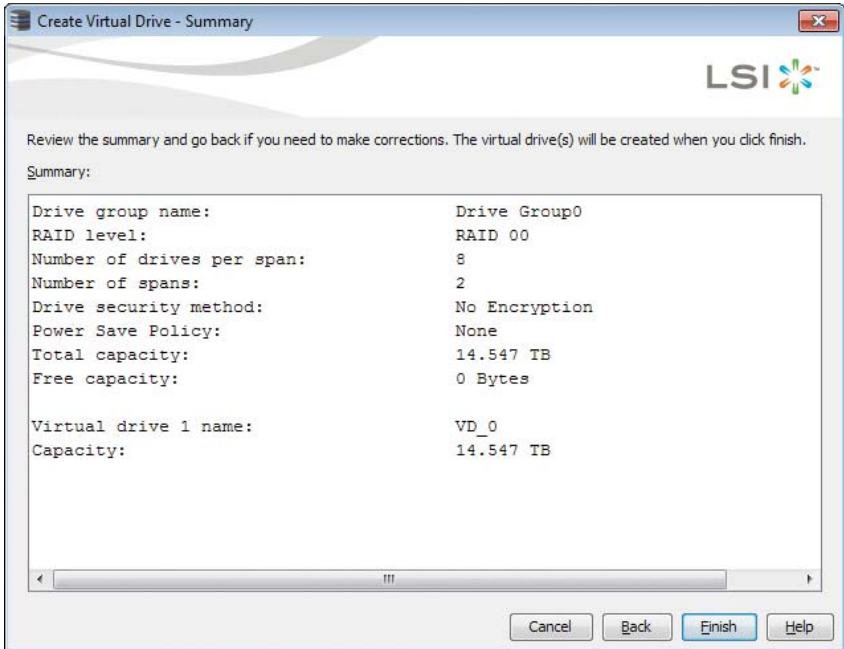

9. Press "Finish" and then "OK."

At this point, a virtual drive has been created. The Logical display tab will show the properties that were defined in the previous steps.

Figure 33. 16-drive summary in logical tab
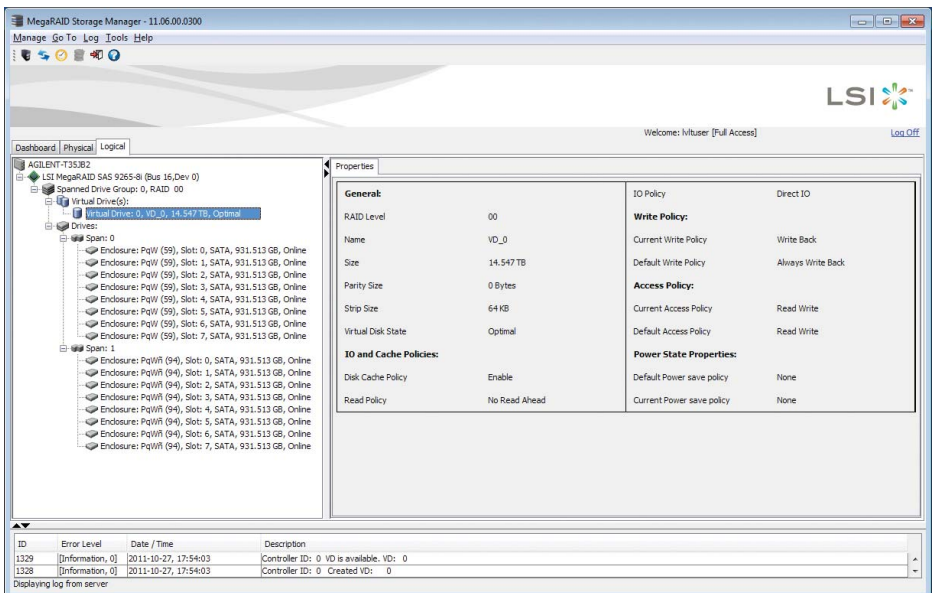
10.
Delete a Virtual Drive

1. To delete a virtual drive go to the "Logical" tab of the MegaRAID Storage Manager's main window.

- In the window pane on the upper left side, the software will display the LSI MegaRAID SAS 9625-8i and the virtual drives associated with that RAID controller.

2. Right click on the Virtual Drive. From the pull down, select "Delete Virtual Drive."

3. In the pop-up window you will need to confirm that you want to delete the drive.

- Select "Confirm" and Press "Yes."

Figure 34. Remove a virtual drive
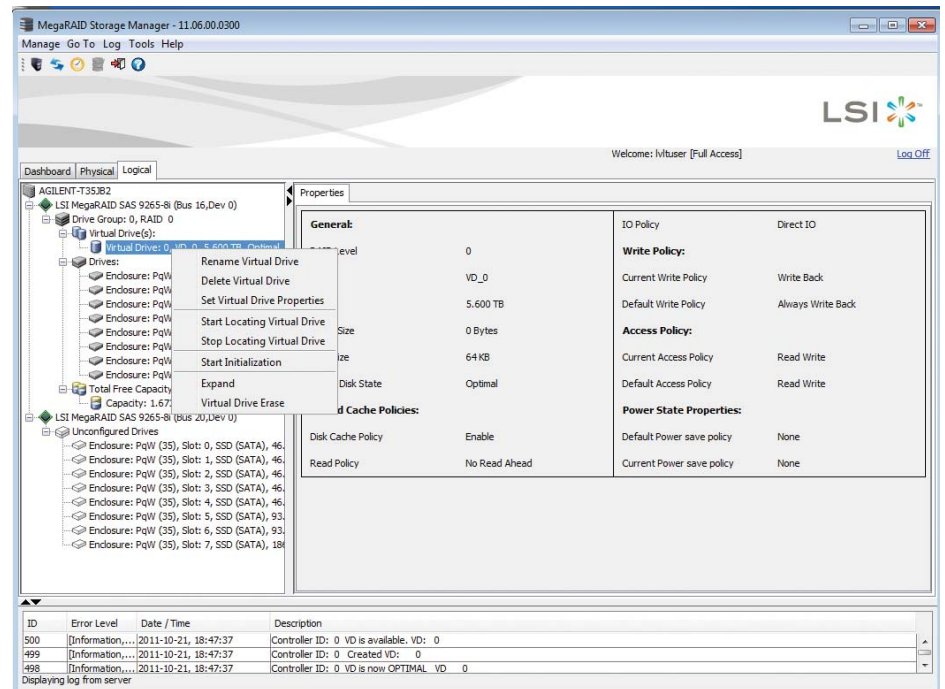
- The virtual drive is now deleted. The drives connected to the RAID are now listed as Unconfigured just like it was before the virtual drive was created.

11.
ID Settings

Several RAID settings are set from the "Logical" tab of the main window. With the "Logical" tab selected, right click on the LSI MegaRAID SAS device identifier to display a menu of options. The key items are: Alarms, SSD Guard, Manage Power Save Settings, and Update Controller Firmware.

Figure 35. Miscellaneous settings
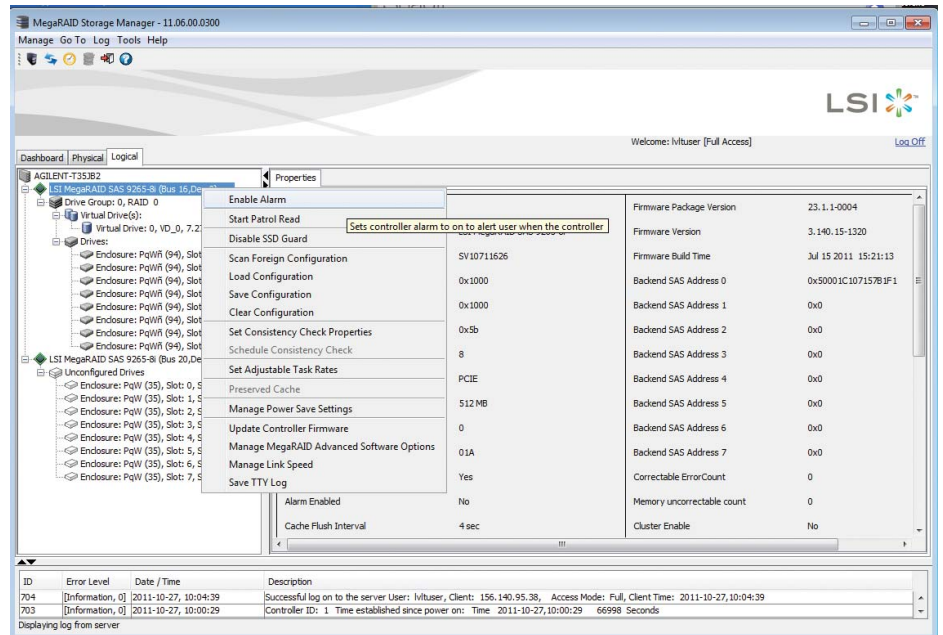
- Disable Alarms.
  Disable alarms. If the menu shows "Enable Alarm" then the alarms are currently disabled. This is a toggle option. It either states "Enable Alarm" or "Disable Alarm" In the picture above, the alarms have been disabled.

- Disable SSD Guard.
  The Disable SSD Guard is also a toggle option: Enable SSD Guard or Disable SSD Guard. In the figure above it shows that the SSD Guard is enabled. Left click on the text "Disable SSD Guard."

- Drive power savings on the LSI controllers should be off.
  These power settings are off by default. To confirm that they are off, left click on the Manage Power Save Settings from the menu shown in the figure above. The Manage Power Save Settings window shouldn't have any items set. This is the off condition.

Figure 36. Miscellaneous settings:
Power save OFF
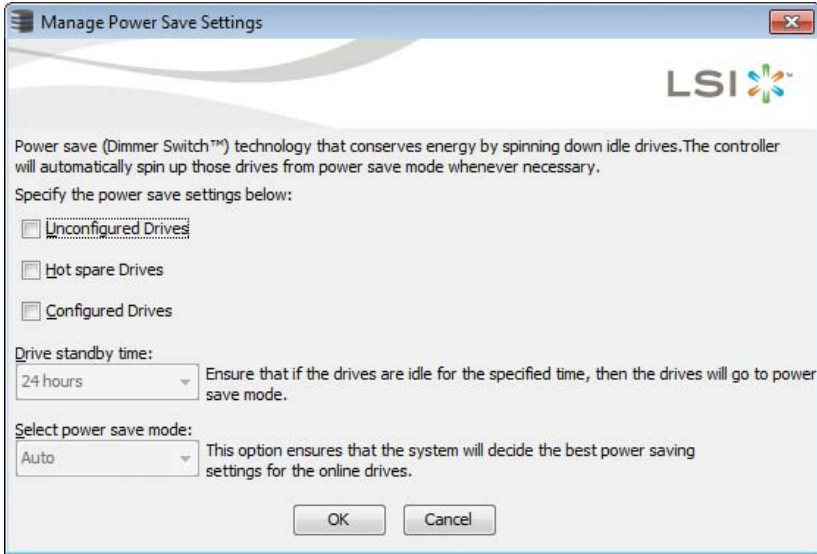
- Ensure that firmware revision 3.140 or later is installed.

The installed version of the FW can be checked by from the "Logical" tab on the main window.

Figure 37. Miscellaneous settings:
9265-8i firmware
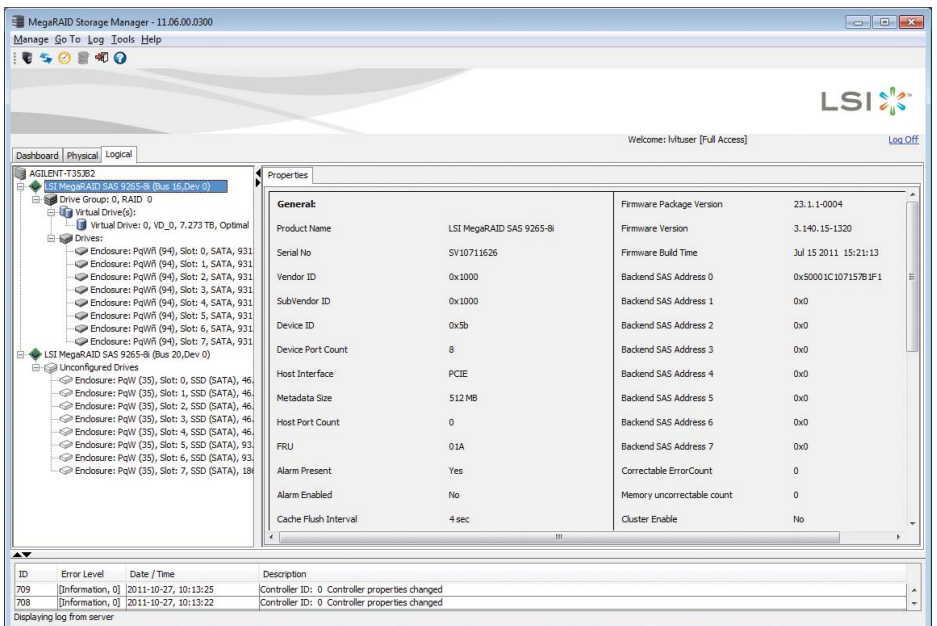
By default, an acceptable version should be shipped with the JMR RAID. If for some reason, an older version has been shipped, download the latest version from the LSI MegaRAID SAS 9265-8i website page to the computer's local drive into a location that you can easily find.

Install the new FW by clicking on "Update Controller Firmware" selection from the menu shown in the first figure of this section and following the directions.

• Don't use FastPath or CacheCade options.
   These are additional options that could be purchased from LSI. They do not come with the standard system. They should not be enabled.

12.
Checking BIOS Update

Once the BIOS has been updated, then for a supported DELL system you can check the BIOS version using the following procedure:

1. Reboot the computer. Press F2 repeatedly during the boot sequence to start the BIOS setup utility. If you press the F2 key too late in the boot process, then it is possible that the system will not recognize that you have pressed this key. If this is the case, then allow the operating system to completely startup. Then, shutdown the computer and try again.

2. Once in the BIOS setup utility, use the mouse to expand the "Settings-General" selection by pressing the "+" next to General. Select "General – System Board" option. From this screen, you can confirm the BIOS Version has been flashed to the NVRAM.

3. Select "General – Boot Sequence." Note the boot sequence that will be used to find the operating system. This sequence may change when the RAIDs are added to the system.

4. Press "Exit" to leave the setup utility. The system will reboot.

This procedure assumed that you have a working mouse. If the mouse does not work for some reason, the left arrow, right arrow, +/-, Enter, and Esc keys can be used to navigate the menu.

13.
Configuring the BIOS if there is a boot error

In most cases, the BIOS settings in the NVRAM will be compatible with the new BIOS and there will be no extra steps required. Any incompatibility may cause unpredictable computer behavior during the boot process. For example, if the boot order has been changed, you might get an error that states something like:

No boot device available –
      Strike F1 to retry boot, F2 for setup utility
      Press F5 to run onboard diagnostics.

This may have occurred because the BIOS have been reconfigured to point to the new RAID system and not to the internal hard drive that contains the operating system. The BIOS will need to be reconfigured to ensure proper boot order.

The following general directions will describe how to reconfigure the BIOS using the DELL setup utility. The actual state of the BIOS may differ from the description below depending on the specific computer configuration. You should write down the current BIOS setting for anything that you change for future reference just in case you need to undo any changes. You may choose to request someone from your IT department to assist with this configuration.

1. Connect the M9018A and RAID system as per the M9392A instructions. You will need to power up the M9018A chassis and the RAID system before turning on the computer. As the computer boots, it enumerates all PCIe devices and allocates the necessary system memory to support these devices. The devices need to be powered and stable before booting the computer. Typically, you will need to wait approximately 10 seconds before booting the computer. Otherwise it is possible that the computer will not see the PCIe devices correctly.

2. Reboot the computer after connecting the system hardware to the computer. You will need to go into the BIOS setup utility to configure the system. Press F2 repeatedly during the boot sequence in order to start this utility. While you are booting, you may see several messages indicating that the computer has discovered the RAID system.

3. In the BIOS setup utility, select the "Settings – General – Boot Sequence" option. This option allows you to determines the order of the devices the compute will search to find the operating system. This needs to be changed in order to point the computer back to the internal hard drive that contains the operating system. It is possible that the internal disk drive is no longer shown as part of the boot order. Do the following:

Press "Load Defaults."
Press "OK" when asked if it is okay to lose the current settings.

The window should now be displaying a message showing the default boot sequence that will be used. Don't Exit yet because there is still one more step before exiting the setup utility.

4. Expand the "Settings – Drives" option by pressing the "+" sign next to Drives. Select the "SATA Operation." The window will show three SATA Operations:

RAID Autodetect /AHCI
RAID Autodetect / ATA
RAID On

- By default, the RAID On operation is selected. You may need to select RAID Autodetect / AHCI.

- Press "Yes" when asked if you want to continue.

- Press "Apply" to save the information to the NVRAM.

- Press "Exit" to reboot.

- During the reboot, press F2 repeatedly to start the BIOS setup utility.

5. In the setup utility, select the "Settings – General – Boot Sequence" option. Note that the internal SATA hard drive will now be in the boot order sequence. However, the RAID is also in the boot order. Do the following:

Uncheck all items associated with a RAID adapter.

The window should now be displaying the default boot sequence which includes the internal hard drive and excludes the RAID. Typically the computer's internal SATA hard disk should be the second item in the default order.

- Press "Apply" to save the settings to the NVRAM.

- Press "Exit" to reboot.

- The system should now properly boot.

If the system doesn't boot properly then recheck the BIOS settings. The BIOS information is stored in non-volatile RAM (NVRAM). The recommended DELL computers ship with flashable BIOS. If you continue to have problems, then it is possible that you may need to clear the NVRAM after updating the BIOS. Depending on system type, NVRAM may be cleared using different procedures. For example, the T3500 uses a set of jumpers on the motherboard. Follow the directions found on the Dell website for your computer model.

14.
Glossary

HDD   Hard Disk Drive.

SSD   Solid State Drive.

SLC   Single Level Cell flash memory. There are two general SSD versions: Multi-Level cell (MLC) and Single Level cell (SLC). MLC flash is lower cost, but it is generally slower and less reliable that SLC.

Short Stroking   Short stroking is a method to format a drive so that only the outer sectors of a HDD are used. This is done to increase the read/write performance by limiting the maximum distance the heads need to travel.

RAID   Redundant Array of Independent Disks. Often a RAID is used to increase reliability of data storage. A RAID can also be used for increasing read/write performance by taking advantage of the read/write capabilities of the individual disks that make up the RAID. The M9392A uses this characteristic in order to provide a data storage solution capable of high speed data capture.

RAID Level   RAIDs can be configured in many different methods depending on the level of performance and data recovery required. RAID 0 provides the highest data bandwidth, however it does not provide any data recovery should there be a disk failure. Other RAID formats trade off data bandwidth, storage size, and data recovery capability.

Virtual Drive   A file that represents as a single disk drive to the operating system but is actually configured of multiple disk drives.
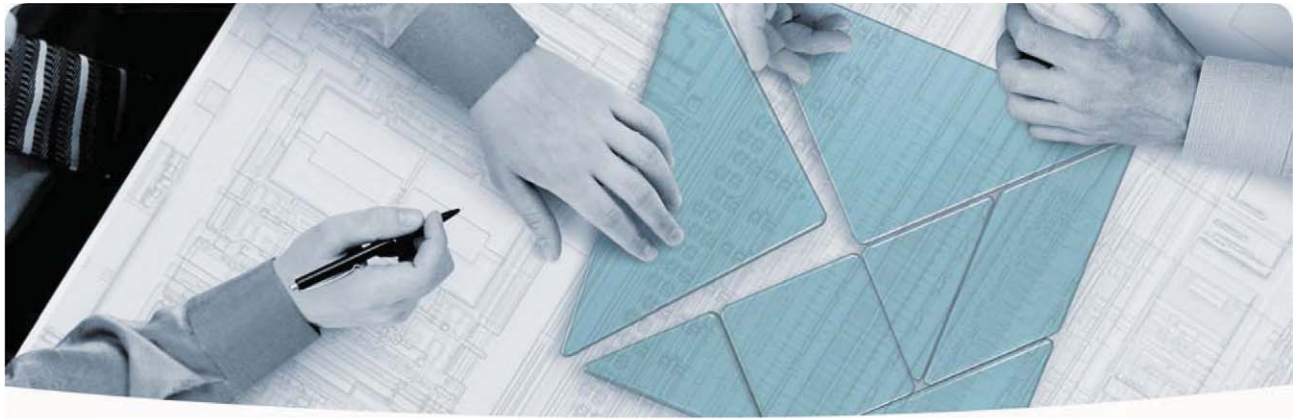
The Modular Tangram

The four-sided geometric symbol that appears in this document is called a tangram. The goal of this seven-piece puzzle is to create identifiable shapes—from simple to complex. As with a tangram, the possibilities may seem infinite as you begin to create a new test system. With a set of clearly defined elements—hardware, software—Agilent can help you create the system you need, from simple to complex

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