

image **SAN**TM

User's Guide
for Windows® 2000/XP

January 7, 2003

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Title:	ImageSAN User's Guide
Software version:	ImageSAN 1.5
Publication Number:	
Date:	January 7, 2003

Manual Revision and Control

Revision Record

Rev.	Date	Description	Page	Revised by
01	7/24/2002	Initial Draft		

toc

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1

ImageSAN Software

In today's digital world, the amount of storage required to support each new advance is constantly growing. Storage costs are surpassing both resources and budget, adding more pressure to an evolving environment. With the introduction of new architectures, such as Network-Attached Storage and Storage Area Networks, businesses can finally obtain cheaper, more scalable alternatives for their ever-growing data requirements.

Designed to leverage the benefits of the SAN architecture, ImageSAN presents the tools for a superior networking. An unique approach to arbitrating data, ImageSAN provides a substantial boost in performance and reliability.

ImageSAN offers a wide and flexible range of application support, ensures a fault-tolerant environment, and delivers a parallel and fast file processing.

What's New in ImageSAN 1.5?

This section describes the new features added to ImageSAN 1.5 for Windows® 2000/XP:

Support for ATTO 2300 HBA

ImageSAN 1.5 now adds the ATTO 2300 Host Bus Adapter (HBA) to the family of supported hardware.

Master/Client Terminology Change

The terms Master/Slave introduced in ImageSAN 1.0 are very common in programming documentation, when referring to arrangements in which one device depends on another as a master/slave arrangement, or to the controlling device as the master and the controlled device as the slave. As this is common

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Faster Failover

The improved mechanism for communication between master and client computers provides better optimization options for your SAN. Due to reduced global timeout values you set on the Advanced Settings dialog, the failovers are much faster compared to ImageSAN 1.0. For more details, see “Optimizing the SAN” on page 34.

Transparent Failover

The new transparent failover feature of ImageSAN 1.5 allows seamless reconnection of volume clients to new volume master in case of master failure. The process is transparent to currently running applications that use data stored on the SAN storage. For more information, refer to “Failover” on page 11.

Improved Dynamic Disks Support

ImageSAN 1.5 provides improved support for dynamic disks. Due to the innovative filter of ImageSAN 1.5 a configuration of local dynamic disks together with dynamic disks on the shared storage is allowed. The management of dynamic disks is fault-

resistant and much easier. With ImageSAN 1.5, local dynamic disks hold configuration information for both local and SAN disks, but dynamic SAN disks hold configuration for SAN disks only. Thus users can introduce changes in the Logical Disk Manager (LDM) database of their local dynamic disks without having to enter the Administrative Mode. For more information, see “Working With Dynamic Disks” on page 43.

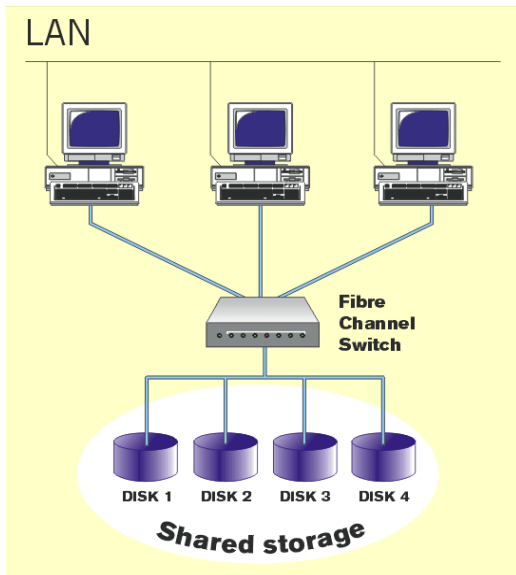
Architectural Overview

Created specifically to work with Windows® 2000, and Windows® XP operating systems, ImageSAN works transparently to the users and applications accessing the shared storage. Shared files are available directly over Fibre Channel for all connected workstations to use.

In a typical ImageSAN configuration, workstations are interconnected over the LAN, via which meta-data requests are processed. In addition, you can specify the types of files to be redirected from the SAN to travel over the LAN. The rest of the data traffic is supervised by the masters of the different

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volumes and travels over Fibre Channel directly to the requestor.



The first workstation to connect to the network is assigned the storage volumes and becomes master. Workstations in an ImageSAN network can be clients for one and masters of another volume of the shared storage.

In the case of a failure of a master, a backup master is elected to take over all operations. Apart from the machines set to work in client-only mode, all other workstations can be elected as masters.

Concepts and Terminology

The following concepts and terminology are used in this guide:

Volume Master

A *volume master* or *master* is that workstation connected to the Storage Area Network (SAN) that

supervises a specific volume and takes care about data protection. The master workstation creates a system share for the volume it is assigned to in order allow other ImageSAN machines to access the volume. The master processes all metadata requests from the client workstations and provides the necessary information to them so they can access the data stored on the shared volume directly through the Fibre Channel. It is the workstation that takes care about data protection on the volume(s) it is assigned to supervise.

Any of your ImageSAN workstations can be a volume master except for the computers that are set to work in *client-only* mode. In the case your storage contains multiple volumes, it is possible different masters to be assigned to the different volumes. This means that it is not necessary one and the same computer to be master of all volumes on your storage.

Note: *Each volume can have a single master at a time.*

Due to the failover mechanism ImageSAN offers, the master of a volume can change dynamically. In case of a failure of the master workstation or scheduled down-time, one of the other ImageSAN machines takes the place of the volume master and begins to process the metadata requests from client machines.

Volume Client

In an ImageSAN network, a single workstation, called *master*, supervises a specific volume. When the other ImageSAN machines try to access the data on the shared volume, they send a request to the volume master. Since all these machines depend on the permission and information provided by the master, they are called *volume clients* or *clients*.

The client workstations send metadata requests to the master through the Local Area Network (LAN) but accesses data on the shared storage directly across the Fibre Channel.

Each volume can have a single master and multiple client workstations connected to it. An ImageSAN workstation can play the role of master for one volume and client for another.

Metadata Requests

Metadata is data about data. For example, the file size, title, the physical location of a file on a disk and etc. constitute metadata about the file.

In an ImageSAN network, when a client workstation tries to access a file on the shared storage, it sends a query, or *metadata request*, to the master of a specific volume about the exact location of the file on the physical disks. The master workstation provides the requested metadata and the client accesses the file.

All metadata traffic - requests and replies - goes across the LAN. The real data, however, travels through the Fibre Channel.

Failover

In an ImageSAN network a single computer is master for a specific SAN volume and serves all metadata requests coming from clients when they try to access this volume. In case of a failure of the current volume master ImageSAN software detects this event and enters a procedure for electing a new master for the SAN volume to ensure the access of the remaining computers on the network. After the election procedure is over, a new master is appointed and it begins to serve the metadata requests coming for client workstations. The process of transferring the mastership of a volume from one computer to another is called *failover*.

When Does ImageSAN Fail Over?

ImageSAN tries to fail over in the following cases:

- Scheduled shut-down of the master computer.

- Failure of the master computer (power failure, blue screen, etc.).

- Failure of the FC HBA or FC cable on the master computer.

ImageSAN does not fail over in the case of LAN failure since it cannot be determined whether the problem is at the master side, client side, or there is a major problem with the entire network (for example, an Ethernet switch has failed). If the connection between computers over the LAN fails, the current master of a specific SAN volume keeps its role ensuring that there is a single computer that can access the volume. All other volume clients are disconnected from the volume to prevent data corruption.

Types of Failover

In ImageSAN we distinguish the following types of failover:

- standard failover
- transparent failover
- real-time failover

The *standard* failover implemented in ImageSAN 1.0 is automatic and ensures high availability of your SAN. However, it is related to temporary inaccessibility of SAN volumes by client computers during the election of a new master. While a SAN volume is in procedure for electing a new master, applications that try to access data on this volume receive errors. Any handles open by these applications are lost and they are not redirected to the new master when it is elected. This means that if a file is open on a client computer and a failover takes place, you need to reopen the file in order to continue working with this file.

ImageSAN 1.5 implements a new mechanism for failover that allows redirecting open handles to the

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new master of a volume. During the failover process requests for access to the SAN volume coming from client computers are not rejected but just delayed till a new master is appointed. This type of failover is called *transparent* - new master is appointed absolutely transparently to all running applications and they can continue working with any open files after the fail over takes place. This type of failover is especially useful for video rendering applications and applications that can tolerate small delays in the execution of specific operations, such as open file or close file.

When failover does not cause delays in the normal functioning of the currently started applications, we call it *real-time failover*. Real-time failover is important for broadcast servers or applications that digitize video material for example. However, it depends not only on ImageSAN but also the way applications implement certain operations.

Generally, with ImageSAN 1.5 you can expect real-time failover for read operations, although they are also application dependent. This means that if an application on a client computer plays a video clip from a SAN volume, it will continue playing it during the failover and after the election of a new volume master. How real-time is failover for write operations depends on the size of the allocated buffer (see “Allocation Optimization Size” on page 23) and when failover takes place. If failover starts when a write operations is at the beginning of the allocation buffer and the new master is elected before the write operation reaches the end of the allocation buffer, the entire process will be real-time as far as the work of the writing application will not be delayed.

Client-Only Mode

In an ImageSAN network, you can specify workstations that you do not want to participate in the fail-over procedures as backup volume masters.

For this, you need to prevent these workstations from becoming masters (for instructions how to set this option, see “Setting the Client-Only Mode” on page 33). An ImageSAN workstation that is prohibited to become a master works in *client-only mode* and it can never become a volume master.

In a SAN configuration with a dedicated master of the storage volumes, which works in *master-only mode*, it is recommended to set the other workstations to work in client-only mode. Otherwise, in case of master failure the other machines will try to become masters and finally, when one of them succeeds, the dedicated master will not be able to connect to the SAN after the recovery.

For more information about SAN configuration with dedicated master, see “Master-Only Mode” on page 12.

Master-Only Mode

In an environment where the uninterruptable availability of the shared storage is not an issue of the highest priority, you can configure your SAN with a dedicated master workstation of all shared volumes and multiple client workstations. In such a situation the dedicated workstation can never become a volume client and it works in *master-only mode*. To see how to set the computer to work in master-only mode, refer to “Setting the Master-Only Mode” on page 32.

If you configure your SAN with a dedicated master, you decline to use the fail-over mechanism ImageSAN offers. However, the master-only mode also provides advantages. A master-only workstation can perform scheduled disk maintenance operations, such as defragmentation or check disk, automatically without the need to enter *administrative mode*. To perform these operations from an ordinary master, you need to shut down all other workstations during the maintenance procedures. To see how to perform

disk maintenance operations in an ImageSAN network, see “Volumes Maintenance” on page 39.

When you set a specific computer to work in master-only mode, it is recommended to set the other ImageSAN workstations to work in client-only mode. Otherwise, if there is another computer in the SAN that is allowed to become volumes master, it can be elected as a master during a restart of the dedicated master workstation, for example. Since the master-only workstation cannot become a client, it will not be able to connect to the SAN and the shared storage will remain inaccessible to that workstation until you restart the current master or change the settings of the master-only machine.

Standalone Mode

When a single ImageSAN workstation is currently connected to the SAN, it works in *standalone* mode. The standalone mode, in combination with the *administrative mode*, allows you to perform disk maintenance operations such as disk defragmentation or check the disk for errors. You can also create or delete volumes, operations that you cannot perform in master-only mode.

For more information about administrative mode, see “Administrative Mode” on page 13.

For more information about master-only mode, see “Master-Only Mode” on page 12.

To see how to perform disk maintenance operations in an ImageSAN network, refer to “Volumes Maintenance” on page 39.

In order a specific workstation to enter the standalone mode, do the following:

- Allow that workstation to become volume master. To see how to set allow a specific workstation to become a master, refer to “Setting the Client-Only Mode” on page 33.

- Turn off all other ImageSAN workstations.

Administrative Mode

The *administrative mode* is the mode in which you can perform disk maintenance operations such as check disk or disk defragmentation. You can also create or delete volumes.

You can switch to administrative mode, only when your ImageSAN workstation is running in standalone mode.

To enter the administrative mode, you must log on to the computer with an account that has administrative privileges. That is why, the administrative mode of ImageSAN provides additional security protection of the volumes on the shared storage.

To see how to perform maintenance operation, refer to “Volumes Maintenance” on page 39.

Public Disk

A *public disk* is a physical disk on the shared storage for which ImageSAN provides data protection and it can mount that disk. The public disks are shared between all ImageSAN workstations.

When you want to mount a specific volume, you should make public all disks from the volume. To see how to change the state of a physical disks, refer to “Setting Disks to Public Mode” on page 30.

Private Disk

A *private disk* is a physical disk for which ImageSAN does not provide data protection. Choose the private mode when you have a disk on the shared storage and it contains data that you do not want to share with other ImageSAN users. ImageSAN does not manage this disk but allows the system to mount it. If this option is selected, the system mounts the disk and

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you are able to work on. Make sure to make private all disks from a volume.

Warning: *Be careful when using the Private disk state. Before you make a disk Private on one workstation, make sure that it is in Not Available state on all other ImageSAN workstations. Otherwise data corruption is possible.*

To see how to set a disk in private state, refer to “Setting Disks to Private Mode” on page 31.

Not Available Disk

A disk in *not available* state is a physical disk that ImageSAN does not mount but it protects its data. A disk in not available state cannot be mounted by the operating system.

To see how to set a disk in not available state, refer to “Setting Disks to “Not Available” Mode” on page 31.

Share Redirection Account

A *share redirection account* serves for presenting workstations outside the SAN before the volumes master when accessing SAN drives shared by client workstations through the Local Area Network. If a share redirection account is not provided, the computers not connected to the SAN are not able to access the SAN drives shared by client workstations.

By default, the built-in Guest account without password is set as share redirection account. To see how to change this account, refer to “Enabling Share Redirection” on page 37.

Fallback Account

A *fallback account* is a user account that is used from a client workstation when accessing the shared storage if the account of the currently logged user is not recognized by the volume(s) master workstation. Fallback accounts should be used in a workgroup network configuration.

By default, the built-in Guest account without password is set as fallback account. Change this setting in accordance with the security policy of your network. To see how to enable the fallback logging on a client workstation, refer to “Enabling a Fallback Login” on page 37.

SAN Table

A *SAN table* stores information about the current volume master, connected clients, the communication port for the volume and etc. ImageSAN creates a SAN table for each volume it manages.

To view the contents of a SAN table, display the Properties dialog for the respective volume in ImageSAN. You can also use ISANUtil to view the contents of a volume’s SAN table. For details about Volume Properties dialog, see “Volume Properties Dialog” on page 25. To see how to work with ISANUtil, refer to “Working with ImageSAN Utility” on page 38.

Volume Table

ImageSAN creates a table, called *volume table*, for all volumes it manages. The volume table is created and updated dynamically. ImageSAN loads the volume table in the computer’s memory.

The contents of a volume table is displayed in the ImageSAN application window. You can also use ISANUtil to view the contents of a volume table. To see how to work with ISANUtil, refer to “Working with ImageSAN Utility” on page 38.

What’s New in ImageSAN 1.5?

This section describes the new features added to ImageSAN 1.5 for Windows® 2000/XP:

Support for ATTO 2300 HBA

ImageSAN 1.5 now adds the ATTO 2300 Host Bus Adapter (HBA) to the family of supported hardware.

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- ImageSAN 1.5 provides improved support for dynamic disks. Due to the innovative filter of ImageSAN 1.5 a configuration of local dynamic disks together with dynamic disks on the shared storage is allowed. The management of dynamic disks is fault-resistant and much easier. With ImageSAN 1.5, local dynamic disks hold configuration information for both local and SAN disks, but dynamic SAN disks hold configuration for SAN disks only. Thus users can introduce changes in the Logical Disk Manager (LDM) database of their local dynamic disks without having to enter the Administrative Mode. For more information, see “Working With Dynamic Disks” on page 43.

System Requirements

To run, ImageSAN administration software your computer must meet the following minimum requirements:

- PC with a PII with a 300 MHz (megahertz) processor clock speed
- no support for Microsoft Windows® 95, Windows® 98 or Millennium Edition, and Windows® NT 4.0.
- For Microsoft Windows® 2000:
 - 64 MB of RAM minimum
 - You must be running Service Pack 2
- For Microsoft Windows® XP:
 - 64 MB of RAM minimum
- Mouse
- Network LAN connection

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Important: Configuration between two computers connected with a cross cable is not supported.

- CD-ROM drive (if installation is done from a CD-ROM)
- Some components may require additional system resources not outlined above
- Disk-Space Requirements for ImageSAN is only Mb.

Installing and Uninstalling ImageSAN

You can choose between installing a fresh copy of ImageSAN or updating your version of ImageSAN. Before installing ImageSAN, check the system requirements and the prerequisites (see “System Requirements” on page 15 and “Prerequisites” on page 16).

Prerequisites

Before installing ImageSAN make sure that:

- All workstations on which you intend to install ImageSAN are connected through the Local Area Network (LAN) to one and the same domain or workgroup.

Note: Each workstation should have a unique IP address.

- All workstations are running Windows NT®, Windows® 2000 or Windows® XP.
- On each workstation, a QLogic or Emulex Fibre Channel Host Bus Adapter (HBA) is properly installed.
- The SAN switch and all drives are setup.
- All workstations are connected to the storage and see the storage volumes.

Note: On Windows® 2000/XP workstations, all dynamic disks on the remote storage should appear as Online in the Disk Management console prior to installing ImageSAN on them. If there are Foreign or Offline disk, you should import/reactivate them before installing ImageSAN.

- The Guest account is enabled on all workstations.

Any SAN management software is removed from your system (necessary when installing a fresh copy of ImageSAN).

Installing ImageSAN

The procedures for installing ImageSAN are the same for each workstation you want to connect to the Storage Area Network (SAN).

Three ImageSAN setup files are available for the different operating systems:

- ImageSAN_nt.exe for Windows NT.
- ImageSAN_w2k.exe for Windows 2000.
- ImageSAN_xp.exe for Windows XP.

You should run the setup file corresponding to the operating system installed on the computer on which you want to setup ImageSAN.

To prevent data loss, you should not allow ImageSAN and non-ImageSAN workstations to access the shared storage simultaneously. Install ImageSAN on one computer at a time.

Note: Since Windows® XP does not support Basic volumes with spanned or stripe layouts, it is recommended to prevent Windows XP machines of mounting such volumes. Remove the drive letters of these volumes from the Computer Management console before installing ImageSAN.

After having selected a computer on which to install ImageSAN, do the following:

To install ImageSAN:

1. Shut down all other computers.
2. On the selected computer, log on using an account with administrative privileges.
3. On the Start menu, click Run.
The Run dialog appears.
4. In the dialog, type one of the following:
 - X:\path\ImageSAN_nt.exe
 - X:\path\ImageSAN_w2kt.exe
 - X:\path\ImageSAN_xp.exe

Where X:\path is the location where the setup file is stored.

The installation begins.

5. Restart your computer when prompted.
6. Shut down the computer and proceed with the installation on another computer.

When ImageSAN is installed on all computers you can start them.

Uninstalling ImageSAN

To prevent data loss, you should not allow ImageSAN and non-ImageSAN workstations to access the shared storage simultaneously. You can uninstall ImageSAN from all workstations or, after uninstalling it from one workstation, disconnect the Fibre Channel HBA.

To uninstall ImageSAN:

1. Display the Control Panel.
2. Double-click the Add/Remove Programs icon.
3. In the Add/Remove Programs window, select ImageSAN and click the Change/Remove.
4. When prompted, restart the computer.

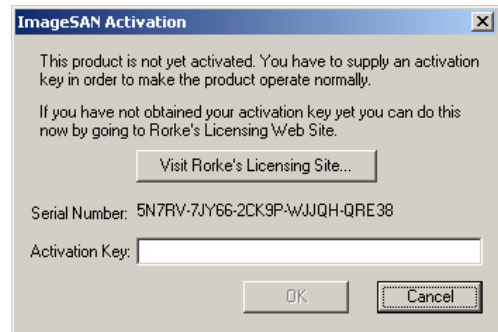
Activating ImageSAN

After installing ImageSAN on your computer you need to activate the product in order to achieve the performance your SAN offers.

Until your copy of ImageSAN is not activated all data is redirected across the Local Area Network (LAN).

To activate ImageSAN:

1. Right-click the ImageSAN icon on the task bar and choose About ImageSAN.
The About ImageSAN dialog appears.
2. On the dialog click Activate.
The ImageSAN Activation dialog appears.



3. (optional) If you have not obtained your activation key yet, click Visit Rorke's Licensing Site to go to the web page of the Licensing Server.
4. In the Activation Key box, type the Activation key generated for your copy of ImageSAN.
5. Click OK.
6. In About ImageSAN dialog, click OK.

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Getting Started

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Starting ImageSAN

When installed, **ImageSAN** starts automatically during startup of the computer and should always be running. When you log on to the computer, the icon of the **ImageSAN** management application appears on the task bar.



ImageSAN icon

Displaying ImageSAN Window

Use ImageSAN window to specify the physical disks that you want **ImageSAN** to manage and to configure different SAN settings.

To display ImageSAN window:

Do one of the following:

- Click on the ImageSAN icon and choose Open.
- Double-click the ImageSAN icon.

The ImageSAN window appears.

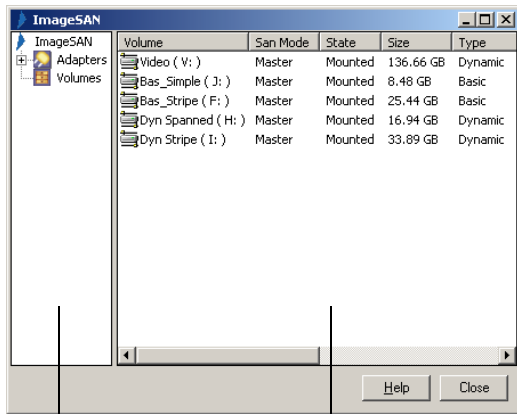
ImageSAN User Interface

This section describes the main interface elements of ImageSAN.

The ImageSAN Window

The ImageSAN window consists of a tree pane and a details pane. The tree pane contains the ImageSAN tree, where the Adapters and Volumes nodes are displayed. If you want to view the details for an item in the tree pane, you must select that item. This will

open the details pane of the window with all the available details for the selected item.



Tree Pane

Details Pane

Tree Pane

The tree pane contains the following tree items:

ImageSAN — The root item in the tree pane provides commands for configuring different SAN settings and managing the your SAN. When selected, the Volumes and Adapters are displayed in the details pane.

Adapters — Adapters item is first level successor of ImageSAN and it is a container of all Host Bus Adapters (HBA) installed on your workstation. When selected, the list of HBAs currently available on your computer is displayed in the details pane.

Adapter(s) — Displays the model of an HBA installed on your workstation. When selected, the list of all physical disks from the storage connected to your adapter is displayed in the details pane. This tree item provides commands for changing the status of the selected HBA. For more information about HBA

or physical disk status, refer to “Concepts and Terminology” on page 10.

Volumes — It is a first level successor of the root item. When selected, the list of all volumes ImageSAN manages appears in the details pane.

Details Pane

The details pane of the ImageSAN window displays information about selected tree items. Depending what tree item is selected, the details pane contains different columns.

The following columns are available in details pane:

Name — When the ImageSAN tree item is selected, this column displays the Adapters and Volumes items.

Host Bus Adapter — Lists all HBAs installed on your computer.

Disk — Displays the name of all physical disks connected to the selected HBA.

Type — Displays the type of volumes that physical disks contain.

Layout — Displays the fault-tolerance type of the volumes.

Status — Displays information about whether ImageSAN manages the respective disks.

Size — Displays the size of physical disks and volumes.

Signature — Displays the serial numbers of physical disks.

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Disk Vendor ID — Displays the identification information provided by the manufacturers of physical disks.

Volume — Displays the label and drive letter of volumes mounted by ImageSAN.

SAN Mode — Displays whether the computer is a master or client for the respective volume.

State — Displays information about whether ImageSAN has succeeded to mount the respective volumes or not.

Device Name — Displays the disk groups from which volumes are created.

Serial Number — Displays volume serial number the operating system has assigned during the format operation of a volume. Each time a volume is formatted, a new serial number is assigned.

ImageSAN Tree Item Commands

The root item context menu provides the following commands:

Administrative mode — Sets ImageSAN in Administrative mode in which you can perform volume maintenance operations such as create, format and defragment volumes, for example. You can enter Administrative mode only if your workstation is a standalone master and you are logged on to it with an account that has administrative privileges.

SAN Settings — Displays the ImageSAN Settings dialog allowing you to configure your ImageSAN. To be able to use this command, you should be logged with an account that has administrative privileges on your computer. For more information about the

options the ImageSAN dialog offers, refer to “ImageSAN Settings Dialog” on page 23.

Advanced Settings — Displays the ImageSAN Advanced Setting dialog allowing you to configure settings that affect the failover latency of ImageSAN. When modifying the Advanced Settings, make sure to use the same values on all ImageSAN workstations. To be able to use the Advance Settings dialog, you should be logged on your computer with an account that has administrative privileges. For more information about the options the ImageSAN Advanced Settings dialog provides, refer to “ImageSAN Advanced Settings Dialog” on page 24.

Security Settings — Displays the ImageSAN Security Settings dialog allowing you to set a Fallback and Share Redirection account. To be able to use the Security Settings command, you should be logged on your computer with an account that has administrative privileges. For more information about ImageSAN Security Settings dialog, see “ImageSAN Security Settings Dialog” on page 24.

Refresh — Use to update the ImageSAN tree and details pane to see the current status of volumes or after you modify any of the settings. Note that any changes you make in ImageSAN take effect after restarting the computer.

About ImageSAN — Displays the ImageSAN About dialog allowing you to view version information about your copy of ImageSAN and register your ImageSAN.

Adapter and Physical Disk Commands

Private — Use to prevent ImageSAN to manage a disk or HBA but allow the system to mount the disks connected to your HBA. If this option is selected, the

system mounts the disks and you are able to work on them but ImageSAN does not take care about data protection. Make sure to make private all disks from a volume.

Warning: *Warning: Be careful when using the Private command. Before you make a disk Private on one workstation, make sure that it is in Not Available state on all other ImageSAN workstations. Otherwise data corruption is possible.*

Public — Use to allow ImageSAN to mount and manage the selected disk or adapter. Make sure to make public all disks from a volume.

Not Available — Use to prevent ImageSAN and the system from managing an HBA or selected disk(s).

Volume Commands

Properties — Displays the Volume Properties dialog allowing you to view information about the selected volume and preform simple performance tests.

ImageSAN Dialogs

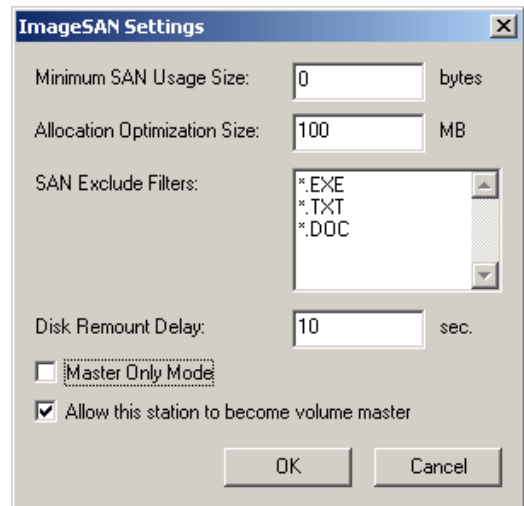
This section describes all ImageSAN dialogs and explains the options they provide.

ImageSAN Settings Dialog

Use ImageSAN Settings dialog to configure SAN options for the computer you are logged on.

To display ImageSAN Settings dialog:

In ImageSAN window, right-click the ImageSAN tree item and choose SAN Settings.



The SAN Settings dialog provides the following options:

Minimum SAN Usage Size — Displays size in KB. When applications or the system write blocks with size that is below the specified, the write operations are redirected across the Local Area Network (LAN).

Allocation Optimization Size — Displays size in MB. Use to adjust the size of the buffer to be allocated on a SAN drive when write operation is performed. When an application reaches the allocation size while performing a write operation, a new buffer with the specified size is allocated on the SAN drive.

SAN Exclude Filters — Displays a list of file extensions. Use this option to specify file types to be redirected across the LAN.

Disk Remount Delay — Displays the maximum delay for starting the fail-over procedure in seconds. Use this setting to specify a time tolerance for

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connection failures between the master and clients or master and the storage.

Note: *It is recommended to use the same value for remount delay on all workstations.*

Master Only Mode — Choose to appoint the computer as master of the shared storage volumes in a SAN configuration with a dedicated master. When this option is selected, the workstation can never become a volume client.

Allow this station to become volume master — Disable this option to prevent the computer from becoming a master of SAN volumes.

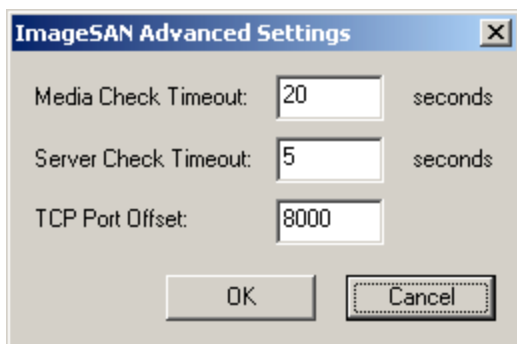
ImageSAN Advanced Settings Dialog

Use the ImageSAN Advanced Settings dialog to configure settings global for the SAN.

Note: *For ImageSAN to work properly, the settings on the ImageSAN Advanced Settings dialog should be the same on all machines, connected to the SAN.*

To display the ImageSAN Advanced Settings dialog:

In ImageSAN window, right-click the ImageSAN tree item and choose Advanced Settings.



Media Check Timeout — Displays the time interval at which the master updates the SAN table on disks

indicating it is still master of the respective volume. If the connection between the master and storage fails, other computers wait for that interval and then try to become master. The interval should be at least 20 seconds.

Warning: *Warning: The value should be the same on all ImageSAN machines.*

Master Check Timeout — Displays the interval at which computers check each other through the LAN. It can be between 5 and 30 seconds.

Warning: *Warning: The value should be the same on all ImageSAN machines.*

TCP Port Offset — Displays the starting port the master machine uses to communicate with the other computers when exchanging metadata. A separate communication port is assigned to each volume. For example, a computer is master of two volumes. The connection between machines for the first volume will be established at port 8000 and for the second it will be established at port 8001.

Note: *Note: You should change the TCP Port Offset only if another application communicates over any of the ports that ImageSAN uses. If this is the case, you should choose another TCP Port Offset and set it on all computers connected to the SAN.*

ImageSAN Security Settings Dialog

Use this dialog to specify a fallback account a client machine to use when connecting to the master workstation in a Workgroup environment. For a definition of fallback accounts, see “Fallback Account” on page 14. To see how to enable the fallback logging, refer to “Enabling a Fallback Login” on page 37.

You can also specify an account to represent non-SAN workstations before the master computer when accessing drives shared on a client workstation. For a

definition of share redirection accounts, see “Share Redirection Account” on page 14. To see how to enable the share redirection, refer to “Enabling Share Redirection” on page 37.

To display ImageSAN Security Settings dialog:

In ImageSAN window, right-click ImageSAN tree item and choose Security Settings.

Enable Fallback Login — Enable this option to allow the access from client workstations to the SAN drives with a reserve account when the access for account of the currently logged user is denied.

User Name — Displays the user name for the Fallback account. By default, the Guest account without password is set as Fallback account.

Password — Provides space for you to type a password for the Fallback account.

Confirm Password — Provides space for you to re-type the password for the Fallback account.

Enable Share Redirection — Enable to allow the redirection of metadata requests to the master coming from non-SAN workstations that access SAN drives through the LAN shared by a client workstations.

User Name — Displays the user name for the Share Redirection account. By default, the Guest account without password is set as Fallback account.

Password — Provides space for you to type a password for the Share Redirection account.

Confirm Password — Provides space for you to re-type the password for the Share Redirection account.

Volume Properties Dialog

Use the Volume Properties dialog to view detailed information about the selected volume. You can also test the data rate for the selected volume to check if data is transferred through the SAN.

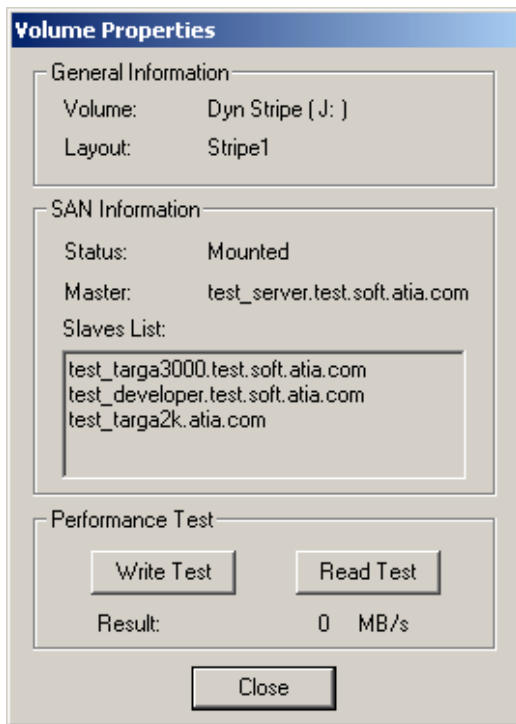
To display Volume Properties dialog:

1. In ImageSAN window, expand the ImageSAN tree item.
2. Select the Volumes tree item.

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3. In the details pane, right-click a volume and click Properties.

The Volume Properties dialog appears.



Volume — Displays volume label and the drive letter.

Layout — Specifies the fault tolerance type of the selected volume.

Status — Displays the current mount status of the volume.

Master — Displays the name of the volume's master workstation.

Clients List — Lists all client workstations that have mounted the selected volume.

Write Test — Use to test the approximate performance of your SAN with write operations on the selected volume. The results are displayed in MB/s. Since the tests is too short the displayed result should not be considered as absolute figure for SAN performance. It only serves to give an idea about the possible data rates at the current moment.

Read Test — Use to test the approximate performance of your SAN with read operations on the selected volume. The results are displayed in MB/s. Since the tests is too short the displayed result should not be considered as absolute figure for SAN performance. It only serves to give an idea about the possible data rates at the current moment.

About Dialog

The About dialog displays version information of your copy of ImageSAN, registration status and serial number. You can also use the dialog to register ImageSAN.

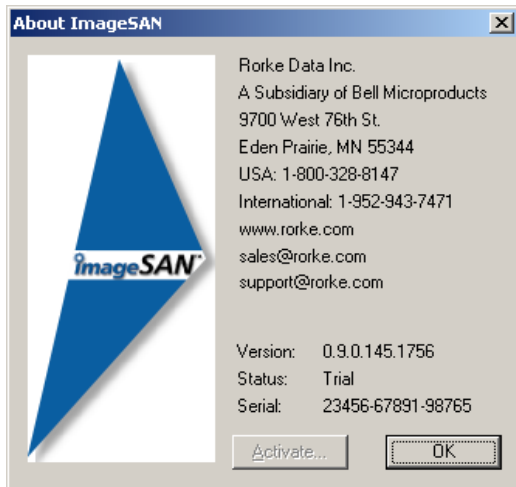
To display the About dialog:

Do one of the following:

- Right-click the ImageSAN icon on the task bar and choose About ImageSAN.

- In ImageSAN window, right-click the ImageSAN tree item and choose About ImageSAN.

The About dialog appears.



Version — Displays the version and build number.

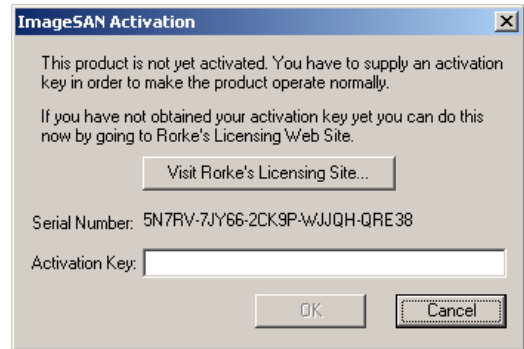
Status — Displays the activation status of your copy of ImageSAN - Not Registered, Trial, Expired and etc.

Serial — Displays the serial number of your copy of ImageSAN. You need this number when providing registration information to activate ImageSAN.

Activate — Use to display the ImageSAN Activation dialog in order to activate ImageSAN, or upgrade it from a trial to registered version. The command is not available if your copy of ImageSAN is already activated.

ImageSAN Activation Dialog

Use the ImageSAN Activation dialog when you want to activate your copy of ImageSAN or upgrade it from a trial version.



Visit Rorke's Licensing Site — Starts your default Internet browser and loads the Internet page of Rorke's Licensing Server. From this site, you can obtain an activation key for your copy of ImageSAN.

Serial Number — Displays the serial number of your copy of ImageSAN. The activation key you receive, corresponds to this serial number.

Activation Key — Provides a space for you to enter the activation key for your ImageSAN.

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3

Overview

With ImageSAN, you can execute tasks, such as scanning and protecting disks by specifying the physical disks ImageSAN to manage. You can also optimize the SAN usage and define backup masters or configure security options for your SAN.

After the installation of ImageSAN, the ImageSAN icon appears on the task bar. Double-clicking on the ImageSAN icon, opens the ImageSAN window, where you can view and modify the settings for Host Bust Adapters, disks, and volumes.

Adapter Control

With ImageSAN, you can scan Fibre Channel Host Bus Adapters (HBAs) and set disks to different modes.

ImageSAN automatically displays a list of all HBAs on the system. By double-clicking on an HBA on this list, you can also view what disks are maintained by it.

This information is visible for all network workstations that have ImageSAN installed on them; Administrative privileges are not required.

You have the option of setting disks to Public, Private, and Not Available modes. For more information about disk modes, see “Concepts and Terminology” on page 10.

Setting Disks to Public Mode

To allow your workstation to use a disk on the shared storage, you must set that disk to Public mode. This way a connection between your workstation and the disk is established and you are set to work with the data, contained on the disk. If you do not set any disks in Public mode, you will not be able to access the shared storage.

In ImageSAN you can set the disks to Public mode one by one or you can set the Host Bus Adapter to Public mode, thus allow the mounting of all disks connected to the HBA.

To set an HBA to Public Mode:

1. Log on to the computer with an account that has administrative privileges.
2. Open the ImageSAN window.
3. Expand the ImageSAN tree and right-click the HBA you want to set to Public mode.
4. From the popup menu, choose Public.
5. Restart your computer in order for the changes to take effect.

To set a disk to Public mode:

1. Log on to the computer with an account that has administrative privileges.
2. Open the ImageSAN window.
3. Expand the ImageSAN tree and select the HBA the disks of which you want to manage.
4. In the list pane, right-click a disk and choose Public.
5. Restart your computer in order for the changes to take effect.

Setting Disks to “Not Available” Mode

When you want to terminate a connection to a particular disk on the shared storage, you must set that disk to Not Available mode. You can perform this operation in the ImageSAN window of your computer.

In ImageSAN you can set the disks to Not Available mode one by one or you can set the Host Bus Adapter

to Not Available mode and thus prevent the mounting of all disks connected to the HBA.

To set an HBA to Not Available mode:

1. Log on to the computer with an account that has administrative privileges.
2. Open the ImageSAN window.
3. Expand the ImageSAN tree and right-click the HBA you want to set to Not Available mode.
4. From the popup menu, choose Not Available.
5. Restart your computer in order for the changes to take effect.

To set a disk to Not Available mode:

1. Log on to the computer with an account that has administrative privileges.
2. Open the ImageSAN window.
3. Expand the ImageSAN tree and select the HBA the disks of which you want to manage.
4. In the list pane, right-click a disk and choose Not Available.
5. Restart your computer in order for the changes to take effect.

Setting Disks to Private Mode

Use the Private disk mode to make your workstation the sole user of a disk.

Warning: *Before setting a disk to Private mode, make sure that no other workstation is using it. If another workstation is using the disk, do not under any circumstances set the disk to Private mode because this can lead to data corruption.*

In ImageSAN you can set the disks to Private mode one by one or you can set the Host Bus Adapter to Private mode and thus prevent ImageSAN from protecting data on all disks connected to the HBA.

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To set an HBA to Private mode:

1. Log on to the computer with an account that has administrative privileges.
2. Open the ImageSAN window.
3. Expand the ImageSAN tree and right-click the HBA you want to set to Private mode.
4. From the popup menu, choose Private.
5. Restart your computer in order for the changes to take effect.

To set a disk in Private mode:

1. Log on to the computer with an account that has administrative privileges.
2. Open the ImageSAN window.
3. Expand the ImageSAN tree and select the HBA the disks of which you want to manage.
4. In the list pane, right-click a disk and choose Private.
5. Restart your computer in order for the changes to take effect.

Configuring the SAN

With ImageSAN you can choose between two configurations when setting up your SAN:

- SAN with a dedicated master for all shared volumes,
- or SAN with dynamically changing masters of volumes in the case of failure or scheduled downtime of the current volume master(s). This configuration is called SAN with failover.

When ImageSAN is installed, it is set for the SAN with failover configuration and all workstations are allowed to become volume masters.

Choose the configuration with dedicated master when you have a networks management machine that

is set to perform scheduled disk maintenance operations automatically. Such a workstation can be a network server machine, for example. You should set ImageSAN to work in master-only mode on that computer and the other ImageSAN workstations should be set to client-only mode. When an ImageSAN workstations works in master-only mode, it can perform scheduled disk maintenance operations automatically without the need to enter the Administrative mode. For more information about master-only and administrative modes, see “Concepts and Terminology” on page 10.

To configure your SAN with dedicated master, do the following:

- On the network management machine, set ImageSAN to master-only mode. To see how to set an ImageSAN workstation to master-only mode, refer to “Setting the Master-Only Mode” on page 32.
- Set all other workstations to client-only mode. To see how to set an ImageSAN workstation to client-only mode, refer to “Setting the Client-Only Mode” on page 33.

Setting the Master-Only Mode

An ImageSAN workstation set to work in master-only mode can never become a client, and is only operative as volumes master.

If a workstation is set to master-only mode, it is recommended that all other network machines be set to work in client-only mode. If, for some reason, a master-only workstation loses the connection to its volumes, and there are other network machines which can obtain master status, these machines will become masters of the volumes. As a result, the master-only machine cannot use the shared storage because it is no longer the volumes’ master and it cannot become a client machine. To avoid such a

scenario, all network machines except the master-only workstation, should be set as clients.

If you choose to configure your SAN with a dedicated master workstation, do the following:

1. Shut down all the machines connected to the SAN but one, which you intend to set in master-only mode.
2. Set the workstation in master-only mode.
3. Start the rest of the ImageSAN machines one by one and set them to work in client-only mode (see “Setting the Client-Only Mode” on page 33).

To set a workstation to master-only mode:

1. Log on to the computer with an account that has administrative privileges.
2. Open ImageSAN window.
3. Right-click the ImageSAN tree item and choose SAN Settings.
The ImageSAN Settings dialog appears.
4. Enable the Master Only option.
5. Restart the workstation.

Setting the Client-Only Mode

When installed, ImageSAN is set for a SAN configuration with failover. In case you want to setup SAN with dedicated volumes master or you want to prevent some of your workstations to participate in the failover procedures, you should set them to work in salve-only mode.

If you log on to a computer, using an account with administrative privileges, you can determine whether the workstation can become a volume master when necessary.

To set a workstation to client-only mode:

1. Log on to the computer with an account that has administrative privileges.
2. Open ImageSAN window.
3. Right-click the ImageSAN tree item and choose SAN Settings.
The ImageSAN Settings dialog appears.
4. Disable the Allow this station to become volume master option.
5. Restart your computer for the changes to take effect.

Specifying TCP Offset Port

If an ImageSAN workstation is a master of several volumes of storage, it uses different ports for each volume to exchange metadata with other workstations. You can specify the starting, or the first port for one of your volumes, after which the remaining volumes are automatically assigned ports. Specify a different port offset for communication between ImageSAN workstations in order to solve conflicts with other applications using the ImageSAN default ports.

Note: *You should change the TCP Port Offset only if another application communicates over any of the ports used by ImageSAN. If this is the case, you should choose another TCP Port Offset and set it on all computers connected to the SAN.*

To change the TCP Port Offset, you need to log on the computer with an account that has administrative privileges.

To specify the TCP Offset Port:

1. Open the ImageSAN window.
2. Right-click the ImageSAN item and choose Advanced Settings.
The ImageSAN Advanced Settings dialog appears.

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3. In the TCP Offset Port field, specify the starting port.
4. Restart the workstation.

Optimizing the SAN

You use the ImageSAN Advanced Settings dialog to configure settings global for the SAN. You can specify the Media Check Timeout and the Server Check Timeout to optimize the performance of the SAN.

Use the ImageSAN Settings dialog to specify different options in order to optimize the access to the SAN storage of a specific computer.

Specifying Disk Remount Delay

Use the disk remount delay option to make ImageSAN less sensitive to short-term hardware failures such as temporary loss of connection between the master and the shared storage or the other ImageSAN workstations, for example.

The *disk remount delay*, specified in seconds, is the interval during which a volume master retries to keep its master status in case of hardware failures. If the specified interval has passed and the problem still persists, the master workstation renounces the ownership of its disk permanently allowing the other workstations to compete for master status.

The disk remount delay increases the time for electing a new volumes master if the current master loses its state.

You can specify a disk remount delay value from 0 to 120 seconds. The bigger value you set, the less sensitive to short-term failures becomes ImageSAN.

When you set the value to 0 seconds, you actually turn off this setting and the master workstation will resign instantly after the failure.

Note: (*Windows® 2000 and Windows® XP specific issues*) When the SAN is restored, dynamic disks of the master (if existing) will appear to be offline. To make them appear online again, you must restore their status from the Computer Management console.

It is recommended to set the same value for disk remount delay on all ImageSAN workstations.

You can specify a disk remount delay value in the ImageSAN Settings dialog, where the default value is set to 10 seconds.

To specify a Disk Remount Delay value:

1. Log on to the computer with an account that has administrative privileges on the computer.
2. Open the ImageSAN Settings dialog.
3. In the Disk Remount Delay field, specify value between 0 and 120 seconds.
4. Click OK.
5. Restart the workstation.

Specifying Media Check Timeout

Media check timeout is the time interval at which masters of volumes update the information on the volumes they supervise, confirming their master status to the other network machines. This is also the time interval at which client workstations check if the current master is still controlling the volume it is assigned to. If the connection between a master and the storage is interrupted, the other workstations wait for the specified interval to pass, and if the SAN tables are not updated promptly, a backup master is elected.

The media check timeout interval is a trade-off between the flexibility of the fail-over mechanism of ImageSAN and SAN performance. The smaller you make the media check timeout interval, the faster will be the response of all ImageSAN workstations to Fibre Channel connection failures. However, the

more frequent checks increase slightly the traffic through the Fibre Channel.

Increasing the time interval may lead to slightly improving the performance of your SAN but in cases of master failure the fail-over mechanism is delayed. Besides, the time for mounting SAN volumes during boot of SAN connected computers is increased. This results in Mount Pending status displayed for a longer time in the ImageSAN window and the volumes become accessible after a delay equal to the specified media check timeout.

Warning: *The interval should be the same for all ImageSAN machines and its values should be between 20 and 180 seconds.*

The Media Check Timeout is set for each ImageSAN workstation locally. This operation must, however, be performed on one workstation at a time, while all other machines are shut down.

To specify the Media Check Timeout:

1. Shut down all workstations but one.
2. Open the ImageSAN window.
3. Right-click the ImageSAN item and choose Advanced Settings.
The ImageSAN Advanced Settings dialog appears.
4. In the Media Check Timeout field, specify the value between 20 and 180 seconds.
5. Restart the workstation.

Specifying Master Check Timeout

You can specify the time interval, at which the master workstation periodically establishes connection with each ImageSAN workstation to check if the client workstations are still accessible over the LAN.

Note: *The value must be the same on all ImageSAN machines and should be between 5 and 30 seconds.*

The smaller you make the master check timeout interval, the faster will be the response to any connection failures. However, more frequent checks increase slightly the traffic through the LAN.

To specify the Master Check Timeout:

1. Shut down all workstations but one.
2. Log on to the machine with account that has administrative privileges on the computer.
3. Open ImageSAN.
4. Right-click the ImageSAN item and choose Advanced Settings.
The ImageSAN Advanced Settings dialog appears.
5. In the Master Check Timeout field, specify the desired value.
6. Restart the workstation.

Optimizing the SAN Usage

ImageSAN sets a default allocation optimization size for all write operations on the storage, which can later be changed locally on each workstation.

The allocation optimization size is the fixed size of the disk space in Megabytes appointed to store data changes resulting from all write operations. For each write operation performed, the information to be saved is allocated in an exact optimization size, even if a much smaller optimization size would be sufficient. If there is more space needed for a certain operation, another set optimization size is added. If after the completion of a write operation, a part of the allocated block is left unutilized, it is then released.

You can change the default allocation block size on each client workstation. This means that when initiating a write operation from a particular workstation, the data will be saved in a block size on the shared storage, set by the client.

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Note: *The value for allocation optimization size should be between 1 and 500 MB. The default value is set to 100 MB.*

You can modify the allocation optimization size in the SAN Settings dialog.

To specify the Allocation Optimization Size:

1. Log on to the computer with an account that has administrative privileges.
2. Open ImageSAN window.
3. Right-click the ImageSAN tree item and choose SAN Settings.
The ImageSAN dialog appears.
4. In the Allocation Optimization Size field, specify value between 1 and 500 MB.
5. Restart the computer.

Specifying Minimum SAN Usage Size

When you perform a write operation, the data to be saved is allocated on the disks in one or more blocks, which are all the same size in bytes. If saving the data requires less disk space than the minimum specified beforehand, instead of through the SAN, the data travels over the LAN optimizing the SAN data access for the current computer.

You can specify a minimum size in bytes for all write operations performed on the SAN in the SAN Settings dialog.

To specify a minimum SAN usage size:

1. Open the SAN Settings dialog.
2. In the Minimum SAN Usage Size field, specify the size in bytes.
3. Restart your computer.

SAN Exclude Filters

The SAN Exclude Filters list displays the file types that are redirected through the LAN. When ImageSAN is installed, the list contains the following file types:

- executable files (*.EXE)
- ASCII text files (*.TXT)
- document files formatted for a word processor (*.DOC).

If you experience problems when accessing or working with specific file types through the SAN, you can add them to the list of file types to be redirected over the LAN.

To specify excluded files list:

1. Log on to the computer with an account that has administrative privileges on the computer.
2. Open the ImageSAN window.
3. Right-click the ImageSAN item and choose SAN Settings.
The SAN Settings dialog appears.
4. In the SAN Exclude Filters field, type the file types to be excluded.
For example, type ***.exe** and all executable files will be started through the LAN instead of the SAN.
5. Restart your computer.

Setting ImageSAN Security Options

Use the ImageSAN security dialog to allow client workstations to share SAN volumes for computers that are not connected to the SAN by specifying a share redirection account (see “Enabling Share Redirection” on page 37).

ImageSAN Security dialog also allows you to control the access to the master workstation in a Workgroup network environment with the introduction of fallback account (see “Enabling a Fallback Login” on page 37).

To be able to change the security options of ImageSAN you need to log on the computer with an account that has administrative privileges on the machine.

Enabling a Fallback Login

When a user tries to access drives on the SAN from a client workstation, and access is denied, a Fallback account can be used to access the storage. If this Fallback account is recognized by the master of the addressed volume, access is granted. By default, the built-in account Guest without password is set as Fallback account but you can specify a different account which is in accordance with the security policy in your network.

For more details about fallback accounts, see “Fallback Account” on page 14.

Use the fallback login option in a workgroup network environment when necessary.

To enable a Fallback Login:

1. Open the ImageSAN window.
2. Right-click the ImageSAN item and choose Security Settings.
The ImageSAN Security Settings dialog appears.
3. Enable the Enable Fallback Login option.
4. Specify a user name and a password in the Username and Password fields.
5. Confirm the password.
6. Restart the workstation.

Enabling Share Redirection

When users outside the SAN try accessing files that have been shared by a client workstation, their metadata requests must be redirected to the master of the addressed drives. A direct file access over the LAN is not possible when the addressed data is shared by a client workstation. This imposes the use of an account through which file access is realized. For more information about share redirection accounts, see “Share Redirection Account” on page 14.

Note: *When users outside the SAN save files on the SAN, for owner of those files is set the user name of the account used for the share redirection. On the master workstation, as owner is displayed the share redirection account. On Windows® 2000 and Windows® XP client workstations, a long sequence of digits is displayed which represents the share redirection account security identification. On Windows NT® client workstations the owner of files created from workstations that are not connected to the SAN is displayed as “Unknown”.*

You should set a share redirection account on client workstations sharing SAN drives for computers that are not connected to the SAN. For a share redirection account you should use an account that is recognized by the workstation that is master of the shared volume. By default, ImageSAN sets the Guest account without password as share redirection account.

To enable Share Redirection:

1. Open the ImageSAN window.
2. Right-click the ImageSAN item and choose Security Settings.
The ImageSAN Security Settings dialog appears.
3. Enable the Share Redirection option.

3. Administrating ImageSAN
4. Specify a user name and a password in the Username and Password fields.
Use an account and password which can be recognized by the workstation that is master of the shared volume.
5. Confirm the password.
6. Restart the workstation.

Working with ImageSAN Utility

ImageSAN utility is a command line utility for maintenance and diagnostics of ImageSAN volumes. It is installed together with ImageSAN. When you uninstall ImageSAN, ImageSAN utility is not removed.

You can use ISANUtil to check the status of your SAN volumes instead of using the ImageSAN window. You can also use ISANUtil to unmark volumes if during the uninstillation of ImageSAN the unmark operation has failed. In this way you will allow the operating system to mount the SAN volumes.

ISANUtil.exe is stored in C:\WINNT\SYSTEM32 or C:\WINDOWS\SYSTEM32.

To start ImageSAN Utility:

Start Command Prompt and type **isanutil**.

The list of available parameters for ISANUtil appears.

Checking the Volume Table

You can list all the SAN volumes your workstation is using and see whether you are a master or client for each individual volume.

To check the Volume Table:

In Command Prompt, type **isanutil/t**

Checking SAN Tables

If you want to view the details of all SAN drives, and check what workstation is master and/or client to which volume(s), you can list the SAN tables.

To list SAN tables:

In Command Prompt, type **isanutil/st**.

To check a SAN table for a specific volume:

In Command Prompt, type **isanutil/st H**, where H is the drive letter of the selected volume.

Checking SAN Volumes' Status

Through this option, you can check whether a volume is marked by ImageSAN. ImageSAN marked volumes cannot be managed by the operating system if ImageSAN is not installed.

To check a volume's status:

In Command Prompt, type **isanutil/v H**, where H is the drive letter of the volume.

Unmarking Volumes

If, for some reason, a volume has remained ImageSAN marked after ImageSAN has been uninstalled from all SAN connected workstations, and the volume cannot be recognized by the operating system, you can unmark it, and make it again available.

Note: *Unmark a volume only if you are sure that ImageSAN is uninstalled from all SAN-connected machines.*

To unmark a Volume:

In Command Prompt, type **isanutil/u H**, where H is the drive letter of the volume.

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Volume Control

To prevent volume formatting, stripping, or spanning by unauthorized users, ImageSAN protects volumes. Disk and volume maintenance operations can be initiated either from master-only workstations or standalone workstations running in Administrative mode.

The following operations can be initiated from a master-only workstation:

- Disk defragmentation.
- Running Check Disk.
- Formatting volumes.

To see how to make a workstation to work in master-only mode, refer to “Setting the Master-Only Mode” on page 32.

Operations such as creating or deleting volumes require higher protection since they are related to re-configuring the shared storage and that is why the Administrative mode is introduced as an additional step before the maintenance operations. The higher protection is achieved through limiting the number of users who can modify volume parameters to the standalone workstation. This means that only user logged on a standalone ImageSAN machine using an account with administrative privileges, after entering Administrative Mode, can change the parameters.

When a workstation enters standalone mode, it obtains the right to enter ImageSAN Administrative Mode, that allows the following operations to be performed:

- Creating new volumes.
- Deleting existing volumes.
- Changing the layout of existing volumes.
- Formatting existing volumes.

- Defragmenting volumes.
- Running Check Disk.

Entering Administrative Mode

After your computer enters standalone mode, you can enter Administrative Mode. In this mode you can perform numerous disk maintenance operations, such as the formatting, stripping, and spanning of volumes.

To make your workstation work in standalone mode:

Shutdown all ImageSAN workstations but one.

The machine you chose to perform volume maintenance operations enters the standalone mode.

You can enter Administrative Mode from the ImageSAN window.

Warning: *When ImageSAN is running in Administrative mode, the ImageSAN window does not display any volumes.*

To enter Administrative mode:

1. Open the ImageSAN window and make sure the workstation is running in standalone mode for all SAN volumes.

Note: *If your workstation is not in standalone mode for any of your SAN volumes, you will not be allowed to enter the Administrative mode. If a specific volume cannot be mounted and, because of it, your computer cannot become a standalone master of the volume, set the respective physical disks to Not Available state to prevent ImageSAN from mounting them.*

2. Right-click the ImageSAN tree item and choose Administrative Mode.
ImageSAN enters the Administrative mode.

Entering Administrative Mode

In case you did not make any changes in ImageSAN window and did not browse SAN volumes, you can return to common mode without restarting the computer. Otherwise, you will need to restart the computer in order the changes to take effect and to run ImageSAN in common mode.

To exit Administrative mode without restarting the computer:

In ImageSAN window, right-click ImageSAN and choose Administrative mode.

A check mark next to the command disappears.

Formatting Volumes

Before formatting a volume, make sure that ImageSAN has mounted the volume.

To format SAN drives, you should do one of the following:

- Log on to an ImageSAN computer that is master-only using an account with administrative privileges and perform the disk format operation. Check your Windows® documentation for steps about formatting disks. For more information about master-only mode and setting a computer to work in master-only mode, see “Master-Only Mode” on page 12 and “Setting the Master-Only Mode” on page 32.

- Log on to a standalone ImageSAN workstation, enter the Administrative mode and then perform the format operation. Check your Windows® documentation for steps about formatting disks. For more information about Administrative mode and entering the mode, see “Administrative Mode” on page 13 and “Entering Administrative Mode” on page 41.

Note: *If you try to format a drive from a client or master workstation that is in common mode, an ImageSAN*

error message is displayed and the operation is cancelled.

Creating Volumes

You can create volumes only from a computer that is in standalone mode and ImageSAN is running in Administrative mode (see “Entering Administrative Mode” on page 41). If you try to create a volume from a client or master workstation, an ImageSAN error message is displayed and the operation is cancelled.

Procedures about creating volumes differ slightly in Windows® 2000, Windows NT®, and Windows® XP. For detailed information about these procedures, check your Windows® documentation.

Running Check Disk

Before running Check Disk for a volume, make sure that ImageSAN has mounted the volume.

To run Check Disk on a SAN volume, you should do one of the following:

- Log on to an ImageSAN computer that is master-only using an account with administrative privileges and run Check Disk. Check your Windows® documentation for steps about running Check Disk. For more information about master-only mode and setting a computer to work in master-only mode, see “Master-Only Mode” on page 12 and “Setting the Master-Only Mode” on page 32.

Note: *In a SAN configuration with a dedicated master, the master-only workstation can be scheduled to run Check Disk automatically. In a SAN configuration with failover the check disk operation cannot be scheduled.*

- Log on to a standalone ImageSAN workstation, enter the Administrative mode and then run Check Disk. Check your Windows® documentation for

running Check Disk. For more information about Administrative mode and entering the mode, see “Administrative Mode” on page 13 and “Entering Administrative Mode” on page 41.

If you run Check Disk for a SAN drive on a client or master workstation that is in common mode, an ImageSAN error message is displayed and the operation is cancelled.

Note: *It is recommended to work on a Windows® 2000 workstation, since it can become standalone master for volumes with all types of layout.*

Performing Disk Defragmentation

Before performing disk defragmentation on a SAN volume, make sure that ImageSAN has mounted the volume.

Note: *In a SAN configuration with a dedicated master, the master-only workstation can be scheduled to perform disk defragmentation automatically. In a SAN configuration with failover the check disk operation cannot be scheduled.*

To perform disk defragmentation for a SAN drive you should do one of the following, depending on the selected SAN configuration:

- Log on to an ImageSAN computer that is master-only using an account with administrative privileges and perform the disk defragmentation. For steps about defragmenting disks, check the documentation of your defragmentation software. For more information about master-only mode and setting a computer to work in master-only mode, see “Master-Only Mode” on page 12 and “Setting the Master-Only Mode” on page 32.

- Log on to a standalone ImageSAN workstation, enter the Administrative mode and then perform the disk defragmentation. format operation. For steps

about defragmenting disks, check the documentation of your defragmentation software. For more information about Administrative mode and entering the mode, see “Administrative Mode” on page 13 and “Entering Administrative Mode” on page 41.

If you try to perform disk defragmentation for a SAN drive on a client or master workstation that is common mode, an ImageSAN error message is displayed and the operation is cancelled.

Note: *It is recommended to work on a Windows® 2000 workstation, since it can become standalone master for volumes with all types of layout.*

Working With Dynamic Disks

This section provides information about using dynamic disks in a SAN and the problems that may arise due to the Logical Disk Manager (LDM) when multiple computers access the same dynamic disks. It also describes how ImageSAN 1.5 avoids these problems and protects dynamic disks from data corruption.

Overview

The introduction of dynamic disks in Windows® 2000 provided features not available with basic disks. For example, you can increase the volume size by extending it on the same physical disk using the unallocated space that is not contiguous, or extend the volume on another dynamic disk. Besides, dynamic disks offer greater flexibility for volume management.

Technically speaking, the main differences between dynamic and basic disks are:

- Dynamic disks, in contrast to basic disks, support multipartition volumes.

- Windows stores the dynamic partition information on the physical disks (the basic disks partition information is stored in the registry).

The Logical Disk Manager (LDM), a subsystem of Windows, controls the dynamic disks. It stores and manages the partition information in the LDM database, which takes exactly 1 MB on each dynamic disk. This database remains hidden to the user.

The LDM database serves to track information about all volumes on a dynamic disk and about other dynamic disks in the computer. Each dynamic disk contains a replica of the LDM database. Thus each dynamic disk stores partition information about all other dynamic disks in your computer. This should allow the Logical Disk Manager to repair a corrupted database on one dynamic disk using the database replica on another dynamic disk.

For more information about dynamic disks, please visit the following links:

http://www.microsoft.com/technet/treeview/default.asp?url=/TechNet/prodtechnol/winxppro/reskit/prkb_cnc_whjq.asp

<http://linux-ntfs.sourceforge.net/ldm/overview/index.html>

Dynamic Disks and the SAN

While the usage of dynamic disks on a standalone workstation goes smoothly, the usage of dynamic disks in SAN environment raises some issues such as unavailability of the dynamic disks when their Logical Disk Manager (LDM) database is accessed by multiple workstations. If a SAN-connected workstation updates the LDM database with changes, all dynamic disks appear as offline to the other network computers because the information in their memory for these disks differs from the information on the very disks. Furthermore, the reactivation of

4 Volumes Maintenance

offline dynamic disks on one computer makes them appear offline on all the others.

To deal with these problems and to ensure constant availability of dynamic SAN disks ImageSAN 1.0 protects the LDM database by creating a local copy to be used by the Logical Disk Manager and preventing access to the real LDM database on the physical drives. Thus you can create and delete volumes, import foreign disks, etc. only when running in Administrative Mode (requiring all other workstations to be shut down) because only then the LDM database is not protected and these changes will reflect in it on the dynamic disks.

However, the usage of dynamic disks in ImageSAN 1.0 may lead to anomalies when using a local dynamic disk together with dynamic disks on the shared storage. As configuration data for the local dynamic disk gets stored on the SAN, this disk appears on other workstations as "missing". Since Windows® 2000/XP supports only one disk group, each workstation saves its own disk group on the SAN causing other workstations to put the SAN disks in "offline" or "foreign" status. To avoid such problems ImageSAN 1.0 poses many requirements and restrictions in the usage of dynamic disks in your SAN.

In ImageSAN 1.5 the process of managing and configuring dynamic disks is much more flexible and user-friendly compared to the previous version. Due to the innovative filter of ImageSAN 1.5 a configuration of local dynamic disk together with dynamic disks on the shared storage is allowed and its management is fault-resistant and much easier. With ImageSAN 1.5 local dynamic disks hold configuration information for both local and SAN disks, but dynamic SAN disks hold configuration for SAN disks only. Thus users can introduce changes in the LDM database of their local dynamic disks without having to enter the Administrative Mode.

To manage SAN dynamic disks:

1. Shutdown all computers connected to the SAN but one.
2. When ImageSAN on the selected computer enters the Standalone mode, switch to Administrative mode.
To see how to enter the Administrative mode, refer to "Entering Administrative Mode" on page 41.
3. Start Windows Disk Management console and make the desired changes to SAN dynamic disks.

Note: *If there are any dynamic disks on the shared storage that are set to Not Available mode in ImageSAN but you want to manage them, first you need to set these disks to Public mode and then make any changes. To see how to set disks to Public mode, refer to "Setting Disks to Public Mode" on page 30.*

4. When finished, restart the computer and make sure the volumes that are created on dynamic disks are accessible.
5. Start all other ImageSAN computers.

Note: *If you create a new volume on dynamic disks, you should import the dynamic disks in all computers connected to the SAN. For this, on each computer you should run ImageSAN in Standalone mode, enter the Administrative mode and import all dynamic disks that make up the volume using the Disk Management console.*

When you want to manage a local dynamic disk (format or delete volumes on it, for example), you do not need to run ImageSAN in Administrative mode.

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