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Compaq Computer Corporation

Contents

Introduction	3
Factory Shipment	3
General Support	4
Storage Management	4
ACU Support for 36.4-GB Drives	6
Creating Arrays with Unlike Drives.....	6
Maximum Logical Drive Sizes in the ACU.....	9
Virtual Replicator Disk Creation	11
TaskSmart N2400 Appliance-Specific Support.....	11
Storage Configuration	14
Automatic Mode	14
Manual Mode	15
Creating Logical Drives from Arrays	20
SANworks Virtual Replicator	22
Creating Pools Using SWVR ...	22
Creating Virtual Disks from Pools	25
Procedure	25
Ultra3 Support	26
Conclusion	26

36.4-GB Drive Support for the TaskSmart N2400 Appliance

Abstract: This document outlines the provisions for 36.4-GB drive support in the Compaq *TaskSmart*[™] N2400 appliance. Specifically it details the supported options and requirements to be met when utilizing the 36.4-GB drives from Compaq. In addition, the document outlines the supporting “best practices” for combining 18.2-GB and 36.4-GB drives in the TaskSmart N2400 appliance.

The Compaq 36.4-GB drive option is Part Number 176498-B21.

Notice

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Introduction

With the introduction of 36.4-GB drive support in the TaskSmart N2400 appliance, the total storage of the appliance is increased to 2 terabytes. Several areas of support need to be quantified with the release of the 36.4-GB drives as an option for this product. These areas include the following.

- Factory Shipment
- General Support
- Array Configuration Utility Support for 36.4-GB Drives
- Virtual Disk Creation
- Storage Configuration
- Ultra3 Support

This white paper assumes a working knowledge of the Array Configuration Utility (ACU) and the Compaq *SANworks*[™] Virtual Replicator (SWVR) software that ships with the TaskSmart N2400 appliance. If you are unfamiliar with these products, refer to the administration guide for the TaskSmart N2400 appliance that is included with the product and is available on the Compaq website at

www.compaq.com/tasksmart

Factory Shipment

The Compaq TaskSmart N2400 appliance, Compaq Part Number 163108-001, will continue shipping from Compaq with 18.2-GB Ultra3 drive support. The 18.2-GB Ultra3 drives will ship in both of the internal drive bays (two drives) as well as in the external drive storage enclosures (four drives) in the basic orderable product. The 36.4-GB Ultra3 drive is available only as an option for Part Number 163108-001.

General Support

The 36.4-GB Ultra3 drive is supported in the external storage enclosure, as shown in Figure 1. It is not supported in the internal drive bays of the TaskSmart N2400 appliance.

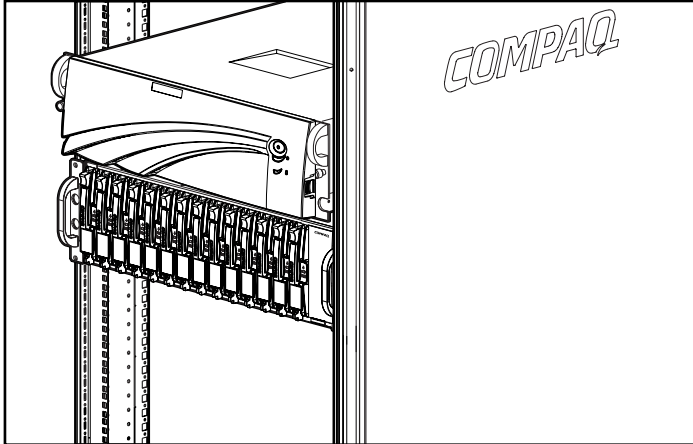


Figure 1. TaskSmart N2400 appliance with drive storage enclosure in rack

Storage Management

The following paragraphs and Figure 2 are included to explain the relationship among the various storage components of the TaskSmart N2400 appliance.

The lowest level of storage management on the appliance occurs at the physical drive level. Physical drives are placed into the external storage enclosure or enclosures, and grouped into RAID arrays for fault tolerance and better performance. The Array Configuration Utility (ACU), a graphical tool, incorporates a wizard-style interface that creates arrays from the physical drives.

CAUTION: Existing logical drives should not be deleted prior to deleting the virtual disks and pools associated with these logical drives.

Drive arrays are used to create logical drives, using ACU. The logical drives are configured as RAID 5 drives for the most efficient fault-tolerant performance. Drives may be added to existing arrays at a later time, forming new logical drives, or they may be added as a new array.

The logical drives created with ACU become members of a storage pool. Storage pools aggregate the disk space from one or more logical disks into a large set of disk blocks. From the pool of blocks, virtual disks are created and presented to the operating system as New Technology File System (NTFS) volumes. Virtual drives may be enlarged at a later time when there is a need for more space. SANworks Virtual Replicator (SWVR) is used to create the pools and virtual disks.

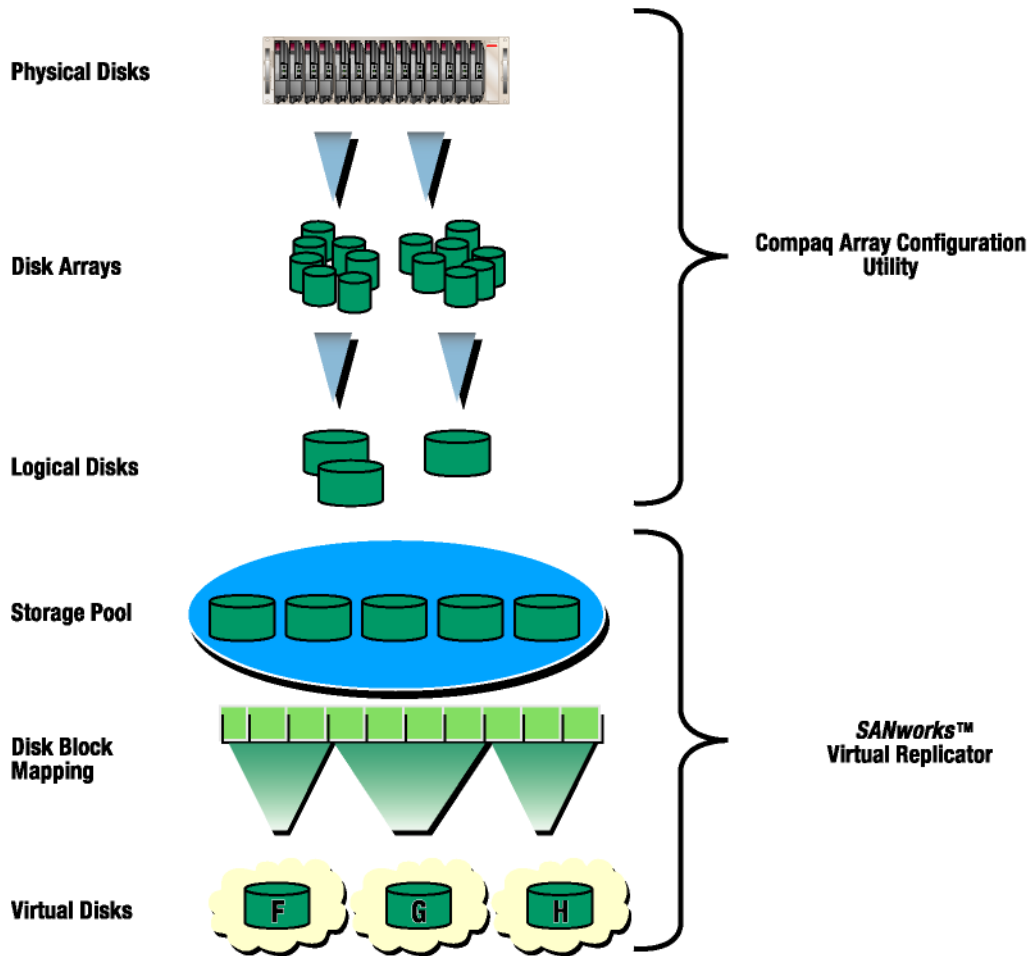


Figure 2. Graphical overview of all storage components used for space management

ACU Support for 36.4-GB Drives

ACU is the base storage configuration utility for creating RAID sets from the attached storage of the TaskSmart N2400 appliance. ACU fully supports 36.4-GB drives, but there are some sizing constraints as well as best practices that should be followed.

Creating Arrays with Unlike Drives

With the introduction of support for multiple drive sizes on the TaskSmart N2400 appliance, creating an array set with either 18.2-GB or 36.4-GB drives is supported. However, creating array sets with mixtures of 18.2-GB and 36.4-GB drives, as seen in Figure 3, is not recommended.

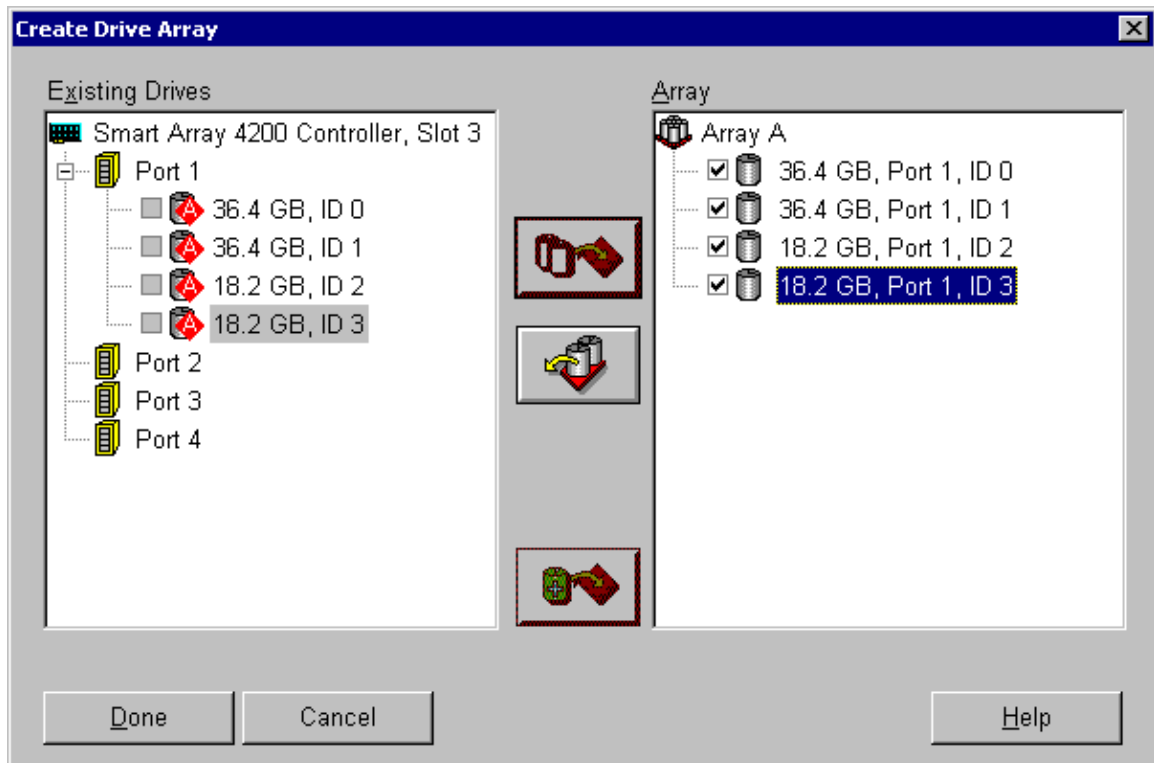


Figure 3. Example of 18.2-GB and 36.4-GB array

If such drives are mixed, a warning will be issued by the Compaq Array Configuration Utility (ACU), as shown in Figure 4.

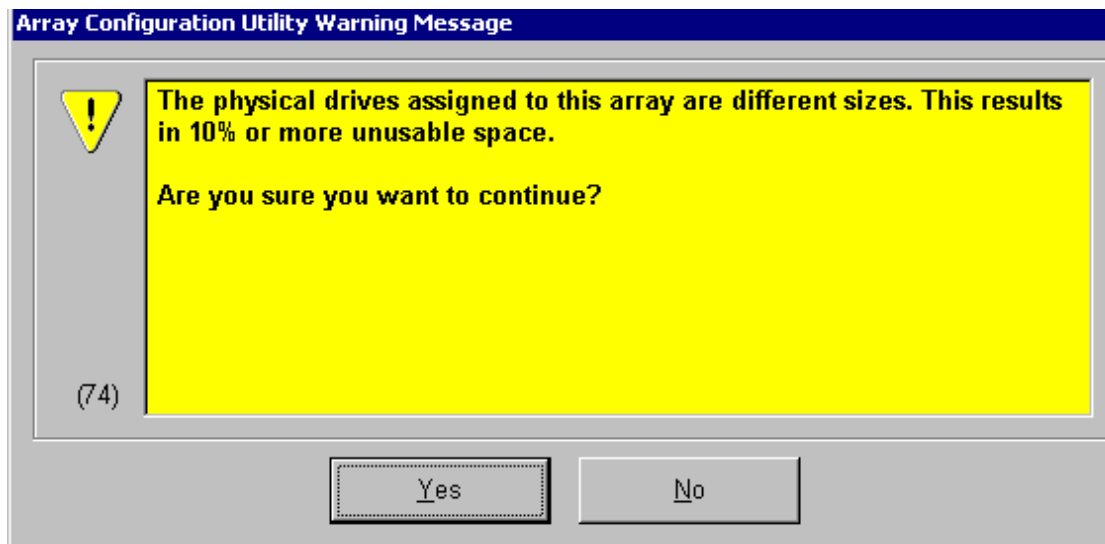


Figure 4. ACU warning message

If the space warning is ignored, the ACU will automatically downgrade the two 36.4-GB drives to 18.2 GB within the four-drive array, as shown in Figure 5. The physical capacity of two 36.4-GB drives and two 18.2-GB drives yields a total of 109.2 GB, but when logically downgraded the total is effectively 67.8 GB.

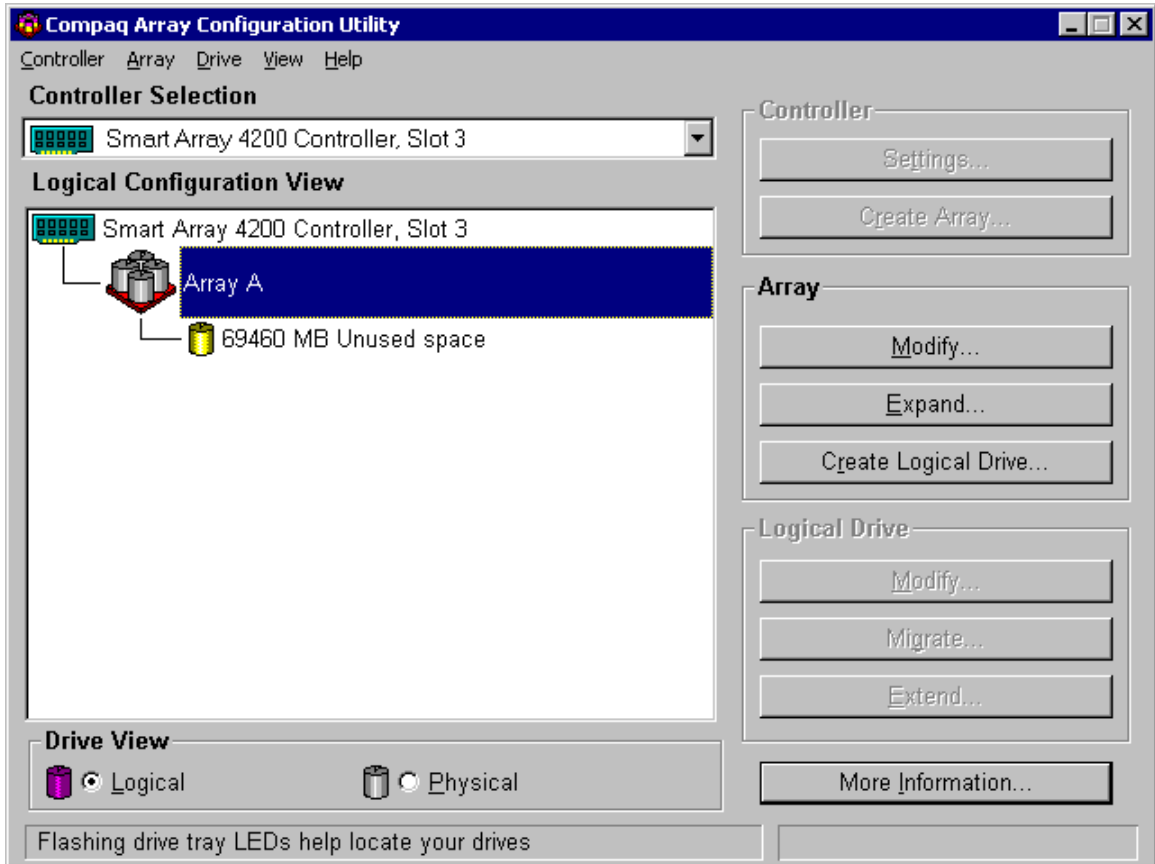


Figure 5. Mixed drive array downgraded to 67.8 GB

This is normal behavior when drives of different sizes are mixed within an array set, because RAID stripes cannot be spread over nonmatching drive sizes.

Maximum Logical Drive Sizes in the ACU

Although the physical storage capacity of the TaskSmart N2400 appliance is now 2 terabytes, the largest single logical drive size, regardless of the RAID level used, is 512 GB, as illustrated in Figure 6.

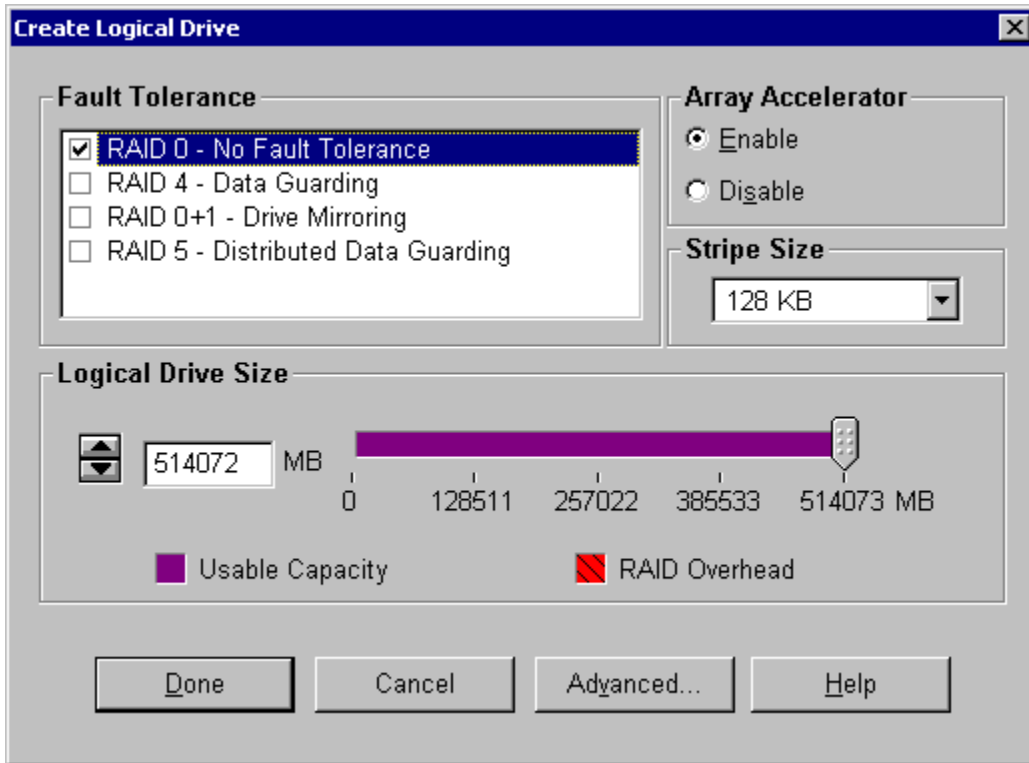


Figure 6. The largest RAID 0 array is 512 GB

The 512-GB single logical drive limit should not be viewed in a negative manner for two important reasons:

1. RAID 5 is the recommended RAID level for logical drives on the TaskSmart N2400 appliance. This RAID level provides the maximum logical drive capacity while maintaining a level of data protection. With each RAID 5 array, it is recommended that the array not exceed fourteen physical drives. With these two guidelines in mind, the largest logical drive that can be formed is 440.9 GB. Figure 7 illustrates the recommended logical drive configuration for an appliance fully populated with 36.4-GB drives.
2. Logical drives created through the ACU can be grouped together within a single SWVR pool. This feature allows the administrator to form larger virtual disks from the pool and provide larger volumes to the operating system.

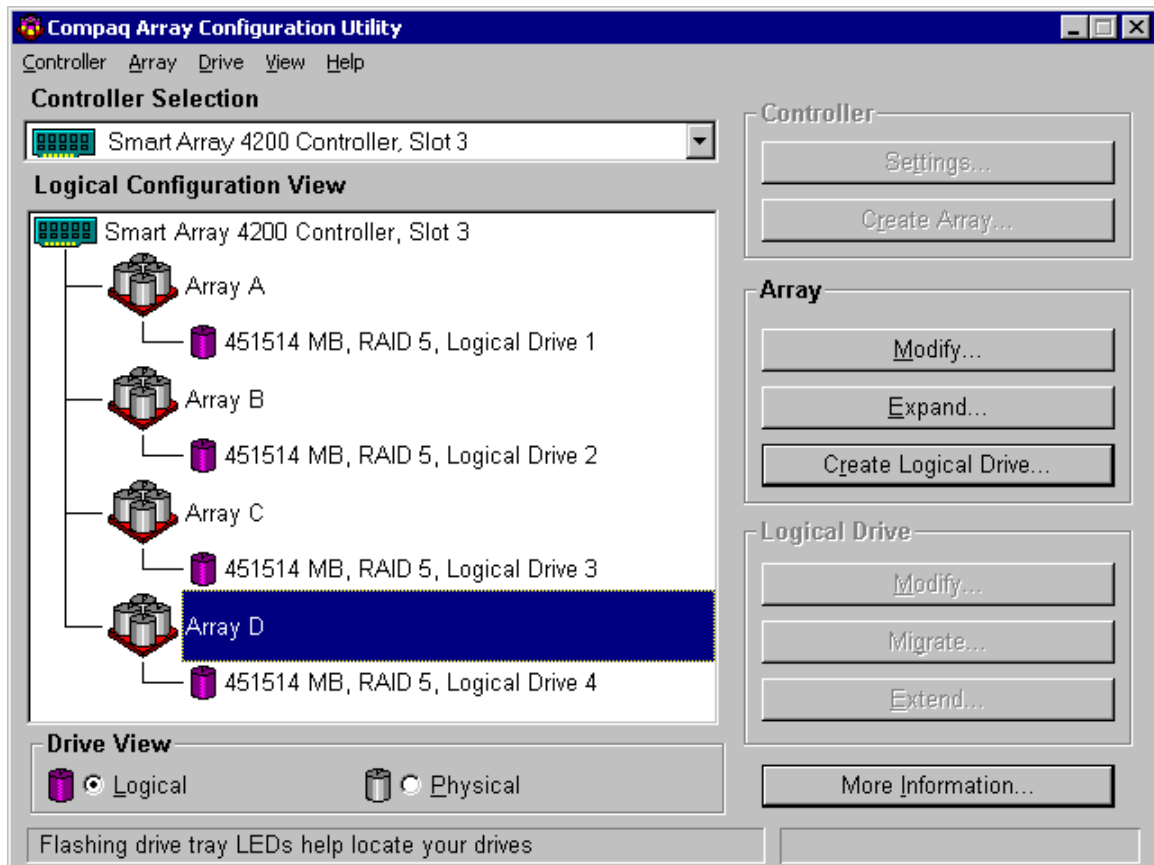


Figure 7. Recommended drive-carving when fully populated with 36.4-GB drives

Virtual Replicator Disk Creation

TaskSmart N2400 Appliance-Specific Support

As noted previously, the logical drives created through the ACU can be combined using SWVR pools. Virtual disks can be created from this large pool of logical drives. Utilizing the maximum logical drive-carving illustrated in Figure 7, the largest pool that can be created is 1.8 terabytes on the TaskSmart N2400 appliance, as shown in Figure 8. Alternate RAID levels or alternate disk carving affect the maximum pool size.

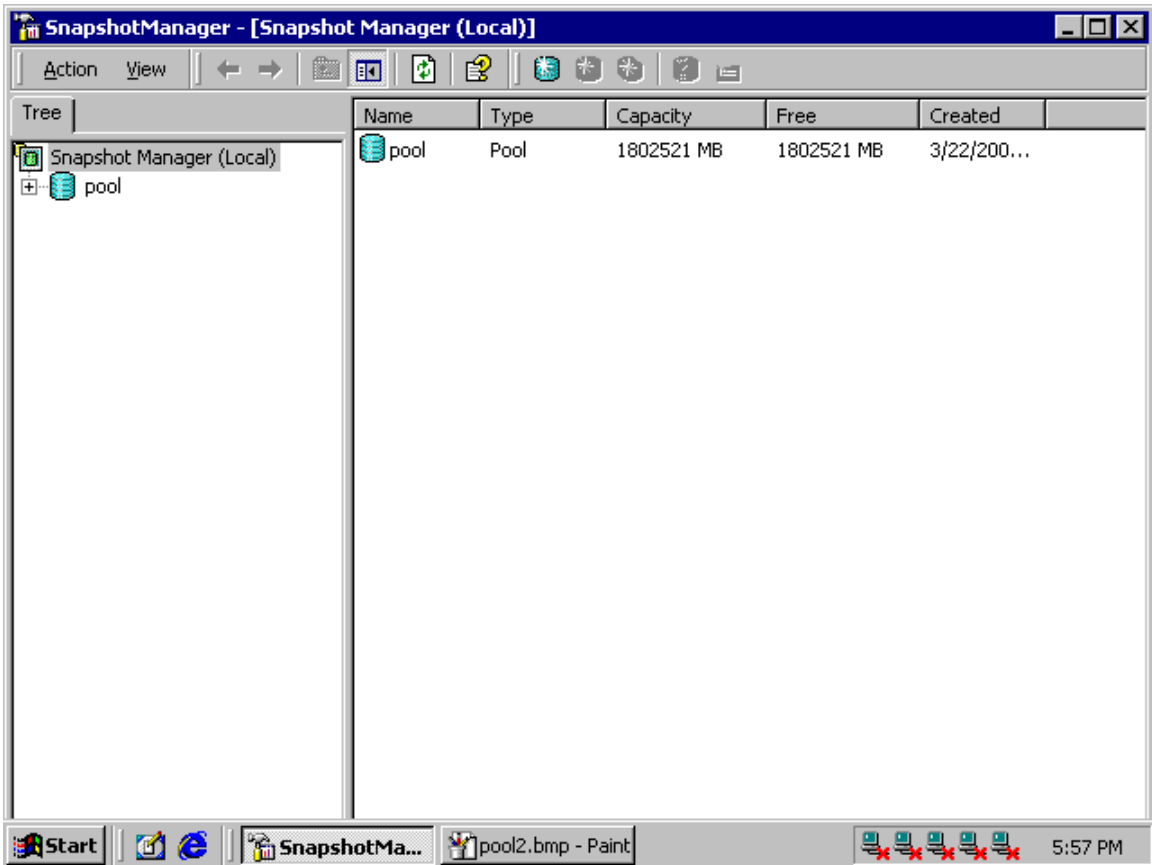


Figure 8. A pool showing 1.8 terabytes

Although the largest pool for the TaskSmart N2400 appliance is 1.8 terabytes, the largest possible virtual disk size is 1 terabyte, as shown in Figure 9. A TaskSmart N2400 appliance with 1.8 terabytes of configured pool space would need to use a minimum of two virtual disks to consume all of the available space. Furthermore, a 30 percent pool reservation for snapshots is set by default on the TaskSmart N2400 appliance, which impacts the available space for virtual disk creation. The administration guide for the product outlines the methods and concerns for adjusting this reservation and includes an explanation of snapshots.

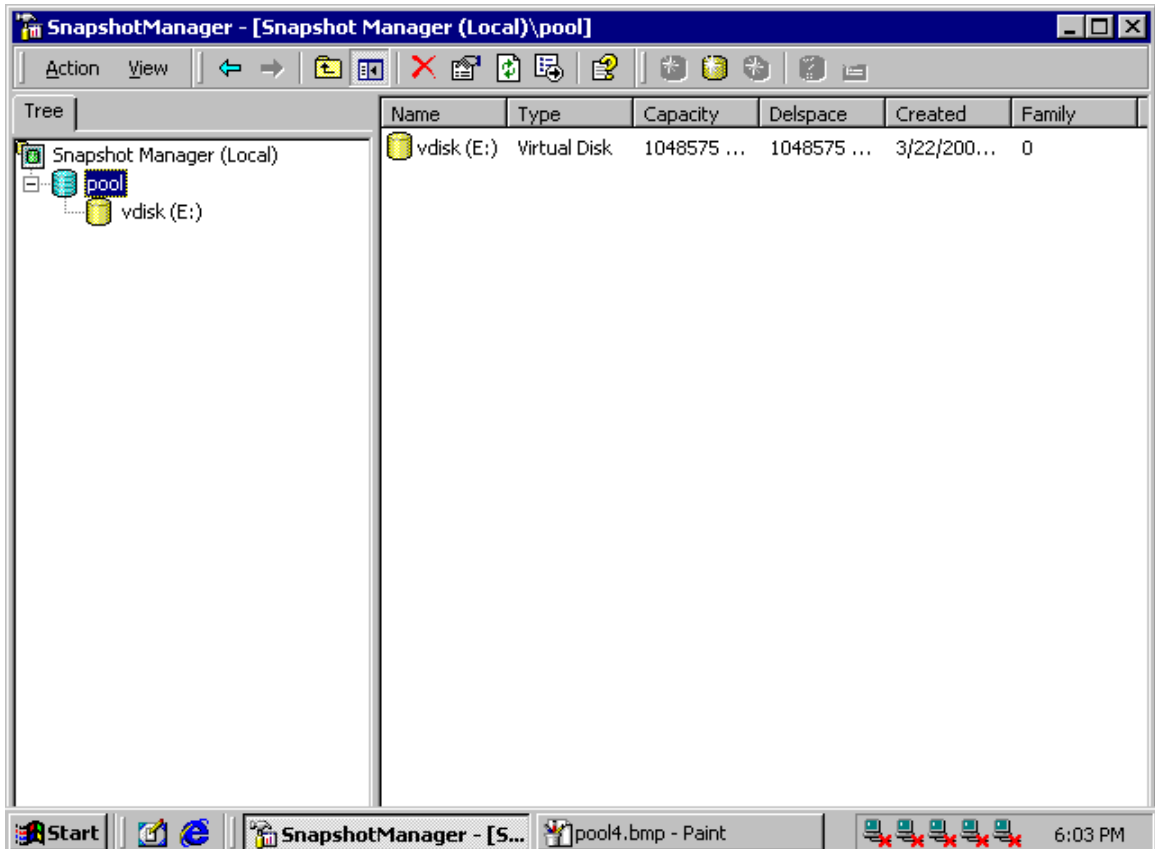


Figure 9. Largest possible virtual disk

Creation of 1-terabyte disks requires the use of 128-KB segment size when creating the Virtual Replicator pool.

If an attempt to create a virtual disk larger than 1 terabyte is made, an error message is displayed on the status bar, as shown in Figure 10.

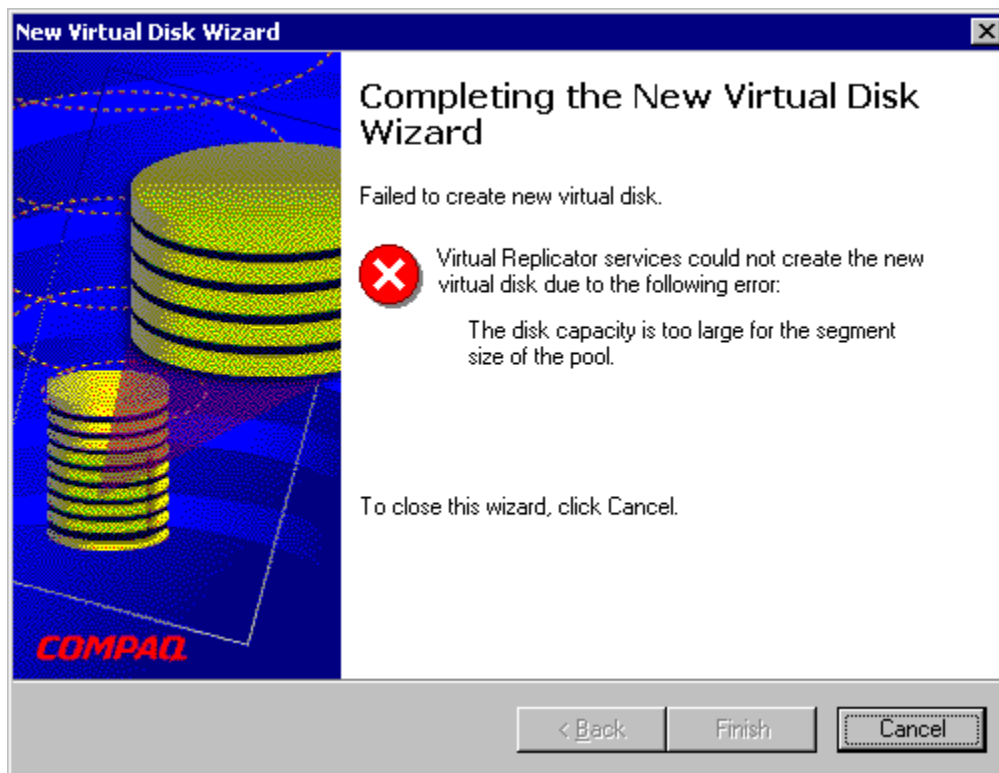


Figure 10. Failed to create new virtual disk error message

In practice, there may be practical reasons not to create single large pools or single large virtual disks, such as backup and restore times or creating dependencies between managed storage groups and users. See the *Backup Guide for the Compaq TaskSmart N-Series Network Attached Storage Appliance* white paper and the *Planning for Network Attached Storage on Compaq TaskSmart N-Series Appliances* technical guide for further information. Both guides are available at

<http://www.compaq.com/tasksmart/n2400>

Storage Configuration

As outlined in the documentation that comes with the TaskSmart N2400 appliance, a QuickRestore CD is provided with the product to reimage the appliance in the event of a system failure. The QuickRestore CD operates in two modes for reimaging: operating system restore and full restore. In the operating system mode, only the operating system drives located internally are reimaged. In full-restore mode, the external data drives are wiped clean in addition to the internal operating system drives. When restoring the external data drive configuration, the restore process can operate in either a manual mode or an automatic mode.

Automatic Mode

In the automatic mode, drive arrays, logical drives, pools, and virtual disks are created automatically. When automatic mode is selected in the restore process, the 36.4-GB drives are treated as if they are 18.2-GB drives. The remaining drive space from each of the 36.4-GB drives can be configured as additional RAID sets, using the ACU.

In Figure 11, the Compaq 36.4-GB drives are shown configured with the automatic disk-carving feature included in TaskSmart N2400 QuickRestore utility. The logical drive shown was created based on the presence of four 18.2-GB drives with one drive's-worth of space being lost for RAID parity, even though the larger drives were present during the carving.

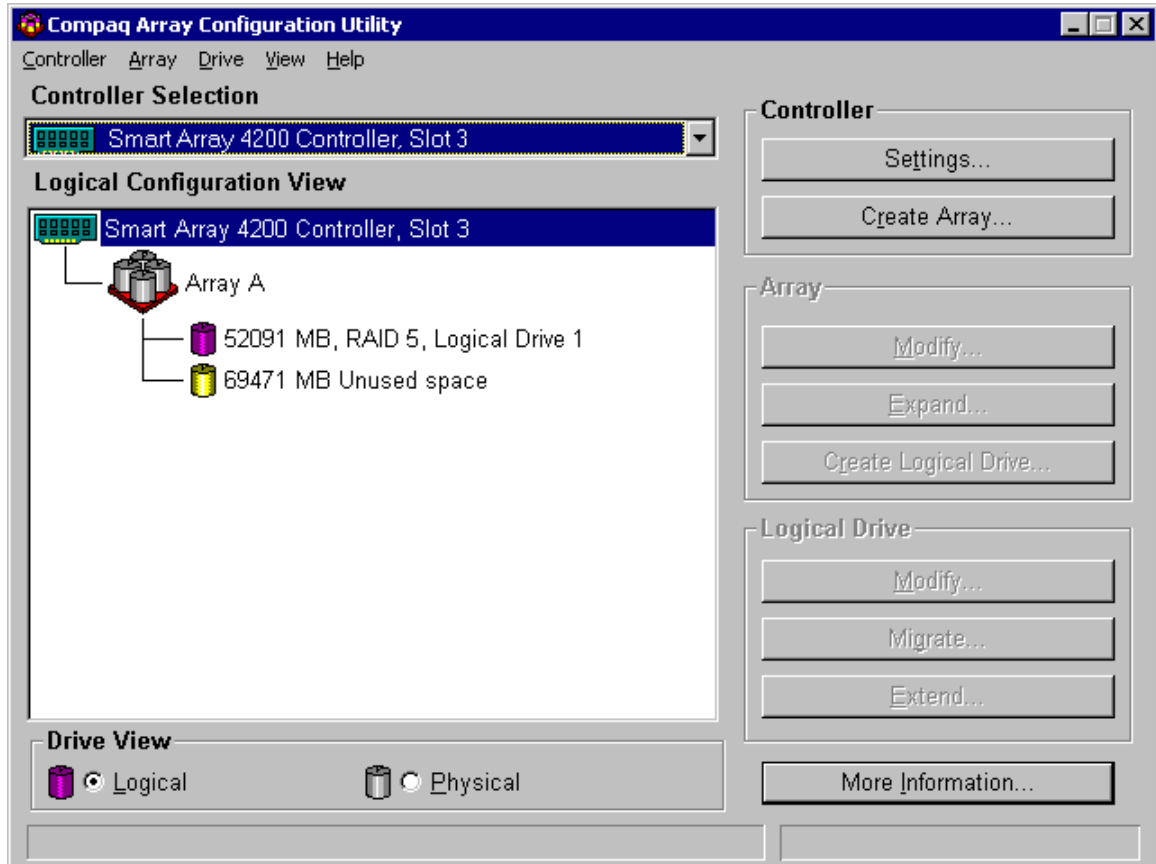


Figure 11. Four 36-GB drives, illustrating the automatic disk-carving feature

It is planned that full support for the 36.4-GB hard drives will be included in future TaskSmart QuickRestore versions. For details on the QuickRestore process, see the QuickRestore section of Chapter 4 in the current *TaskSmart N2400 Administration Guide*, Part Number 177675-001.

Manual Mode

An alternative option when using the QuickRestore CD is to manually configure the drives using the Compaq Array Configuration Utility (ACU). This option is user selectable when a full restore is performed on the TaskSmart N2400 appliance. The basic steps for manually configuring storage are as follows:

1. Create a drive array or arrays.
2. Create a logical drive or drives.
3. Place the logical drives into SWVR pools.
4. Create virtual disks from that pool or multiple pools.

The following section is an abstract of Chapter 4 in the *TaskSmart N2400 Administration Guide*. See the storage management section of that chapter for complete details.

The following examples are based on 18.2-GB drives, but the procedures are identical to those used when configuring 36.4-GB drives.

To manually configure your RAID array using ACU, follow these steps:

1. Log on to the TaskSmart N2400 appliance as Administrator.
2. Click **Microsoft Management Console**.

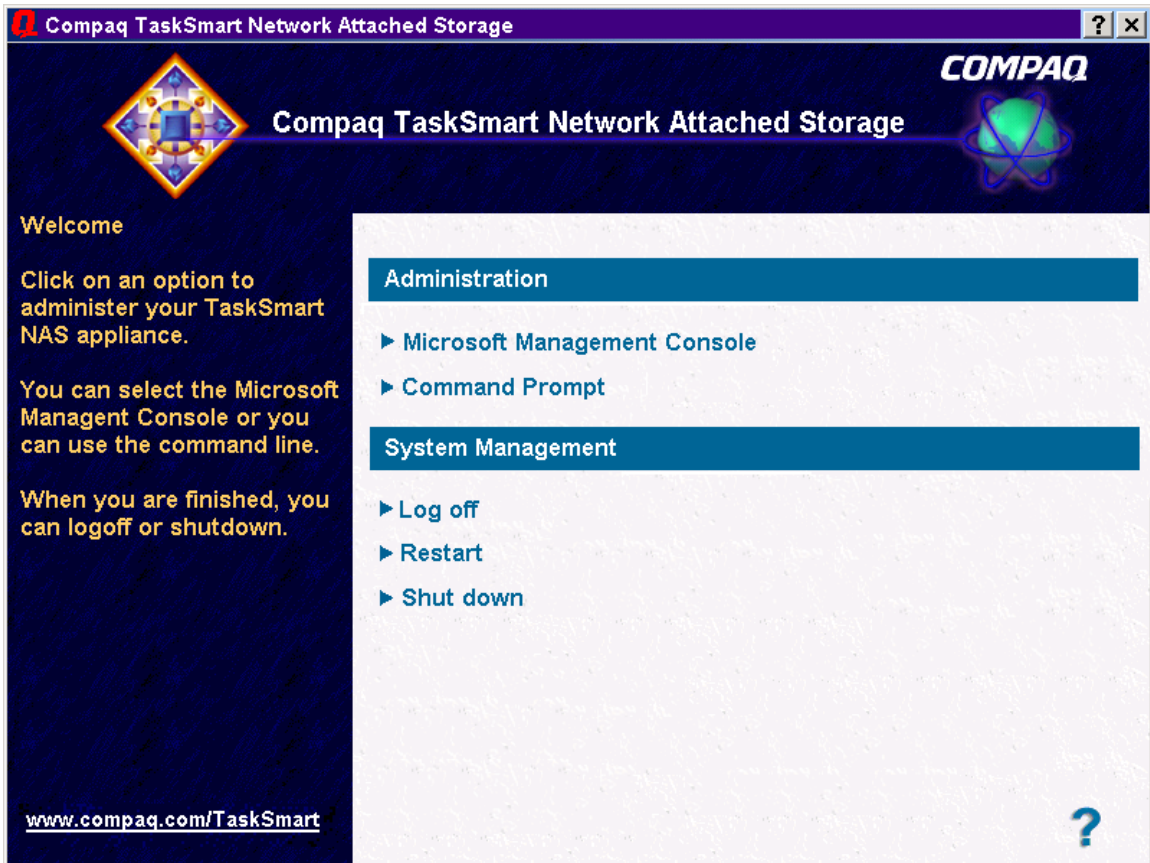


Figure 12. TaskSmart N2400 console screen

3. Click the **Disk System** folder.
4. Click **Compaq Array Configuration Utility** to open the ACU.

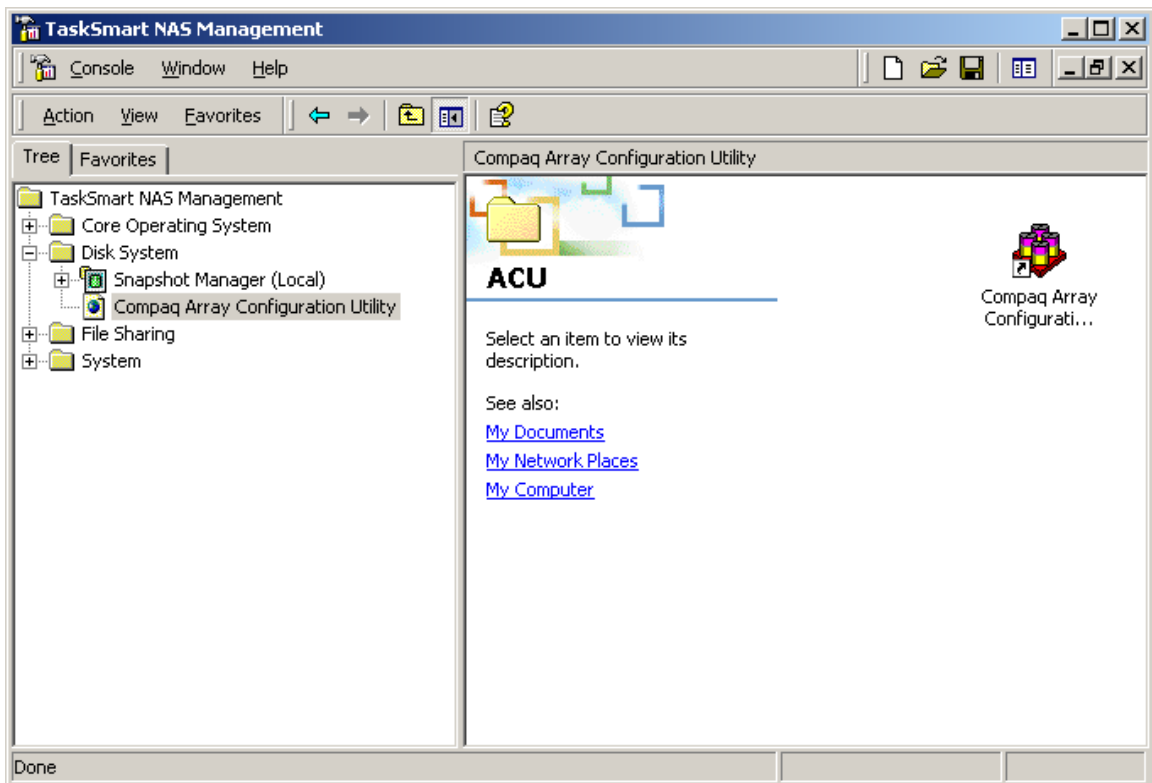


Figure 13. Compaq system tools selection screen

5. Under **Controller Selection**, click the drop-down box and select **SmartArray 4200 Controller**.
6. ACU presents either a physical or a logical view of the arrays and drives. The view is selectable using the radio buttons at the bottom of the interface. Select **Logical**, and then click **Create Array**.

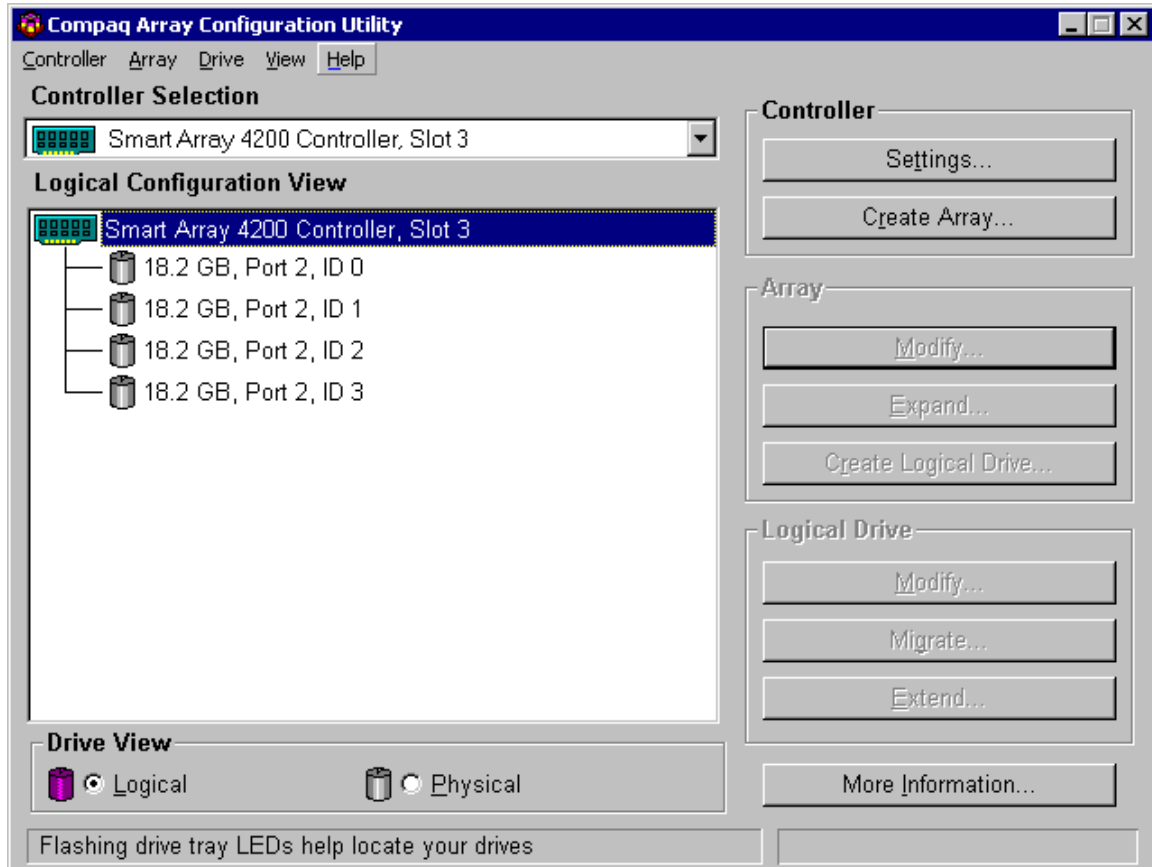


Figure 14. Smart Array Controller Configuration Utility preview dialog box

CAUTION: Be sure to select the array controller after you start ACU. Make sure that the array controller displayed at the top of the window is NOT the Integrated Smart Array Controller. Changes to the configuration of the integrated array controller can corrupt the operating system on the server.

CAUTION: Existing logical drives should not be deleted prior to deleting the virtual disks and pools associated with these logical drives.

7. Select the physical drive or drives that you would like to include in the new array.

Notes:

- Compaq recommends that an array set for RAID 5 consist of a maximum of 14 physical drives. The more member drives in an array, the greater the chance for multidrive failure.
 - If you are adding drives to an existing array, Compaq recommends that you add the drives in multiples of three or four. The new drives become separate logical drives.
 - The maximum number of logical drives in a pool is eight. It is advantageous to make logical drives as large as possible, if you want to have large pools from which to create virtual disks.
8. Click the icon showing the **right-pointing arrow**. All selected drives are moved to the right pane on the interface, displaying their inclusion in a new array.

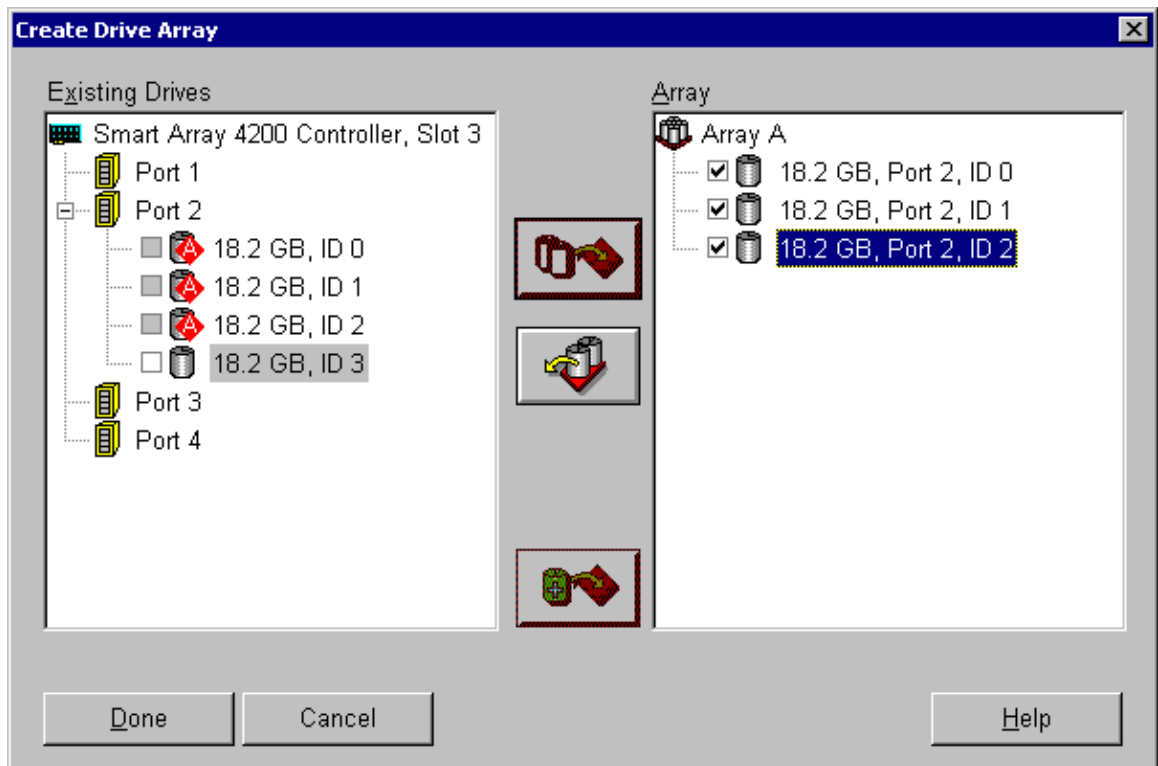


Figure 15. Create Drive Array screen

Compaq recommends that a spare drive be designated for an array. This online spare, or “hot spare,” is automatically used when one of the other member drives in the array fails. When a failure is detected, the array controller uses parity information to rebuild the information contained on the failed drive. After the rebuilding process, the array resumes its fault-tolerant state. If a spare drive is not designated for your array and a drive fails, the rebuild process cannot begin until the drive is physically replaced. Until the drive is replaced or the rebuild process is completed, the array is not fault tolerant. If another drive fails at this time, data loss is probable. To select a spare drive, use the spare drive icon and add the drive to the array set. Spares can be shared among arrays.

Creating Logical Drives from Arrays

Now that the physical drives have been gathered into fault-tolerant arrays, logical drives need to be created from them. One large logical drive can be created using the entire space of the array. Compaq recommends creating one logical drive from the array. Physical drives can be added to the array later.

Procedure

1. Log on to the TaskSmart N2400 appliance as Administrator.
2. From the TaskSmart N2400 appliance management console, click **Microsoft Management Console**.
3. Expand the **Disk System** folder.
4. Click **Compaq Array Configuration Utility**.
5. In the right-hand pane of the interface, double-click the icon to start the Compaq Array Configuration Utility.
6. Be sure that the Smart Array Controller (not the embedded one) is selected at the top of the interface.
7. Select an array from which to create the logical drive.
8. Click the **Create Logical Drive** button.

9. In the upper-left area of this screen, select **(RAID 5) Distributed Data Guarding**, which provides the most efficient fault-tolerant protection for the data.

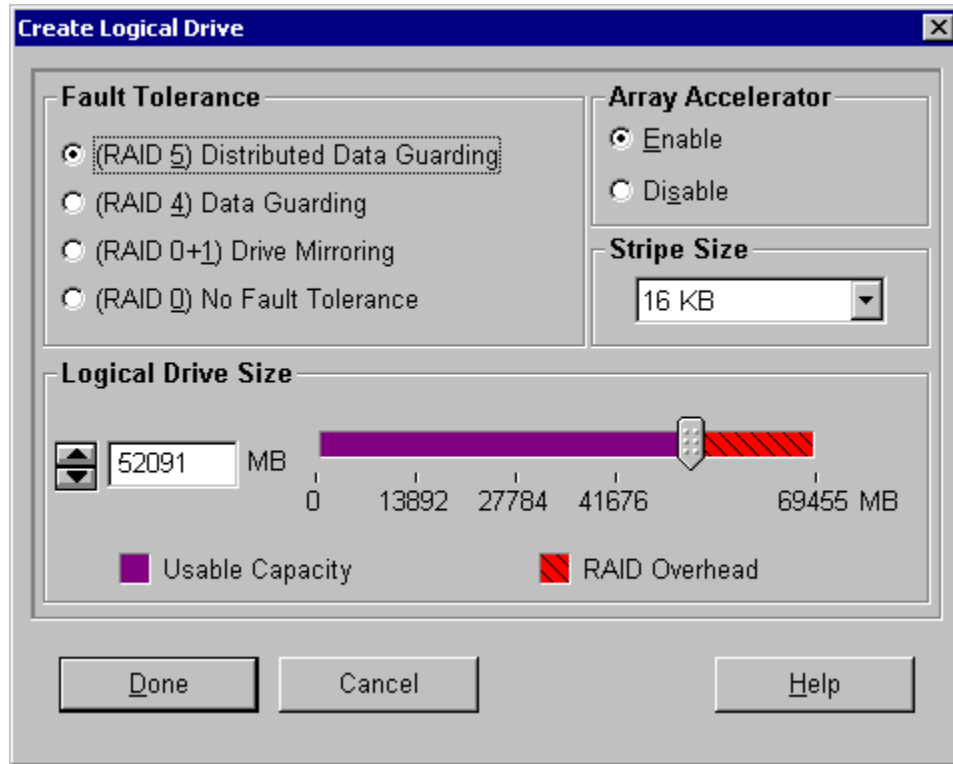


Figure 16. Create Logical Drive dialog box

10. Be sure that the **Array Accelerator** is enabled.
11. Set **Stripe Size** to the appropriate value.
12. Set the **Logical Drive Size**. Use the default values to create a logical drive that occupies the entire array.
13. Click **Done**.
14. If any other arrays exist, repeat the procedure to create new logical drives on those arrays as well.
15. The drives must be rescanned so that the newly created logical drives are visible to the operating system. This procedure is accomplished from the TaskSmart N2400 appliance console. To find the newly created logical drives:
 - Right-click the **My Computer** icon on the desktop.
 - Select **Manage** from the menu.
 - Double-click **Device Manager**.
 - Right-click **Disks**, and select **scan for hardware changes**.

16. After setting up the arrays and logical drives, add the logical drives to a pool of space from which virtual disks may be created. Use the information in the next section to learn about pools and virtual disks.

Note: Once a logical drive is added as a member of an SWVR pool, logical drives cannot be enlarged using the Array Configuration Utility. The logical drive size cannot change.

CAUTION: Windows 2000 Advanced Server Logical Volume Manager (LVM) is not necessary for use with the TaskSmart N2400 appliance and has been removed. The use of LVM in addition to any active component of SWVR can cause data loss and unexpected behavior. Should the use of LVM be necessary, all SWVR interfaces should be closed prior to and during use. To activate the LVM, refer to the release notes provided with the appliance.

SANworks Virtual Replicator

SANworks Virtual Replicator (SWVR) is a Compaq utility for managing disk space logically and efficiently. SWVR combines logical drives into a pool of space from which the administrator may create virtual disks of exactly the size needed by a particular group or user. The virtual disks may be expanded later, so this virtualization is a very powerful administrator tool.

Creating Pools Using SWVR

The process of creating a pool of disk space and dividing it into virtual disks is straightforward, as follows:

1. Log in as Administrator.
2. From the TaskSmart N2400 appliance management console, click **Microsoft Management Console**.
3. Click **Disk System**.
4. Click **Snapshot Manager (Local)**. The resulting screen controls pools, virtual disks, and snapshots. Snapshots are discussed in Chapter 3 of the current administration guide.

5. In the snapshot manager interface, right-click **Snapshot Manager**, select **New**, and then click **Pool**.

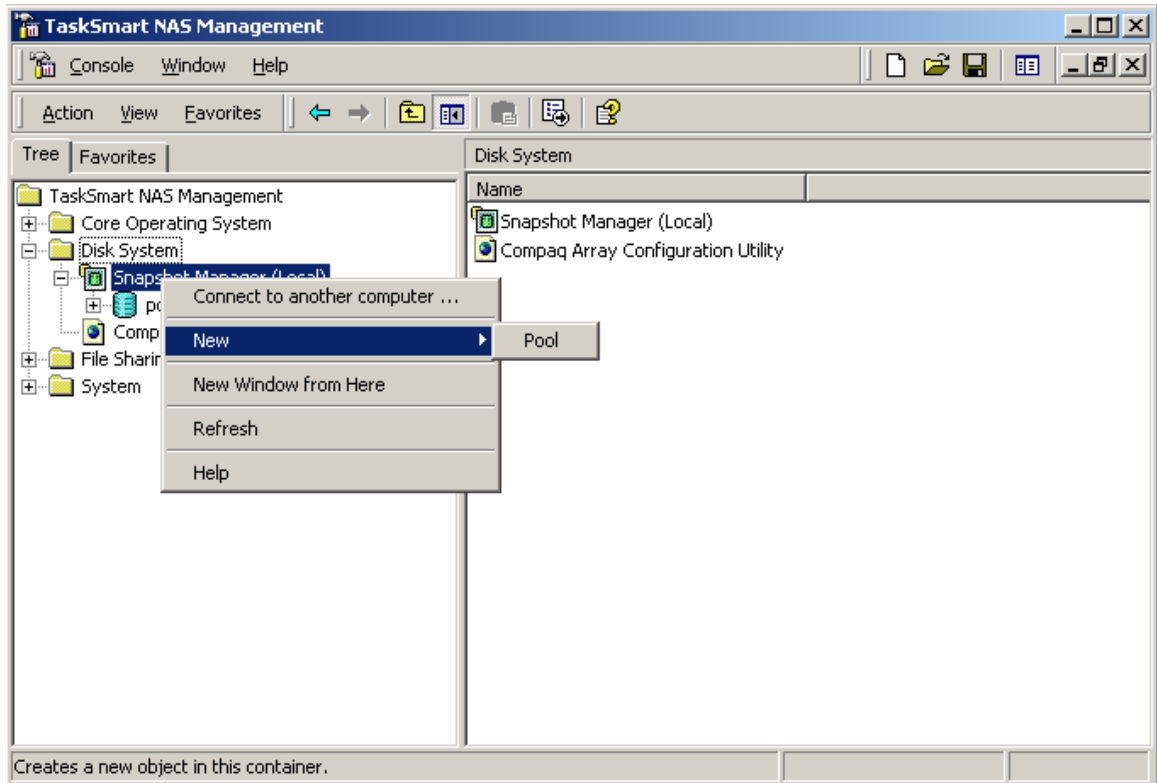


Figure 17. Snapshot Manager screen

6. The New Pool wizard starts and displays the logical drives that are available for inclusion in new pools.

Note: When creating pools or virtual disks, the wizard progresses to the final screen prior to checking for duplicate names of a pool or virtual disk. The wizard presents an error message if duplicate names exist, then exits. To correct the error, restart the wizard.

7. Select a logical drive or drives to include in the new pool, and click the **right-pointing arrow button** in the center of the interface to move the drive into the new pool.

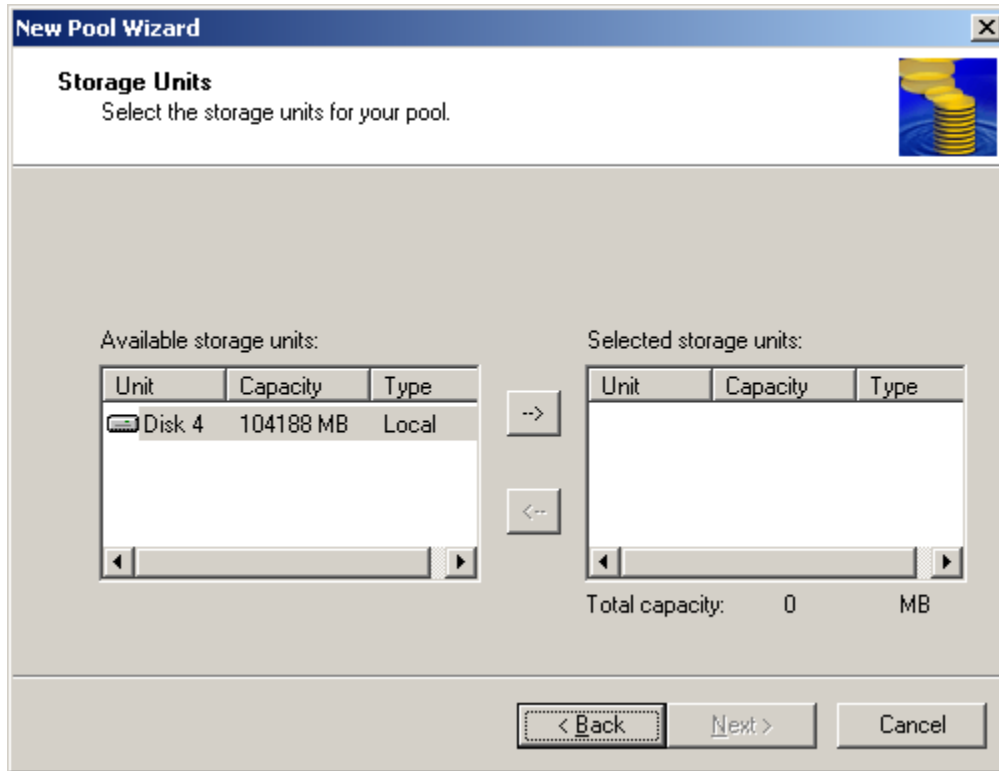


Figure 18. Selected Logical Drives dialog box

Note: Up to eight logical drives can be selected as members of a pool.

8. Click **Next** to proceed.
9. Select the segment size of the pool, noting that this selection determines the maximum size of a virtual disk that may be created in the pool. Compaq recommends a segment size of 128 KB. Any size between 32 KB and 128 KB may be specified.
10. You can see the total capacity of the new pool displayed at the bottom of the right pane.
11. Click **Next**, and then click **Finish**.

Creating Virtual Disks from Pools

Virtual disks are the storage units that the operating system recognizes as drives, and upon which the data is placed. Because virtual disks are created from pools, they may be created for the specific size needed. From a pool, the administrator may wish to create three separate virtual disks that exactly match the space needs of the users or groups requesting space. Alternately, the administrator may create a single, large virtual disk from a pool. The only limitation is that virtual disks may not “span” pools—they must be created from a single pool.

Note:

- The pool has a “reserved” area for snapshot creation. Snapshots are a real-time copy of data on the virtual disk.
- By default, 30 percent of the pool space is devoted to snapshot reserves. Depending on how fast the data changes and the number of snapshots kept, the administrator may need more or less space devoted to snapshots.

Procedure

1. In the **Snapshot Manager** interface, right-click a pool, and select **New Virtual Disk**.

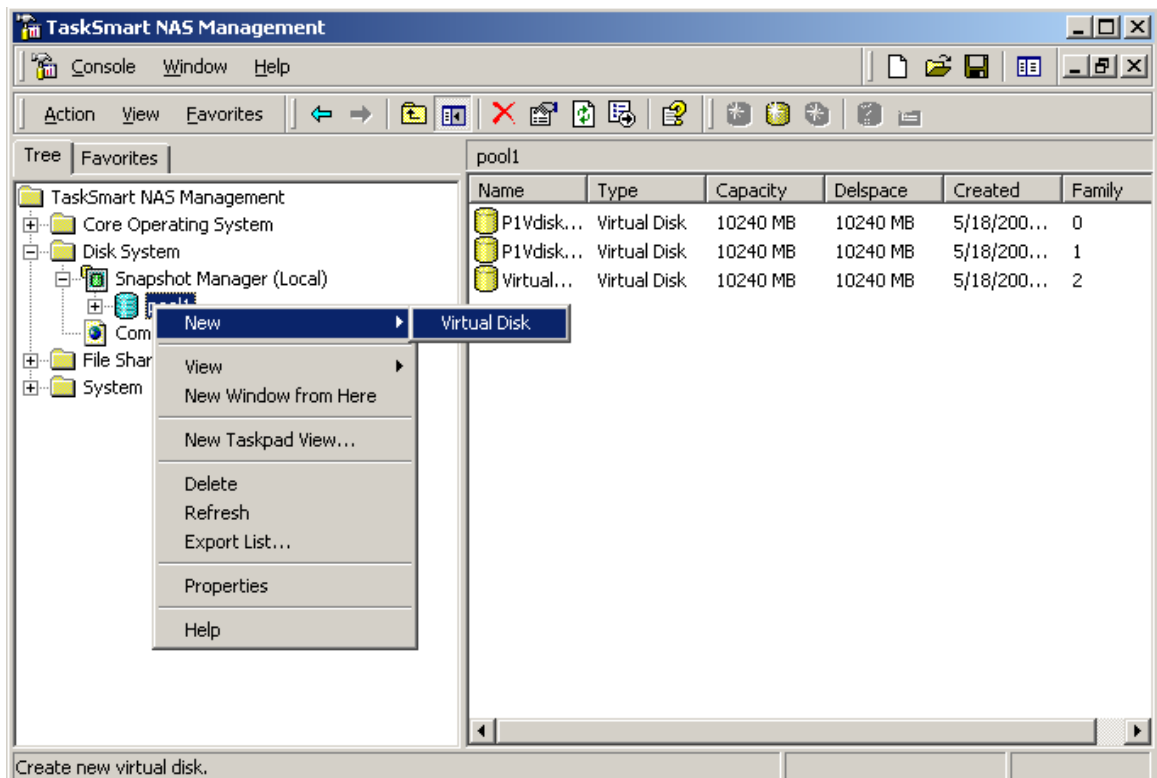


Figure 19. Creating a new virtual disk

2. The New Virtual Disk wizard opens and guides the administrator through the creation process.

3. Assign a drive letter to each virtual disk created so that it is accessible to the operating system.
4. Format the virtual disk, using the recommended 16-KB allocation unit size or a size slightly larger than the average file size.
5. Click **Finish** to close the wizard.
6. From the console, click **Manage with Command Line**.

Ultra3 Support

The controller within the TaskSmart N2400 appliance features support for Ultra2 only. As a result, the 36.4-GB drives will transfer data at only Ultra2 speeds.

Conclusion

Drive support for 36.4-GB Ultra3 drives in the TaskSmart N2400 appliance can be utilized with the limitations previously outlined. As new information becomes available, it will be posted to the Compaq website at

www.compaq.com/TaskSmart