

Application Note 115:

Notify: Increasing PC Reliability by Using RAID

When using Notify for emergency situations, it is recommended that you increase the fault-tolerance of the PC that runs the Notify software. For example, use a UPS (uninterruptible power supply) for the Notify PC and use RAID¹ mirroring to create Notify PC hard drive redundancy².

With RAID mirroring, two hard drives on the PC store identical information. All data written to the partition³ on the primary disk is also written to the mirror, or secondary, partition on the other disk.

If one disk fails, the system is able to use the data on the other disk. The loss of one partition in a mirror set is invisible; you will be able to read from and write to the remaining partition as if the mirror set was healthy. However, if only one partition of a mirror set is functioning, then it is no longer fault tolerant because loss of the remaining partition will result in an unrecoverable loss of all data in the mirror set.

If the boot or system partition is mirrored and the primary partition is damaged, you can restart Windows by using a fault-tolerant boot floppy disk.

Mirrors are not dependent on disk geometry. The only requirement is that free disk space on the mirror drive be equal to or greater than the size of the primary hard drive. Mirroring is not restricted to partitions of identical geometry (size, number of heads, cylinders, tracks, sectors, etc.).

Requirements

Windows 2000 Server (Service Pack 2 or later) must be installed as the Notify PC operating system. RAID 1 support is not available on Windows 2000 Professional.

The Notify PC must have at least two hard drives. The second drive needs to be at least the size of the hard drive partition on which the operating system boot and system files reside.

¹ Redundant Array of Independent Disks. A method used to standardize and categorize fault-tolerant disk systems. Windows 2000 provides three RAID levels: Level 0 (striping), Level 1 (mirroring), and Level 5 (RAID-5).

² This application note has been compiled from several Microsoft documents. See References at the end of this document.

³ A portion of a physical disk that functions as though it were a physically separate disk.

Increasing PC Reliability by Using RAID (Cont.)

Setup

Configuring a Windows 2000 Server for RAID involves the following steps: opening Disk Management, upgrading the disks to dynamic disks, mirroring the disks, and creating a boot disk.



Caution: Before starting this procedure, back up the system.

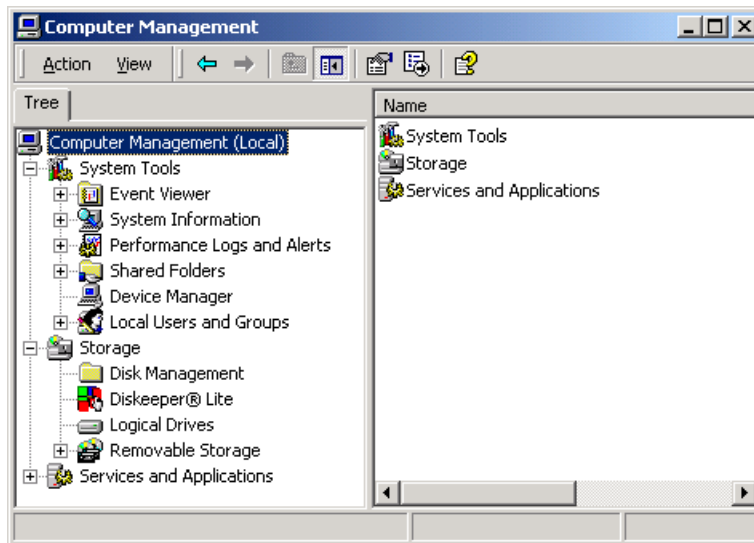


Note: You must be logged on as an administrator or a member of the Administrators group to complete this procedure. If your computer is connected to a network, network policy settings may also prevent you from completing this procedure.

Opening Disk Management

1. Right-click the My Computer icon on the desktop.
2. In the shortcut menu, select Manage.

The Computer Management window opens.



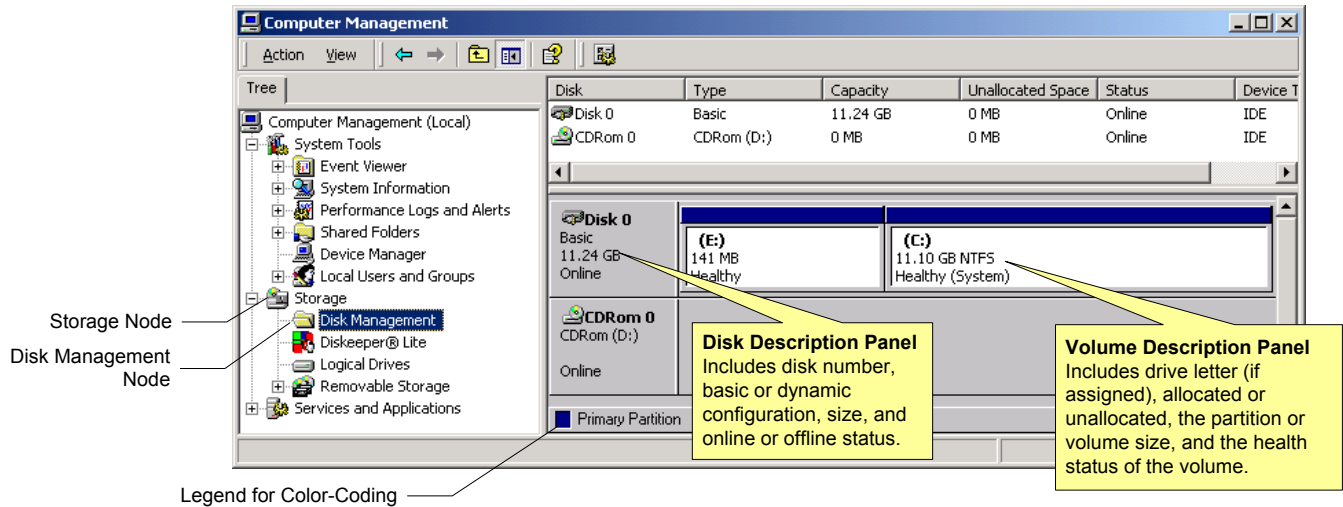
2. Expand the Storage node if needed (see following figure).
3. Click the Disk Management node.
4. On the View menu, select Top > Disk List.

In the top right pane, the attributes, such as type and capacity, of each disk in the system are displayed.

5. On the View menu, select Bottom > Graphical View.

In the bottom right pane, a color-coded graphical view of the disks on the system is displayed.

Increasing PC Reliability by Using RAID (Cont.)



Disk Management with Disk List and Graphical View Selected

Upgrading to Dynamic Disks

Under Windows 2000, RAID systems require dynamic disks⁴. Any disks that you upgrade from basic to dynamic must contain at least 1 megabyte (MB) of free space at the end of the disk for the upgrade to succeed. Windows Disk Management automatically reserves this free space when creating partitions or volumes on a disk, but disks with partitions or volumes created by other operating systems may not have this free space available.

To upgrade a basic disk to a dynamic disk using Windows Disk Management:

1. Close any programs that are running on the disk.
2. In Windows Disk Management, right-click the gray Disk Description panel.
3. In the shortcut menu, select Upgrade to Dynamic Disk.

If the second disk is not a dynamic disk, follow the above steps to upgrade it to a dynamic disk



Important: Do not define a drive letter for the second disk when creating a dynamic disk.

⁴ A physical disk that is managed by Disk Management. Dynamic disks can contain only dynamic volumes (that is, volumes created with Disk Management). Dynamic disks cannot contain partitions or logical drives, nor can they be accessed by MS-DOS.

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Mirroring the Disks

In the following instructions, Disk 1 is the disk on which the image of Disk 0 will be mirrored. Disk 1 must be unallocated space before you can proceed with mirroring. Disk 0 contains the boot and system files.



Note: Partitions are referred to as volumes when disks are dynamic.

1. In Windows Disk Management, right-click the Disk 0 Disk Description panel.
2. In the shortcut menu, select Add Mirror.

A dialog box opens in which any disk on your system that is available for mirroring is displayed.

3. Under Select a disk to use as the mirrored space for Boot and System, select Disk 1.
4. Select Add Mirror.

Both Disk 0 and Disk 1 now have the same color code, the same drive letter, and the volumes have the status note "Regenerating" displayed while the information is being copied from the Disk 0 to Disk 1. The volume of the new mirror is automatically sized by the system to the same size as that of the original boot and system volume.

5. When the following message is displayed, click OK.

DISK MANAGEMENT

You have mirrored your boot volume. To be able to boot from the mirrored disk, add the appropriate entry to the boot.ini file

Creating a Boot Disk

If the mirrored boot volume is lost, to set up a new mirror set you will need a fault-tolerant boot floppy disk. See your Windows 2000 Server documentation for instructions on creating a fault-tolerant boot disk.

System Recovery

If the volume containing the Windows 2000 Server system files is mirrored and then lost, Notify will continue to function normally. However, now your system is no longer fault tolerant: if the remaining volume is lost, all your data is lost also.

So it is safest at this point to break the current mirror set, configure a new boot and system partition, and create a new mirror.

1. Shut down the PC.
2. Replace the lost hard disk if needed.

Increasing PC Reliability by Using RAID (Cont.)

3. Use your fault-tolerant boot disk to point to and boot the remaining healthy volume.

Once you have successfully restarted Windows, the files and directories on the mirror drive are available for normal disk operations. Even if the disk containing the primary partition is lost, no differences are apparent (unless you examine the status information displayed in Disk Management).

4. Open Disk Management.
5. Select the mirror set volume and break the mirror
6. Configure a new mirror set.

References

Windows 2000 Server documentation/Help

How To Mirror the System and Boot Partition (RAID1) in Windows 2000
(Microsoft Knowledge Base Article [302969](#))

Booting From Mirror After Primary Partition Is Lost
(Microsoft Knowledge Base Article [113977](#))

Steps to Recover a Failed Mirrored System/Boot Partition
(Microsoft Knowledge Base Article [120227](#))