IBM FileNet Image Services

4.1.2

IBM

MSAR Procedures and Guides

IBM FileNet Image Services

4.1.2

MSAR Procedures and Guides

Contents

2 **Planning and Setting Up Your MSAR System 31**

3   Managing Your MSAR System   83

Appendix C – MSAR Checksumming   163

Glossary   165

Notices   181

About This Manual

This document provides MSAR procedures and guidelines for IBM®
FileNet® Image Services systems on both Windows® Server and
UNIX® platforms.

Important It is strongly recommended that you read this entire document (espe-
cially Chapters 1 and 2) before performing any procedures to setup
and configure your system. This is necessary to familiarize yourself
with the concepts and new features of an MSAR system.

Audience

This manual is directed to service representatives. We assume that
you are familiar with the FileNet Application Executive applications
including Storage Library Control, Background Job Control, and Data-
base Maintenance, as well as the FileNet System Configuration Editor.
We also assume that you are familiar with your operating system envi-
ronment (where Image Services is installed) and workstation opera-
tions.

Document revision history

IS version	Date	Comment
4.1.2	Nov. 2008	Initial release.

Conventions Used in this Manual

The following paragraphs discuss the ways in which we call your attention to information throughout this document.

Typing Instructions

To indicate commands, values, or other information you enter at your keyboard, we use the following indentation and typeface:

help [CSM_exim]

Screen Displays

Windows and screen examples shown in the procedures in this document are from Windows servers. These windows and screens could look different on UNIX servers.

Console Displays

Information you see displayed at your console is shown in this document in the following manner:

```
Surface '3176' : 1 document processed
Local doc_id = '2235007' Original doc_id = '2235007'
Original ssn = '8502'
Primary copy. No tranlog copy exists.
* document successfully deleted from databases. *
* Purging pages from disk... *
* This document has been successfully purged. *
```

Observe Cautions, Important Notes, Notes, and Tips

Important information and warnings appear in cautions, important notes, notes, and tips. Be sure to read these items carefully:

CAUTION	Signals possible damaging consequences of an action, such as loss of data or time.

Important	Gives added emphasis to notes that contains particularly vital information that must not be skipped over. While all the information in each section is important, these notes are especially important.

Note	Draws your attention to essential information you should be sure to read.

Tip	Introduces an idea that might make your work easier.

Command Syntax

Command syntax definitions are indented:

ddexim –e > <filename>

Optional Parameters

Optional parameters and keywords are within square brackets:

ddexim [–e] > <filename>

Required Parameters

Parameters that require you to provide information are shown within angle brackets (< >).

For example, for the following command:

ddexim –e > <filename>

you must substitute the name of a command for the parameter in angle brackets, such as:

ddexim –e > myfile

IBM FileNet Education

IBM provides various forms of education. Please visit the IBM Information Management support page at (**www.ibm.com/software/data/support**).

Accessing IBM FileNet documentation

To access documentation for IBM FileNet products:

1 Navigate to the Information Management support page (**www.ibm.com/software/data/support**).

2 Select the appropriate IBM FileNet product from the "Select a category" list.

3 On the Product Support page, click **Documentation** and then click **Product Documentation**.

4 On the Product Documentation page, locate the document you need, then cick the icon in the appropriate release column to access the document.

Feedback

We value your opinion, experience, and use of our products. Please help us improve our products by providing feedback or by completing a consumability survey.

Documentation feedback

Send comments on this publication or other IBM FileNet Image Services documentation by e-mail to **comments@us.ibm.com**. Be sure to include the name of the product, the version number of the product, and the name and part number of the book (if applicable). If you are commenting on specific text, include the location of the text (for example, a help topic title, a chapter and section title, a table number, or a page number).

Product consumability feedback

Help us identify product enhancements by taking a Consumability Survey (**http://www-306.ibm.com/software/data/info/consumability-survey/**). The results of this comprehensive survey are used by product development teams when planning future releases. Although we are especially interested in survey responses regarding the most recent product releases, we welcome your feedback on any of our products.

The survey will take approximately 30 minutes to complete and must be completed in a single session; there is no option to save a partially completed response.

1
MSAR Overview

The Magnetic Storage and Retrieval (MSAR) storage library provides high speed and high capacity storage libraries on magnetic disk media instead of using optical media or large magnetic disk caches (cache-only systems).

While MSAR stands for Magnetic Storage and Retrieval, it also supports more than just magnetic disk drives. It could be used with any file system that meets the criteria specified in this document and the MSAR Support Policy. See . For example, a Hierarchical Storage Management (HSM) system could present a file system that MSAR can use, but the HSM will manage the file as it moves from magnetic storage to alternate storage devices. In this example, the alternate storage devices could actually be tape or writable DVD storage, but the HSM software is representing these devices as a standard file system.

Note   Care must be taken when configuring file systems that use slow storage devices or remote file systems accessed across slow connections. Although these are sound configurations for disaster recovery and deep archive purposes, retrieval performance could be slow. Faster devices are recommended for routine retrievals.

MSAR introduces a new type of storage library, a magnetic storage library that functions similarly to optical storage libraries. An MSAR storage library manages magnetic media just as an optical storage

library manages optical media. Magnetic media will be written sequentially, filed, closed, and so on, just as optical media are.

Magnetic media and MSAR storage libraries use all of the conventions that exist for optical media and storage libraries. Magnetic media are associated with media families, media families are associated with storage libraries, and so on. Magnetic media can be copied, ejected, imported, consolidated, erased, incorporated, and so on, using standard Image Services programs.

For definitions of FileNet software, and MSAR or Optical terms, see the **"Glossary," on page 165**.

How MSAR Storage Libraries Can be Deployed

There are several ways that you can choose to deploy MSAR libraries. MSAR offers a great deal of flexibility and can meet a wide variety of business needs.

Each MSAR storage library uses a normal file system directory. Any file system directory can be used including: local drives, direct attached RAID storage, HSM, NAS, and so on. This allows for deployment flexibility since different surfaces on the same system can use any combination of these storage mechanisms.

The following are some of the ways that MSAR can be deployed:

• Configure new system with only MSAR storage libraries

• Configure new system with MSAR and optical storage libraries (An example of this system might have MSAR media families which would use optical tranlogs.)

- Convert an existing cache-only system to use MSAR storage libraries.

- Convert an existing optical system to use only MSAR storage libraries

- Configure MSAR storage libraries for new documents and retaining optical libraries for retrieval only.
(For this type of deployment, some optical surfaces could need to be converted to MSAR surfaces so that all non-converted optical surfaces can fit in existing optical libraries. This will eliminate or greatly reduce the likelihood of out_of_box RSVP's in the optical libraries.)

Advantages of an MSAR System

MSAR provides an alternative to current optical media storage libraries or existing magnetic cache storage (cache-only) systems.

Advantages over optical storage library systems

- Increased storage capacity.

- Better performance by eliminating delays encountered by optical media (for example, swapping optical disks to locate the disk containing the document being retrieved).

- Higher reliability than optical storage libraries since MSAR libraries usually have fewer mechanical parts.

- Any file backup tool can be used to backup MSAR surfaces, offering backup and recovery advantages.

- Fewer RSVP messages (for example, a blank MSAR surface will never be requested). MSAR current write surfaces are created in place. This results in a reduction of user intervention.

- MSAR surfaces can be managed remotely since there are no physical media that need to be inserted into a storage library.

- Flexibility to use any physical storage media as long as they support file systems (for example, HSM).

Advantages Over Cache-only Systems

- Cache-only systems are limited to 4 terabytes of magnetic storage per server. MSAR libraries can support up to 128 terabytes.

- Cache-only systems require off-line backups or a sophisticated magnetic disk storage system for 24x7 operations. When MSAR systems are being backed-up, surfaces can still be read.

- Cache-only systems are likely to use their magnetic storage inefficiently. Each document is permanently locked in its original position. There could be a problem reclaiming the gaps left by subsequently deleted documents or these gaps could cause newer documents to be written in several different parts of the available space.

- With a cache-only system, failure of a single cache partition could require restoration of all objects. Current customer support procedures could recommend re-initialization of first tier object stores to recover from any such errors, thereby returning the first tier cache to some previous point in time when a backup was done. This could result in lost documents or the need to re-scan some documents.

- Cache-only systems cannot use most of the tools provided by Image Services (import, copy, and so on) that operate on surfaces. MSAR uses these tools.

- Documents stored on a cache-only system cannot be exported to another system easily. With MSAR, this is not a problem.

- Documents in a cache-only system cannot be aggregated into manageable units while MSAR surfaces, using the same paradigm as optical surfaces, can be.

- MSAR surfaces can inter-operate with optical disk primary and tranlog families, copying to and from MSAR and optical surfaces.

- Retiring groups of documents is not easy to do in an cache-only system. In an MSAR system, however, a natural container is provided for surfaces much the same as in an optical storage library system.

Storage Capacities

Image Services supports up to 8 storage libraries per storage library server, including combinations of optical and MSAR libraries.

MSAR has the following limitations:

- maximum MSAR surface size is 32 GB

- maximum number of slots is 1024 per MSAR storage library. MSAR has 5 types of storage libraries that you can configure: Model 16, Model 128, Model 256, Model 512, and Model 1024. The model number represents the number of slots available in the storage library. The model number also corresponds to the license purchased. (16 = development, 128 = low, 256 = medium, 512 = high, 1024 = very high)

- maximum capacity is 256 terabytes per storage library server

Understanding Major MSAR Design Features

MSAR libraries simulate optical storage library operations using ordinary magnetic storage by substituting files for optical media surfaces. MSAR storage libraries function similarly to optical storage libraries, and use most of the conventions that exist for optical media and storage libraries. But MSAR libraries have other distinctive features which are discussed in this section.

MSAR Media

Optical media can contain data on either one or two sides. MSAR media, however, is considered one-sided. MSAR surfaces are physically stored as files in a file system.

Various MSAR media types are supported. The MSAR media type is associated with the media capacity. (The MSAR surface will also grow as needed to its configured capacity.) MSAR supports 1GB, 2GB, 4GB, 8GB, 16GB, and 32GB media types. In all supported media types, 1K sector sizes are used for MSAR surfaces.

Note An MSAR surface could also have an optical media type because it has been converted from an optical media. Therefore, the media can have different sector sizes.

Using database maintenance, media families can be associated with MSAR Media types. For example, a media family can be associated with a 4GB MSAR media type and in turn a document class could use this media family.

For information on MSAR media format see, **"Appendix B – MSAR Media Format Layout" on page 161**.

MSAR Drives

The Image Services software expects to move media (or surfaces) from a slot to a drive for reading or writing. While there is no physical MSAR drive, the MSAR implementation supports virtual drives.

MSAR storage libraries always have 12 virtual drives. Since the number of drives in a library has an effect on the allocation of data transfer processes, and some impact on the drive scheduling process, you can disable MSAR drives as needed. The number of enabled drives determines the number of concurrent surfaces that can be accessed in the library.

MSAR drives are very flexible regarding formats. An MSAR drive can read and write any MSAR media type, and can also read any surface converted from optical.

Note   An MSAR surface has an optical media type if it has been converted from an optical media. See **"Converting Your Optical or Cache-Only Systems to MSAR" on page 66**.

MSAR Slots

A slot is where the Image Services software generally expects to find media (or surfaces). Much like the virtual drives, the Image Services MSAR implementation supports virtual slots to be consistent with the way optical libraries work. This allows many of the Image Services tools and operating procedures to remain unchanged. Unlike optical, slots in an MSAR library cannot be disabled.

There are 5 types of MSAR storage libraries that you can configure: Model 16, Model 128, Model 256, Model 512, and Model 1024. Since

the model number represents the number of slots available in the storage library, the maximum number of slots is 1024 per MSAR storage library. The number of surfaces in an MSAR library cannot exceed the number of slots.

Current Write Surfaces

For optical libraries, when a new current write surface is needed, the IS software searches for a blank surface that matches the media type of the media family. If none is found, a blank surface RSVP is generated.

For MSAR libraries, when a new current write surface is needed, the IS software searches for an empty slot and automatically creates a new MSAR surface that matches the current family media type. (The surface is created in the MSAR creation directory.)

If a slot is not available, the storage library is full, a surface is automatically ejected by the IS to make room for the new current write surface. (An algorithm is used to determine the best surface to eject. See **"Full MSAR Libraries" on page 29**.)

The flowchart below represents how the software determines where to create the new current write surface.

```
                    ┌─────────────┐
                    │  Request for │
                    │  new current │
                    │ write surface│
                    └─────────────┘
```

Request for new current write surface

Is there a preferred library? — NO → **Are there any libraries that are not full?** — YES

YES ↓   NO ↓

Is the preferred library full? ← YES — **Eject a surface from the preferred library.**

Eject a surface from any library.

NO ↓

Create a new current write surface in an empty slot.
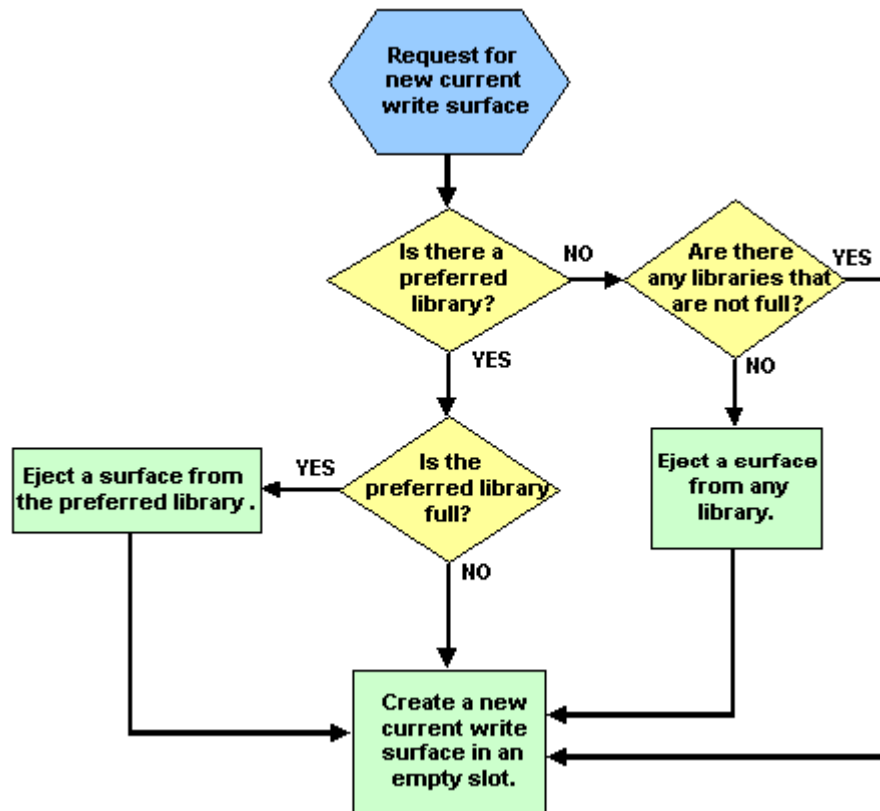
MSAR Creation Directories

The MSAR Creation Directory is sometimes referred to as the MSAR **Surface** Creation Directory. Whenever a new MSAR surface is needed, it is created in the creation directory and its location is stored in the database. Each storage library has one creation directory for storing newly created surfaces.

However, when a creation directory is full, or approaches being full, you can configure a new MSAR creation directory. The new creation directory is where all subsequent **new** surfaces will be stored. Directory locations for these new surfaces point to the new creation directory. Surfaces that were created in the previous creation directory, however, are not automatically moved. They remain in the previous creation directory.

Unlabeled MSAR Surfaces

When a new current write surface is needed, an unlabeled MSAR surface is created in an empty slot. At this point, the MSAR surface file (.dat) has not yet been created. The name and location of the surface file has been determined, but the Image Services software must put the surface into an available drive before the MSAR surface file can be created. After the unlabeled surface is put into an MSAR drive, a volume label is written on the surface file.

An unlabeled MSAR surface is unique in that no MSAR surface file has yet been created. In addition, unlabeled MSAR surfaces cannot be ejected.

Surface Data (.dat) Files and Link (.lnk) Files

MSAR libraries generate two types of files. The MSAR surface data file (.dat file) and the MSAR surface link file (.lnk file).

• The .dat file contains the actual surface data, images, text, and so on. These files are typically found in the MSAR creation directory. The MSAR surface file name is created with the surface ID. For example, surface 3000 will have the file name 003000.dat. The location (absolute path) to the data file is stored in the Image Services database so that it can be opened when needed.

Note	In this document, when the phrase, "MSAR surface file" is used, we are always describing the MSAR surface data (.dat) file.

- The .lnk file is created, with the surface ID, in the out_of_box directory when a surface is ejected. For example, when surface 3000 is ejected, the 003000.lnk file is created.

  The .lnk file contains the location of the .dat file, unless the .dat file was moved after it was ejected from a storage library. If the surface was not moved after it was ejected, it is usually easier to use the .lnk file when re-inserting a surface.

Foreign Surfaces

A foreign surface that was incorporated from an incompatible system, has a surface ID that is different from the data (.dat) file and link (.lnk) file. When a foreign surface is incorporated, a local surface ID is assigned to the incorporated surface. If a foreign surface is ejected, the link file is created using the local surface ID.

Foreign surfaces should be placed in a directory separate from the local MSAR Creation directory. A convention such as using the source system domain name will prevent naming conflicts.

The out_of_box Directory

The out_of_box directory is a special directory that is created for each Storage Library Server under the general Image Services directory structure. It is always found in the following location:

- For Windows, the out_of_box directory is located at:
  <drive>:\fnsw_loc\msar\out_of_box.

- For UNIX, the out_of_box directory is located at: /fnsw/local/msar/out_of_box.

Whenever an MSAR surface is ejected, a link file with the same name (but with a .lnk extension) is placed in the out_of_box directory. The link file contains the absolute path of the original data file and can be used to locate that file (for example, when doing an Insert operation).

If the MSAR data (.dat) file is moved or renamed, the link file is no longer valid. The surface can still be inserted back into the library, but the new location of the .dat file must be entered when inserting the surface.

In the figure below, the MSAR surface is located in a slot until it is ejected. As with optical storage libraries, after ejection the surface has no visibility to the Image Services software unless it is re-inserted into the MSAR library, but the user can still interact with the surface via the OS file system.

While it is actively used, surface 3004 is in the MSAR library.

MSAR storage library

003004.dat

IS User

Before Ejection

After Ejection

When surface 3004 is ejected, a link file is created which holds the location of 003004.dat for future reference.

/fnsw
/local
/msar
/out_of_box/003004.lnk

Unless the 003004.dat file is moved, the link file (003004.lnk) can be used to insert the surface 3004 back into the storage library.

MSAR Surfaces are Favored on Retrieval

When there is a choice between an inbox MSAR surface or an optical surface, MSAR surfaces are favored for retrieval requests.

For example, if there is an optical tranlog and an MSAR primary, or vice versa, the MSAR surface is favored on retrieval. An inbox MSAR surface is always selected over an optical surface.

In addition, if the MSAR surface is in a slot and the optical surface is in a drive, the MSAR surface is still selected.

For more information, see the appendix "Logic for Retrieving Surfaces and Ejecting Media" in the *System Administrator's Handbook*. To download this handbook from the IBM support page, see **"Accessing IBM FileNet documentation" on page 14**.

Full MSAR Libraries

An MSAR library is considered full when the total number of MSAR surfaces equals the maximum number of slots. If an MSAR surface needs to be inserted into a full MSAR library, an MSAR surface in the library is automatically ejected from a slot.

An algorithm is used to determine the best surface to eject based on the following considerations:

- Find the slot that contains a labeled surface with the oldest mount time (the time a surface was last swapped out of a drive) in the library **and** one that has no requests. (Unlabeled MSAR surfaces are not ejected.)

- If no slot is found that meets the above criteria, select a slot that contains a surface with the oldest mount time with requests.

For more information, see the appendix "Logic for Retrieving Surfaces and Ejecting Media" in the *System Administrator's Handbook*. To download this handbook from the IBM support page, see **"Accessing IBM FileNet documentation" on page 14**.

MSAR Backup Mode

Backup mode is a new feature provided in MSAR by the Storage Library Control application within the FileNet Image Services Application Executive.

The Backup mode feature allows you to easily place MSAR libraries in a read-only mode for backup purposes and take them out of Backup mode as well.

2

Planning and Setting Up Your MSAR System

This chapter provides procedures and recommendations for planning and setting up an MSAR system. It is **important** that you follow the procedures in this chapter to properly setup and configure your MSAR system. The main topics provided in this chapter include:

Note   Most of the windows and screens shown in the procedures in this document are from Windows servers. These windows and screens could look different on UNIX servers.

Performance Recommendations

The performance of your MSAR system can be affected by many factors. The following list contains some recommendations that could help to improve the performance of your system. Throughput is determined by a variety of factors, many of which are not addressed here. For example, buying a faster, higher throughput storage subsystem for your MSAR installation won't necessarily increase your performance if the real problem is network congestion getting to the storage subsystem.

Recommendations which could improve performance

- Separate your MSAR creation directories from the cache partitions so that cache and MSAR surfaces reside on different physical devices.

- On systems using local storage, when possible, install all databases (index, permanent, and transient) on separate physical devices.

- Each MSAR library has an MSAR Creation Directory. Configure your system so that each MSAR Creation Directory points to a different physical storage device.

- Changing the Performance Tuning parameters in the System Configuration Editor could improve performance. On the Server Memory subtab, within the Performance Tuning tab, consider increasing values for these parameters: Document Buffer Count, Document Buffer Size, Transient Buffer Pool Size, and Permanent Buffer Pool Size. The recommended **minimum** value for the Permanent Buffer Pool Size parameter is 2500KB.

> **Note** To calculate the Document Buffer Count for each applicable server, use the following configuration guidelines: 1 per MSAR drive + 1 per optical drive +1 per scanner +1 per COLD process +1 per HPII or any other document entry program +16.

- If you are using a high throughput attached storage device you could locate all database and MSAR surfaces on those devices, thereby gaining flexibility with regard to redundancy and high availability, without sacrificing performance.

- Increase your network connection speed if you use NAS (Network Attached Storage) to store your MSAR surfaces. A **minimum** network connection of 100Mbps is recommended.

- Run in a full duplex environment when possible. This could increase network throughput speed if you use NAS to store your MSAR surfaces.

- Isolate MSAR traffic from other network traffic.

- Upgrade to an NAS device with a higher rated I/O speed.

I/O Characterization Test

In addition to evaluating disk I/O, network, and CPU utilization using standard operating system and third party tools, it could be useful to perform an I/O characterization test by running the msar_io_test program against several directories.

This will help determine the relative speed between different file system directories, and whether further I/O bottleneck problems remain. In addition, concurrent copies of this program can be run against a directory.

Running the msar_io_test Program

This program is used to determine the relative speed of I/O for a specific directory. The program displays the read and write times in minutes. The values can then be compared between different file systems. You can use this program on the MSAR creation directory.

This program creates a temporary file in the specified directory. The program will simulate writes of documents and short descriptors. It will also simulate IS document reads from this file. Test results will be printed to standard output and logged in the system log file. Time in minutes will also be displayed for the write and read phases.

To run this program, enter the following command:

> **msar_io_test [-s <surface size in MB>] [-d <document size in KB>] [-r <read documents (X times)>] [-o] <directory path>**

Note All parameters shown in the table below are optional with the exception of the directory parameter.

Parameter	Parameter Definition
-s	Surface size in MB (10-32000). The default is 1024 MB (1 GB).
-d	Document size in KB (1-1000). The default is 80 KB.
-r	Read documents (0-100). The number of reads is specified in multiples of writes. For example, if '2' is used then 2 times the number of write documents will be read. If there were 10,000 document writes, there would be 20,000 reads. Reads will be done in random locations. The default is 1.
-o	Open and Close temporary file on every read. The default is that the temporary file is opened once. If this option is selected, it simulates a system where each retrieval requires that a surface be moved from a slot to a drive.
directory	MSAR creation directory path (required parameter)

Note	All reads and writes are done in multiples of 1K sector sizes.

For example, if you accept the defaults the command would look like:

> **msar_io_test d:\msar**

Or if you choose some optional parameters, the command might look like:

> **msar_io_test -s 2048 -r 2 d:\msar**

Running the program will display an output screen similar to the example below.

```
started write phase surface_sz=2048 MB doc_size=80 KB multiple reads=2
directory=d:\msar
time for write phase 6.257800 in minutes, number of writes=26152
complete read iteration 1
complete read iteration 2
time for read phase 6.735933 min, 2 iteration(s), number of reads per
iteration = 26152
```

Setting File Size and ulimit (UNIX Systems Only)

In order to Verify that your available system disk space can accommodate the large files necessary to support MSAR Storage Libraries, parameters **must** be set to allow such large files to be created.

A large file is a regular file whose size is greater than or equal to 2GB. On Windows platforms, there is no restriction on creating large files. However, in UNIX environments, these parameters must be set.

Therefore, in order to successfully create MSAR surface files, the following rules are required:

- File system needs to have large file enabled.

- The ulimit (User Resource Limit) must be changed to "unlimited."

Note	Use JFS2 file systems for MSAR libraries.

Refer to tables below for detailed information.

File System Information

Platform	Default value	Required value	Remarks
AIX®	Either large file enabled or disabled	large file enabled	Once a file system is created with largefile-disabled attribute, it cannot be changed to become largefile enabled. To allow large files, the largefile-enabled attribute **must be set** during the file system creation time.
Solaris	large file ON	large file ON	Administrator can restrict user access by mounting a file system with "-o nolargefiles" or "-o largefiles" options and assigning appropriate permissions.
HP-UX	no large file	large file	Administrator can alter a 'nolargefile' file system to become largefile-enabled file system, or vice versa.

* Setting file limit size is dependant on the shell you are operating in.

fsize ulimit Information *

Platform	Default value	Required value	Remarks
AIX	1GB	-1 (Unlimited)	This limit is defined in /etc/security/limits. 1GB of fsize is defined as "fsize = 2097151" in 512-byte blocks.
Solaris	No Limit	Unlimited	This limit is defined in /etc/default/login as "ULIMIT=0"
HP-UX	No Limit	Unlimited	

Increase Maximum Account File Size Limit for large MSAR Surfaces

MSAR support surfaces up to 32 GB, but the UNIX operating system generally limits file sizes to about 2 GB. If you try to write MSAR surface files larger than 2 GB, you might see the following elog error message:

```
2006/09/11 10:28:57.231 202,100,31 <fnsw> dsched e  (24634) ... [SERIOUS]
Lib e, MSAR surface 3118, file '/fnsw/msarE/003118.dat' has an RSVP.
The error is 'FCL: write failed because the file size exceeds the file size limit.'
```

You need to increase the max_acct_file_size parameter in order to accommodate large MSAR surfaces. While this applies to all supported UNIX operating systems, our example in this section only addresses the HP-UX operating system. The procedure is different for older UNIX (uses SAM) and HP Integrity (uses kctune).

For example, on an HP Integrity server select FS Type: Journaled (VxFS) and check the "Allow Large Files" option for the logical volume. For existing MSAR file systems, use SAM (HP-UX 11i v1) or kctune (HP-UX 11i v2 and higher) to increase the max_acct_file_size tunable kernel parameter.

On HP-UX 11i v1 systems:

1 As a user with root privileges, launch SAM.

2 Navigate to Tunable Kernel Parameters.

3 Locate the **max_acct_file_size** parameter and increase its value. The maximum setting is:

2,147,483,647 bytes

4 Exit from SAM, and save your changes. The new value will take effect the next time HP-UX is restarted.

On HP-UX 11i v2 and higher systems:

1 As a user with root privileges, use the kctune command line tool:

kctune max_acct_file_size=2147483647

2 If necessary, restart the server to put the change into effect.

Setting Checksum to Maximum

Checksum is used to verify image integrity. The available settings are: None, Minimum (the default setting), or Maximum.

You can change the checksum setting in the System Configuration Editor on the System Applications Services tab, Others subtab. For MSAR image integrity checking, it is recommended that you set, or verify, checksum to maximum.

Maximum causes the checksum to be recalculated and checked each time the image data is moved anywhere in the system: within memory, to and from magnetic disk, or to and from storage media.

With maximum checksum, additional verification is done to insure that a corrupted image in cache is detected before it is written to storage media. (The images written to cache could have been corrupted because of magnetic disk faults.) After the image is written to cache, it is read into a temporary buffer and compared to the original cache image.

For more information on checksumming as it relates to MSARs, refer to **"Appendix C – MSAR Checksumming" on page 163**.

MSAR WORM Migration

For those upgrading their Image Services systems from IS 3.6 ESE to IS 4.1.2 that also have MSAR surface files on WORM devices, you will need to follow the steps in this section due to the MSAR Checksum feature implemented in IS 4.0. Image Services 4.1.2 release automatically attempts to update all in-box MSAR surface files at system startup. This may make these surfaces inaccessible because of the errors generated during the system's attempt to update a read-only device's MSAR label.

Consequently, file permissions to all of the MSAR surface files that reside on the protected devices will need to be changed to read-only mode so the IS software will open them in read-only mode and not attempt to update the device's MSAR label.

Note   If you do not update the file permissions and then upgrade to IS 4.1.2, the startup code will either generate a write error on the surfaces that are in the WORM device, or creates a new version of the file, which violates the WORM protocol.

You will need to perform the following steps:

1   Shutdown the Image Services software.

2   Determine the files that need to have their permissions changed.

3   Enter the following command for each MSAR file in the device:

   chmod ugo -w <msar_surface_file> (UNIX)

   attrib <msar_surface_file> +R (Windows Server)

On a Windows Server system, Windows Explorer can also be used: Right-click on the MSAR surface file and mark the Read-only attribute under the General tab.

IS 4.x MSAR WORM Issues

For WORM files that are created in 4.x, you must update the permissions on the files to control their updates. To accomplish this, complete the following steps for each file:

1   Eject the file. When you eject the file, the Image Services software will make a final edit to the file to include the new checksum constraints described in the previous section.

2   Manually set the permissions on the file to read-only mode as shown in the previous section.

3   Insert the file back into the library with the paths pointing to the new protected storage device.

MSAR Creation Directories

MSAR surfaces are stored in directories just as any files are. Any type of file storage system can be used if it conforms to the criteria discussed in this section (for example, NAS, HSM, SAN, and so on).

Note   Care must be taken when configuring file systems that use slow storage devices or remote file systems accessed across slow connections. Although these are sound configurations for disaster recovery and deep archive purposes, retrieval performance could be slow. Faster devices are recommended for routine retrievals.

When an MSAR surface is created, it is stored in the MSAR Creation Directory.

Note   The MSAR Creation Directory is also sometimes referred to as the MSAR Surface Creation Directory.

What are MSAR Creation Directories?

Whenever a new MSAR surface is needed, it is created in the creation directory and its location is stored in the database. Each storage library has one creation directory for storing newly created surfaces.

However, when a creation directory is full, or approaches being full, you can configure a new MSAR creation directory. The new creation directory will be where all subsequent **new** surfaces will be stored and directory locations for these new surfaces will point to the new creation directory. Surfaces that were created in the previous creation directory, however, do not get moved. (This includes any active current write surface.) They remain in the previous creation directory unless they are deliberately moved.

Note   If you want all new writes to be made to the new creation directory, you must disable the active current write surfaces. When you disable an active current write surface, a new current write surface will be created in the new creation directory if there are any pending write requests. If you don't disable the active current write surface, documents will continue to be written to the surface file which could not reside in the new creation directory.

The MSAR creation directory **must** also support synchronous writes. Some NAS storage settings do not support synchronous writes. To find out if your creation directory does, see **"Determining if Your MSAR Creation Directory Supports Synchronous Writes" on page 44**

Note   When you configure an MSAR storage library in the System Configuration Editor, you will need to enter the location path of the creation directory. See **"Configuring MSAR Storage Libraries" on page 58**. The creation directory can be changed later on the Storage Libraries tab in the System Configuration Editor. See, **"Changing the MSAR Creation Directory Name" on page 112**.

Creating MSAR Surface Directories

The directory you create here will be used as the MSAR Surface Creation Directory in the procedure, **"Configuring MSAR Storage Libraries" on page 58**.

CAUTION   **Do not** share MSAR Surface Creation Directories between different Image Services systems because of potential MSAR surface file naming conflicts. (However, it is possible to share a file system if different sub directories are used. For example, the domain name could be used as the sub directory.)

Also, **do not** create the MSAR Surface Creation Directory in the root directory, /fnsw/local, \fnsw_loc, or in any other filesystem where running out of space could adversely affect the Operating System. For example, the following directories: /opt, /var/, and /tmp are bad choices.

- For UNIX servers, use the **mkdir** command to make an MSAR Surface Directory.

- For Windows servers, use Windows Explorer to make a directory folder for an MSAR Surface Directory.

Determining if Your MSAR Creation Directory Supports Synchronous Writes

If your system uses a storage management system such as NAS (Network Attached Storage), SAN (Storage Area Network), or HSM (Hierarchical Storage Management) for your MSAR directory (see the **"Glossary" on page 165**), it **must** support synchronous writes. This requirement is not unusual. MSAR creation directories, any directories which are used for storing database files, and any directories used for storing CSM cache files must support synchronous writes. Otherwise, data could be lost. It is also a specific requirement of database vendors for storing database files.

CAUTION   If synchronous writes are **not** supported, surface file data, database, or cache information could be lost.

You can use the **sync_write_test** program to determine if a given storage management system directory supports synchronous writes. This stand-alone program can also be used without other IS software.

Note	Local SCSI magnetic disk drives and SAN devices always support synchronous writes. So, it is not necessary to run this tool on SCSI or SAN devices. Local ATA magnetic disk storage devices do not always support synchronous writes, so they must be tested.

The noac (No Attribute Caching) Option

For UNIX systems using NFS protocol, verify that the **noac** (no attribute caching) option is set correctly in the system file that is used for mounting the file system.

However, for Image Services systems running on AIX/6000 servers, the noac option must **not** be set.

To verify the noac option, perform the following steps.

1 As **root** user, use your preferred text editor (such as **vi**) to view the /etc/filesystems file:

   cd /
   vi /etc/filesystems

2 Locate the stanza for the /fnsw/msar file system. It might look similar to this:

```
/fnsw/msar
        dev       = "/msar/ibm44d2r"
        vfs       = nfs
        nodename  = englibcm
        mount     = true
        options   = bg,hard,noac,intr
        account   = false
```

Notice that the options line contains the noac option. All HP-UX and Solaris systems should use this option.

3   Add the noac option, if it isn't already set, for all HP-UX and Solaris systems.

4   For AIX systems, remove the noac option so the /fnsw/msar stanza looks like this:

```
/fnsw/msar
        dev       = "/msar/ibm44d2r"
        vfs       = nfs
        nodename  = englibcm
        mount     = true
        options   = bg,hard,intr
        account   = false
```

5   You might see additional parameters listed in the /fnsw/msar stanza. If the **vers** (version) or **proto** (protocol) parameters are present, they should be set as follows:

```
/fnsw/msar
        ...
        vers      = 3
        proto     = tcp
        ...
```

6   Save the file and exit. If you made a change to the /etc/filesystems file, it will become effective after the next system restart.

For more information about NFS, refer to your NFS operating system manual.

How the sync_write_test Program Works

The **sync_write_test** program requires one parameter, the target (NAS, HSM, and so on) directory. A file will be created and opened with the platform-specific synchronous write through flags set (for UNIX: O_SYNC, for Windows: FILE_FLAG_NO_BUFFERING and FILE_FLAG_WRITE_THROUGH) in the directory. These flags are used by the IS software for opening MSAR, database, and cache files. The program operates as follows:

- The file will be written to in 1024 byte block sizes indefinitely. Each block will contain a block number repeatedly stored in long words and the blocks will be numbered sequentially.

  For example, the first block written will contain 256 long words with the value of 1, and the second block written will contain 256 long words with the value of 2, and so on. This information will be useful it ever becomes necessary to run traces on the data that is coming over the network or storage device.

- Once the program has written 10 KB of data, you are prompted to disconnect the target storage system.

Note   There is a 1 GB limit for the target file. If the file exceeds this limit during testing, the program will terminate and the sync_write_test will need to be re-run.

- While the program is running, perform a soft disconnect to break the connection. For example, log onto the remote storage device and unexport the share. This will cause the **sync_write_test** program to fail on the next write to the target file. A message will be written to the screen indicating the last successfully written sector. You are also prompted to reconnect the target storage system.

- Next, the target connection should be restored. Once this is done, the **sync_write_test** program will start the verification phase where the content of the data is verified and ultimately indicate if the system passes the test.

- If the system passes, the target test file will be deleted. This indicates that the target directory does support synchronous writes and could be used as an MSAR creation directory or used to store FileNet database and cache files. If the system does not pass, the target file will not be deleted. This indicates that the target directory does not support synchronous writes and is not used as an MSAR creation directory or as storage for FileNet database and cache files.

- This test should be performed five times.

Running the sync_write_test Program

    1 Enter the following command:

        sync_write_test <Target_directory>

    Where <Target_directory> is the Target storage file directory.

Note   In the examples below, we use **I:\msar_stor** for the <Target_directory>, and the target_sync_file has the unique process ID appended, which is 2952.

    After you enter the command above, you will see a screen similar to the following.

```
D:\fnsw\bin>sync_write_test I:\msar_stor
Creating file I:\msar_stor\target_sync_file2952
```

2 Once the program has written 10k of data, you are prompted to discon-
nect the target storage system.

```
D:\fnsw\bin>sync_write_test I:\msar_stor
Creating file I:\msar_stor\target_sync_file2952
Disconnect the target storage device. (10k written so far)
Disconnect the target storage device. (100k written so far)
Disconnect the target storage device. (1000k written so far)
```

While the program is running, perform a soft disconnect to break the
connection. For example, log onto the remote storage device and un-
export the share. This will cause the sync_write_test program to fail on
the next write to the target file.

Note Additionally, if the sync_write_test is allowed to run and the target file
exceeds 1073741824 bytes, the sync_write_test program will termi-
nate. If this occurs, you will need to re-run the test.

3 The screen will display the following information.

```
After disconnection, Expected Failure occurred while writing to:
I:\msar_stor\target_sync_file2952 file (Target) system error=1167
The target file has been closed
Target file 'I:\msar_stor\target_sync_file2952' should be at least
21603k.
The target file has been closed
Re-connect the target storage device.
After you have re-connected. Type 'y' to continue or 'a' to abort.
```

You're also prompted to reconnect the target storage system as shown
in the example above.

4 Restore the connection to the target system and answer **y** to the prompt. When this is done, the **sync_write_test** program starts the verification phase where the content of the data is verified and ultimately indicate if the system passes the test.

```
Opening file I:\msar_stor\targer_sync_file2952
Verifying the data (one dot for every 100k verified):
.......................................................
.......................................................
................................
Last block verified=21603k

Passed SYNC test!!!

Target file has been deleted: I:\msar_stor\targer_sync_file2952
```

If the system passes, a **Passed Sync test!!!** message is displayed on the screen and the target test file is deleted. This indicates that the target directory does support synchronous writes and could be used as an MSAR creation directory or used to store FileNet database and cache files.

If the file is smaller than the last successful write, the system will not pass. This will be evident by a screen similar to the following:

```
Target file has not been deleted: I:\msar_stor\targer_sync_file2952
This was done because the storage device failed the SYNC test.
```

In this case, the target file will not be deleted. This failure indicates that the target directory does not support synchronous writes and is not used as an MSAR creation directory or used to store FileNet database and cache files. If this occurs, you need to contact your storage provider for assistance.

5   Repeat these steps four more times.

It's necessary to perform the test 5 times successfully because there could be a false positive result. If the test fails even once during the five tests, the system has **NOT** passed the test.

Note   In some cases, the operating system or storage system could flush its buffers before the disconnection is complete. This means there is a possibility of having a false positive result. It could be necessary to consult with the storage provider about the specific way to disconnect a storage system.

Running the test_raw_partition Program

The **test_raw_partition** tool tests whether a UNIX platform supports raw partitions and synchronous writes to partitions and files. On UNIX platforms, the Image Services CSM page cache and the MKF transient, permanent, and security databases are stored in raw partitions. (Raw partitions are called logical volumes on some platforms.)

The test-raw-partition tool determines whether or not synchronous writes are being performed by performing these steps:

1   First, test_raw_partition computes the equivalent RPM number of the file or raw partition being tested based on the write rate described earlier.

2   Then test_raw_partition creates an ordinary file with asynchronous writes and computes the equivalent RPM number.

3   Finally, test_raw_partion compares the two RPM numbers:

If the RPM number of the file or raw partition being tested is less than the minimum of 18,000 RPM, and one half the RPM number of a file with asynchronous writes, then the RPM number is assumed to be low enough to be achieved by synchronous writes to a magnetic disk. In this case, test_raw_partition passes the file or raw partition being tested.

If the RPM number of the file or raw partition being tested is equal to or greater than the minimum of 18,000, and one fourth the RPM number of a file with asynchronous writes, the file or raw partition being tested fails the test for synchronous writes.

For more information on the program, refer to the *System Tools Reference Manual*. To download this manual from the IBM support page, see **"Accessing IBM FileNet documentation" on page 14**.

Setting MSAR Directory Permissions

Setting permissions for MSAR directories is important. If not set properly, your system will not function. Use the examples below to setup your system.

Setting Permissions on UNIX Servers

As root user, change the ownership and access permissions for the MSAR directory. Verify that the ownership is set to the FileNet user and the FileNet user group. If the access permissions are not correct, you will need to change them. Use this syntax:

    chown <FileNet user>:<FileNet user group> <directory>
    chmod 775 <directory>

For example, if the MSAR surface creation directory is going to be located in the /msar directory you might enter commands similar to these:

chown fnsw:fnusr /msar
chmod 775 /msar

Setting Permissions on Windows Servers

Follow the steps in this procedure to set permissions for an MSAR directory folder on a local Windows server. If your MSAR directory is located on a remote Windows server, see **"Appendix A – Windows Network Security Settings for Accessing Remote Shared Drives" on page 137**.

1   In Windows Explorer, verify or create a directory folder for MSAR.

Note   In this procedure the directory folder is named MSAR.

2   Right-click on the MSAR folder and select **Properties**. The properties window for the folder opens.

3   In the properties window, select Security tab to display the Security tab dialog box.
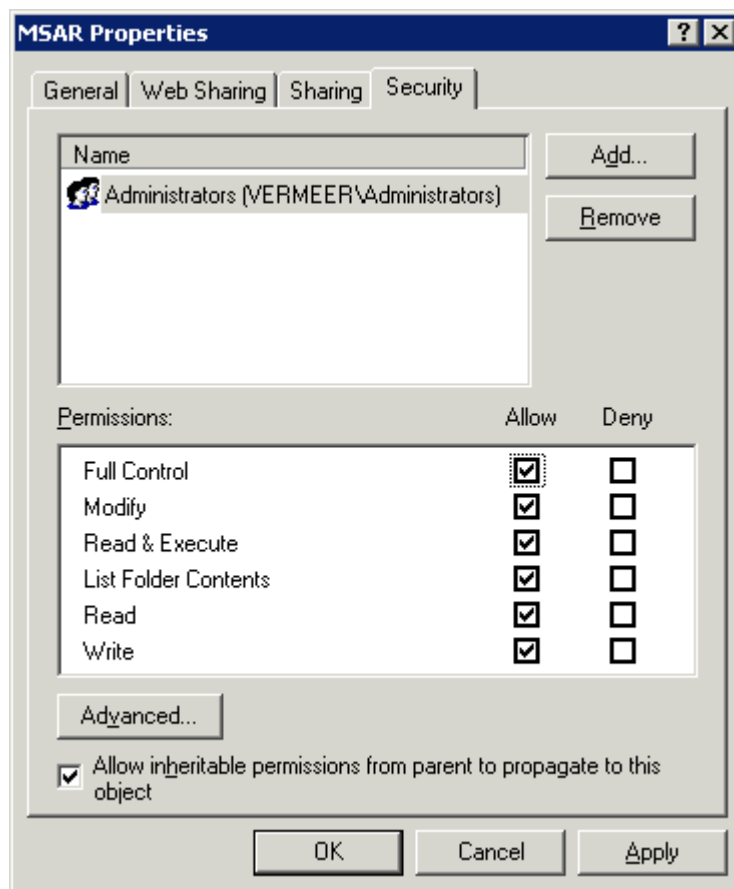
4   Click the **Add** button to open the Select Users, Computers, or Groups window.
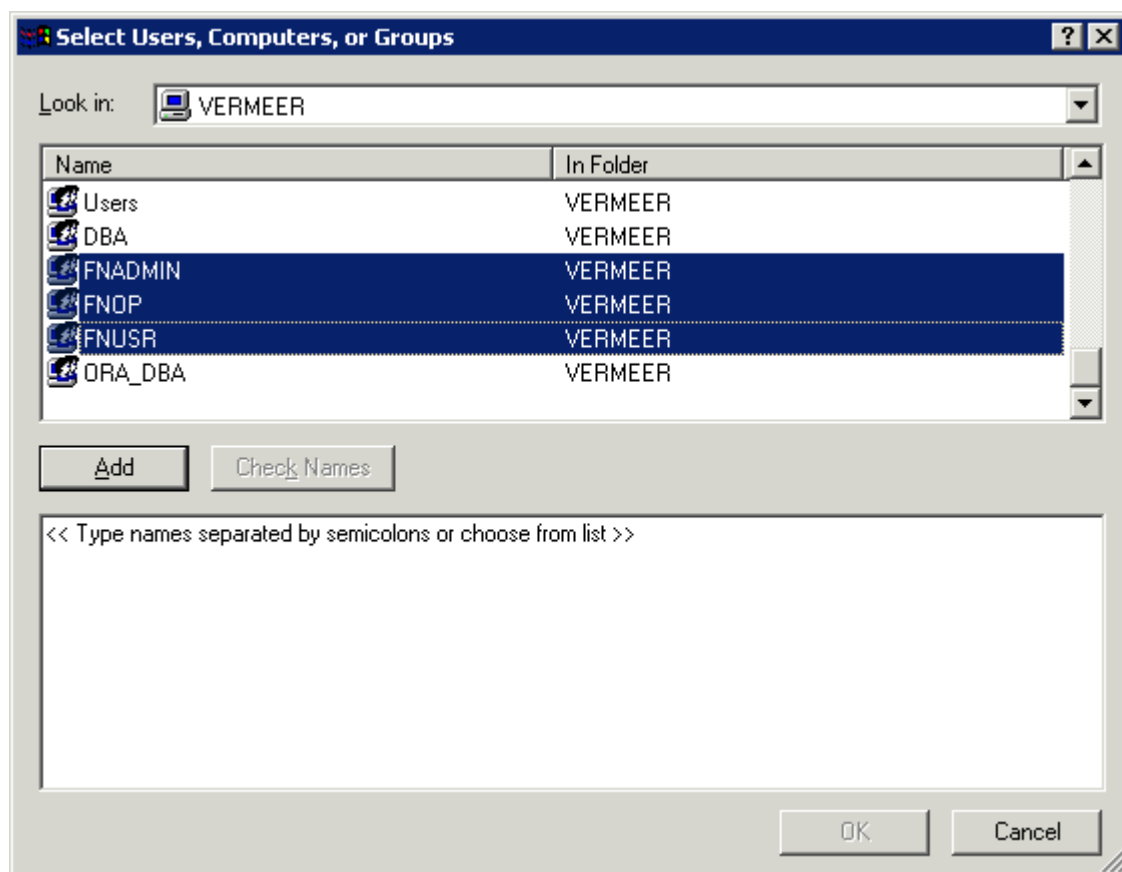
5 From the drop-down list in the Look in: box, verify or select your com-
puter name.

6 Scroll through the list of group names and select FNADMIN, FNOP,
and FNUSR.

7 Click **Add** and then click **OK**. The Security tab dialog box reappears.
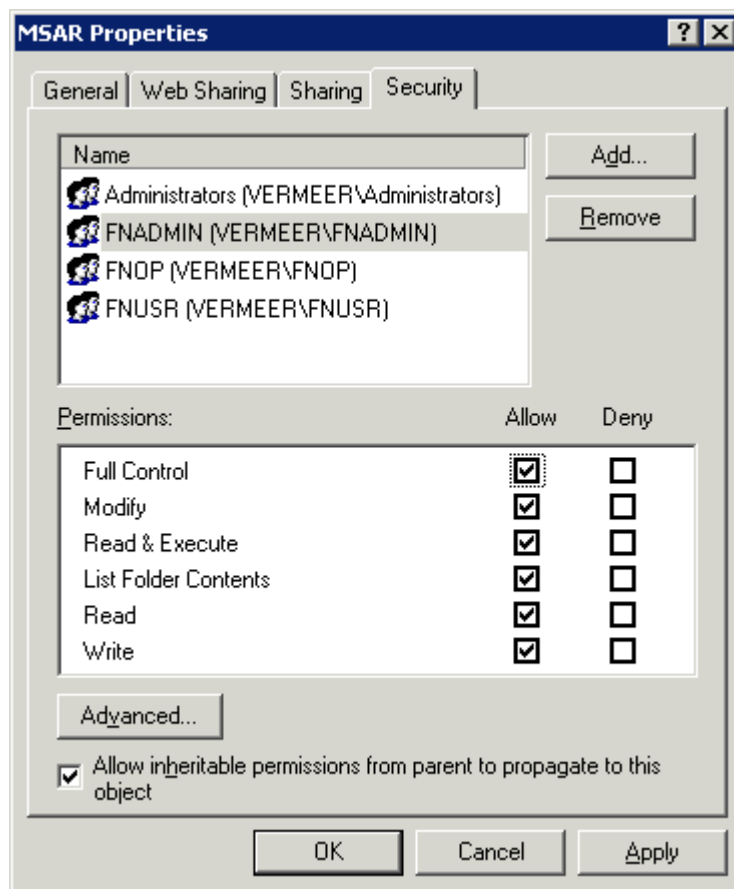
8   Set the permissions for each group you added in the Security tab dia-
log box. Refer to the table below for the permissions setting for each
group.

Group	Permissions
fnadmin	Full Control
fnop	Read & Execute, List Folder Contents, Read, and Write
fnusr	Read & Execute, List Folder Contents, Read, and Write

9   After setting the permissions for each group, click *OK* to close the
Properties dialog box and have your settings take effect.

Setting Permissions for CIFS Directories

Follow the steps below to setup a CIFS shared directory for use as an
MSAR Creation Directory on a Windows server.

1   If you aren't already, logon as Windows **Administrator**.

2   On the system with the NAS device, the Administrator user must grant
CIFS access to the owner of the IS ControlService on the IS server.
Usually, this will be the domain fnsw account. The Administrator user
would use the CIFS utility (for example, CIFS access <server> <do-
main fnsw> full control).

3   On the Image Services server, map the network drive to the shared di-
rectory.

4   In Windows Explorer, right click on the mapped directory and add the
owner of the IS ControlService, usually domain fnsw, to the security list
and give that user Full Control.

Note If Image Services is on a Windows platform, the MSAR surface creation directory can only be mounted from a NAS server Windows file system. If a NAS server Mixed or UNIX file system is used, a permission error will occur during a file creation.

Configuring MSAR Storage Libraries

Use the FileNet Image Services System Configuration Editor to configure the MSAR Storage Libraries that you need. To configure an MSAR library you will have to know the following information:

- Server name (if more than one server is configured)

- MSAR library type

- MSAR library number

- MSAR surface creation directory

- Number of drives that should favor writes

1 Open the System Configuration Editor.

The System Configuration Editor window opens.
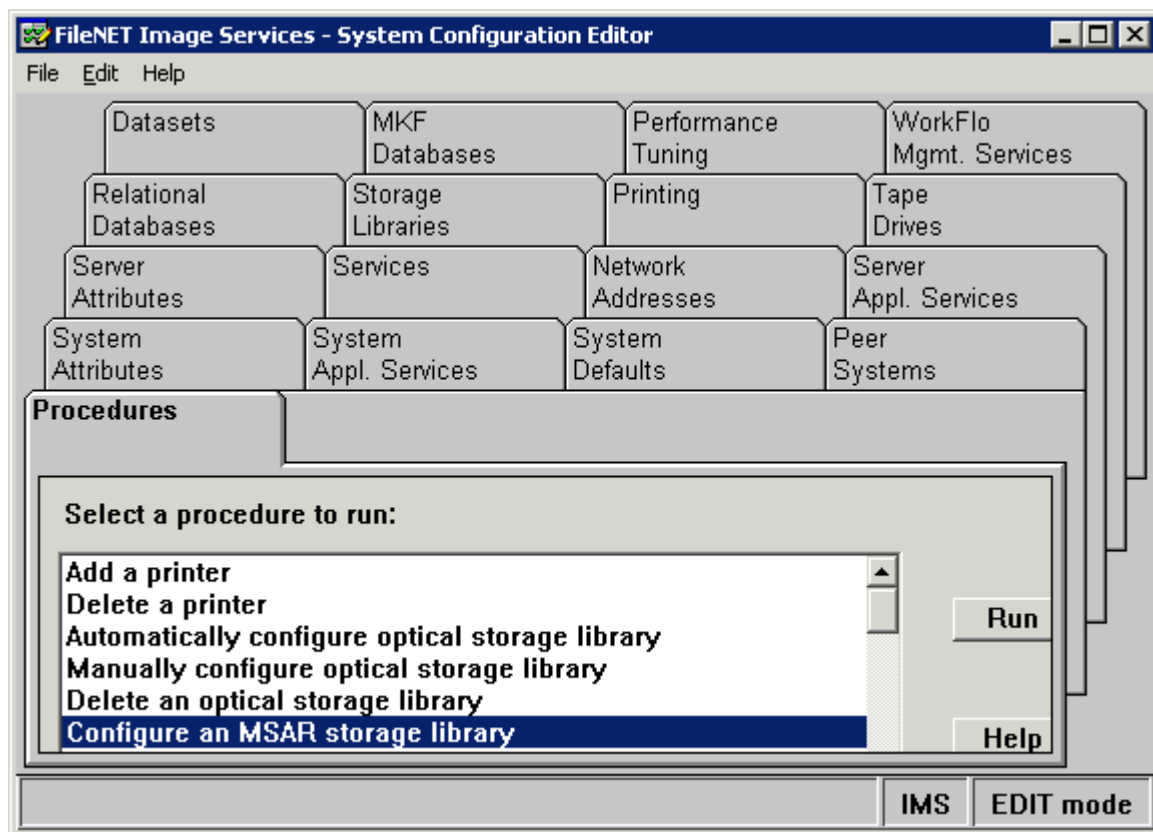
- **2** From the Procedures tab, select the procedure, "Configure an MSAR Storage Library" and click **Run**.

- **3** From the list of servers that appears, select the server to add the storage library to and click **Next**.

Note This dialog box only appears if you have more than one server configured on your system.
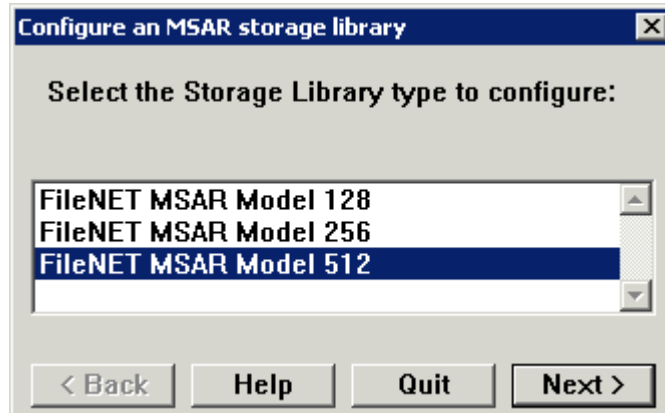
4 Select the Storage Library type and click **Next**.

Note The model number represents the number of slots available in the storage library. For example, Model 512 has 512 slots, Model 256 has 256 slots, and so on.
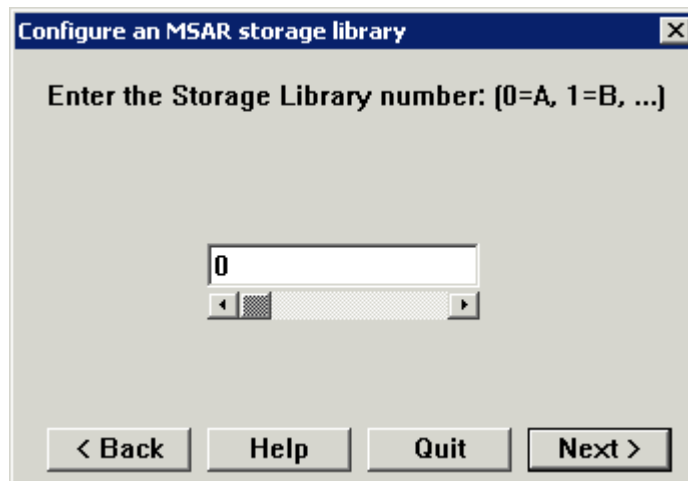
5 Select, or enter the storage library number and click **Next**.

Note If the storage library number is in use, you will get an error message and be allowed to quit or choose another number.

6 Enter the MSAR surface creation directory for the MSAR library and click **Next**. See **"Creating MSAR Surface Directories" on page 43** for more information.

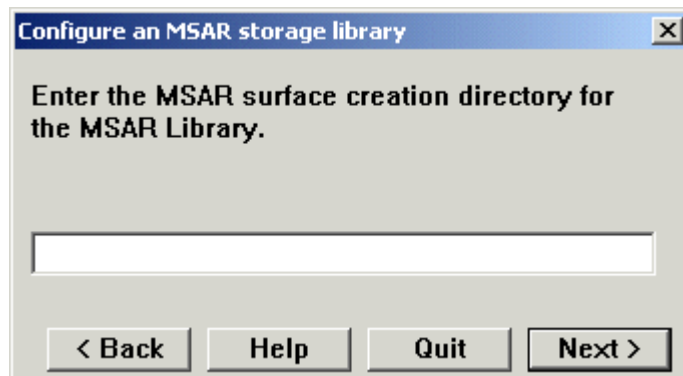The directory you configure here will be listed in the System Configuration Editor on the Storage Libraries tab. If you want to change this later, use the procedure, **"Changing the MSAR Creation Directory Name" on page 112**.

Note Unless the surface creation directory was already created in the procedure, **"Creating MSAR Surface Directories" on page 43**, it will not appear in Windows Explorer or the UNIX file structure until the first document is committed to an MSAR surface in this library.

```
┌─────────────────────────────────────────────────┐
│ Configure an MSAR storage library            [×] │
├─────────────────────────────────────────────────┤
│                                                   │
│  How many drives should favor writes?            │
│                                                   │
│                                                   │
│                                                   │
│              ┌──────────────────────────┐        │
│              │0                         │        │
│              └──────────────────────────┘        │
│              ◄│  │                      ►│       │
│                                                   │
│                                                   │
│                                                   │
│   ┌────────┐ ┌────────┐ ┌────────┐ ┌────────┐   │
│   │ < Back │ │  Help  │ │  Quit  │ │ Next > │   │
│   └────────┘ └────────┘ └────────┘ └────────┘   │
└─────────────────────────────────────────────────┘
```
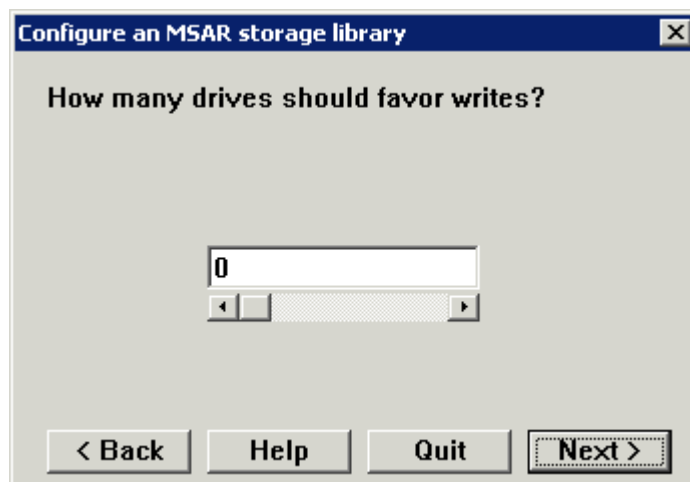
7 Enter the number of drives you want to favor writes, or accept the default 0, and click **Next**.

The number you select in this box will apply to the drives beginning with drive 1. For example, if you enter 3, drives 1, 2, and 3 will be set to favor writes.
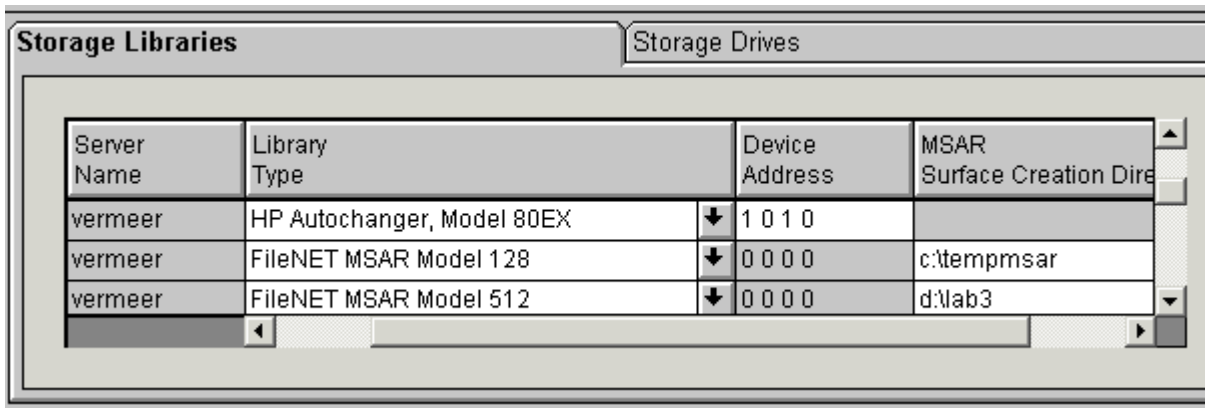
Tip If you want to change this setting later, you can do so in the System Configuration Editor on the Storage Libraries tab.

Note To increase Document Buffer Count, or to make other performance tuning parameter changes to increase performance, see **"Performance Recommendations" on page 32**.

Viewing the Storage Library in the System Configuration Editor

After you have configured the MSAR storage library you can view it in the System Configuration Editor on the Storage Libraries tab.

1 Open the System Configuration Editor.

2 Select the Storage Libraries tab.

Storage Libraries		Storage Drives	
Server Name	Library Type	Device Address	MSAR Surface Creation Dire
vermeer	HP Autochanger, Model 80EX ⬇	1 0 1 0	
vermeer	FileNET MSAR Model 128 ⬇	0 0 0 0	c:\tempmsar
vermeer	FileNET MSAR Model 512 ⬇	0 0 0 0	d:\lab3

3 On the Storage Libraries sub tab, scroll to the MSAR Surface Creation Directory field. The example screen above shows what a system would look like if it had both Optical (HP Autochanger, Model 80EX) and MSAR storage libraries configured.

Note - The optical library does not have an MSAR Surface Creation Directory so that field is grayed-out.

- Two MSAR libraries have been configured. Model 128 has 128 slots and model 512 has 512 slots.

- The MSAR libraries do not have a device address so that field is grayed-out and always set to 0000.

Defining MSAR Media Families and Classes

Use this information to define new MSAR media families and classes.

Defining MSAR Media Families

Defining MSAR Media Families is done using the Database Maintenance application of the System Application Executive. The procedure is similar to how you would configure an optical media family.

During this procedure you will have to choose an MSAR media size from the Media Size drop-down list.

There are six MSAR media size choices. 1GB, 2GB, 4GB, 8GB, 16GB and 32GB. This is shown in the following screen:
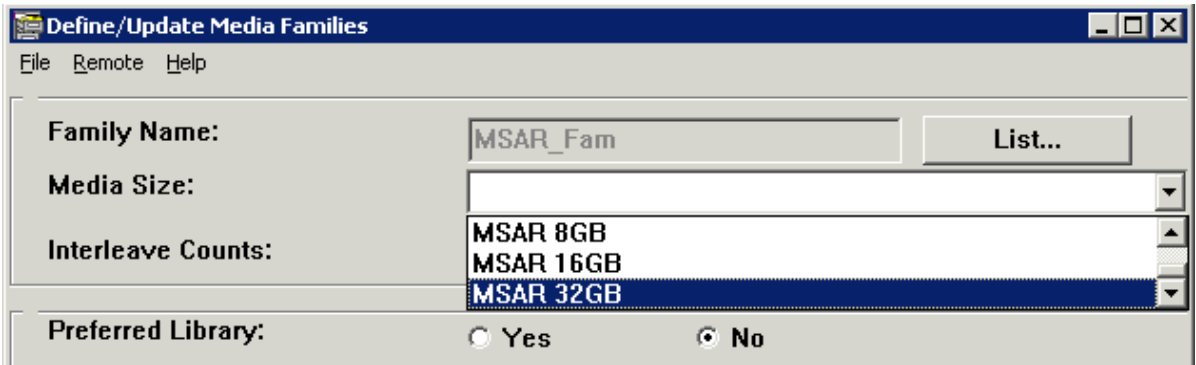
Defining MSAR Document Classes

Defining MSAR Document Classes is done using the Database Maintenance application of the System Application Executive. The procedure is similar to how you would configure an optical document class.

When you define an MSAR document class it is recommended that you verify or set the Migration option to **Yes**, and Migration Delay option to **No**, as shown in the partial screen below.

These settings will cause images to be written to MSAR surfaces as soon as possible, thus reducing the number of locked cache objects. Fewer cache objects speeds up the process of backing-up locked objects in page cache. See the **"Backup Strategy Example" on page 135**.

Converting Your Optical or Cache-Only Systems to MSAR

There are three separate conversion procedures in this section.

They include:

- **"Converting a Single Optical Surface to an MSAR Surface.'**

- **"Converting an Optical Storage Library Server to an MSAR-Only Server.'**

- **"Converting a Cache-only Server to use MSAR Libraries.'**

Converting a Single Optical Surface to an MSAR Surface

This procedure describes how to convert a single optical disk to a new MSAR surface(s).

Note   If you convert both sides of a two-sided optical disk, and there is data on both sides, two MSAR surfaces will be created.

To convert an entire optical storage library refer to the section, **"Converting an Optical Storage Library Server to an MSAR-Only Server" on page 76**.

MSAR convert copies an optical surface to an MSAR surface. The converted surface is a mirror image of the optical surface with the exception of the surface header information (volume and MSAR label). The converted MSAR surface is read only and retains the original optical media type, media sector size, and format.

MSAR convert is performed using the Background Job Control application in the FileNet Image Services Application Executive. To access the convert background job, choose Convert Optical Surface to MSAR

from the New menu. You will need to know the Surface ID of the optical surface you want to convert and the MSAR library you are placing the newly converted surface into. The MSAR convert program will then create a new surface ID for the newly converted MSAR surface.

Note   If no library is selected, the convert program will attempt to insert the surface into an MSAR library that is not full.

The MSAR convert background job default is to convert both sides of an optical disk onto two MSAR surfaces. If you do not want to convert both sides of the optical disk, you must deselect that option.

When you run the Convert background job, unwritten portions at the end of the optical surface will not be copied. For example, a 12 GB optical surface which contains 6 GB of data will result in an MSAR surface that is 6 GB.

Advantages of MSAR Convert over Consolidate Media Option

The Consolidate Media option in Background Job Control can also be used to copy optical surfaces to MSAR surfaces. However, using MSAR convert offers the following advantages over the Consolidate Media option.

- MSAR convert is faster than the Consolidate Media option, and much faster than using Consolidate Media if small documents exist on an optical surface. MSAR convert makes a mirror image copy of the optical surface, but Consolidate Media copies one document at a time using page cache. MSAR convert does not use cache, but instead copies directly from the optical to the MSAR surface.

- The speed of MSAR convert is more predictable than the Consolidate Media option because the speed of Consolidate Media is

highly dependent on the number of documents on a surface while MSAR convert is not. MSAR convert is mainly dependent on the size of the optical surface so the speed of converting it can be estimated based on the size of the surface rather than on how many documents are stored on it.

• MSAR convert maintains the natural collection of documents like they were on optical surfaces. This is done by copying the optical surfaces one-for-one. Consolidate Media will copy multiple surfaces but consolidate them into fewer surfaces, thereby losing the natural arrangement of documents based on the time of document entry and their media family associations.

• Consolidate Media will not copy deleted documents.

To understand the implications of running this procedure, read the following information **before** you convert any optical surfaces.

Converted Surfaces are Read Only

MSAR surfaces that have been converted from optical become **read only** surfaces. You will not be able to write to the newly created MSAR surface. Therefore, you could want to copy annotations to source optical surfaces or update document headers **before** running the conversion procedure.

Foreign Surfaces

A foreign surface is a surface created on another system that has a different SSN (System Serial Number). You can identify a foreign surface by viewing the Detailed Surface Information window in Storage Library Control. If the **Original SSN** is different from the SSN of the local system, the surface is foreign.

Beginning with the IS 4.0 release, foreign surfaces can now be converted using the Convert Background Job Control application.

Directory Out-of-Space

If the target MSAR directory runs out of space, the conversion function will terminate, an error message will be logged, and the appropriate clean up will be done.

Note   If you add more space to the target MSAR directory to resolve the problem, or if you select another MSAR library that has enough available space, you **must** re-submit the Convert job.

Errors

- If a fatal error occurs while converting an optical surface, or the job is aborted, the MSAR surface file entry will be deleted. In addition, any database references will also be removed. The original optical surface will remain write disabled.

- Any errors encountered while reading the optical surface will cause the conversion function to terminate and the appropriate clean-up to be done. The lower layers of Image Services software will do retries.

    If a media error (error tuple 30,0,8) is caused by a dirty optical disk, the conversion function will terminate and clean up as with other error conditions. However, the conversion function will also instruct the user (via the System Log) to eject the dirty optical disk, clean it, re-insert it, and resubmit the conversion background job.

Phases of MSAR Convert

There are five distinct phases when converting an optical surface to an MSAR surface:

• Phase 1 - An entry is created in the database which references the MSAR surface file location. The MSAR surface file will be created in the MSAR surface creation directory.

• Phase 2 - The optical surface is read and the MSAR surface is written.

• Phase 3 - The MSAR surface is inserted into an MSAR library and the database tables are updated.

• Phase 4 - The document locator (docs) table is updated, if specified.

• Phase 5 - The job completes.

Note   The conversion job can be aborted in phases 1-3 using the Abort button. However, when the conversion background job enters Phase 4 (update docs phase), the job cannot be aborted.

Running the Conversion Program

The Convert Optical Surface to MSAR program is located in the Background Job Control application in the FileNet Application Executive.

Note   Although running the program using the Background Job Control application is preferable, you can also run the conversion using the command: **st_msar_convert**. See the *System Tools Reference Manual* for

information. To download this manual from the IBM support page, see **"Accessing IBM FileNet documentation" on page 14**.
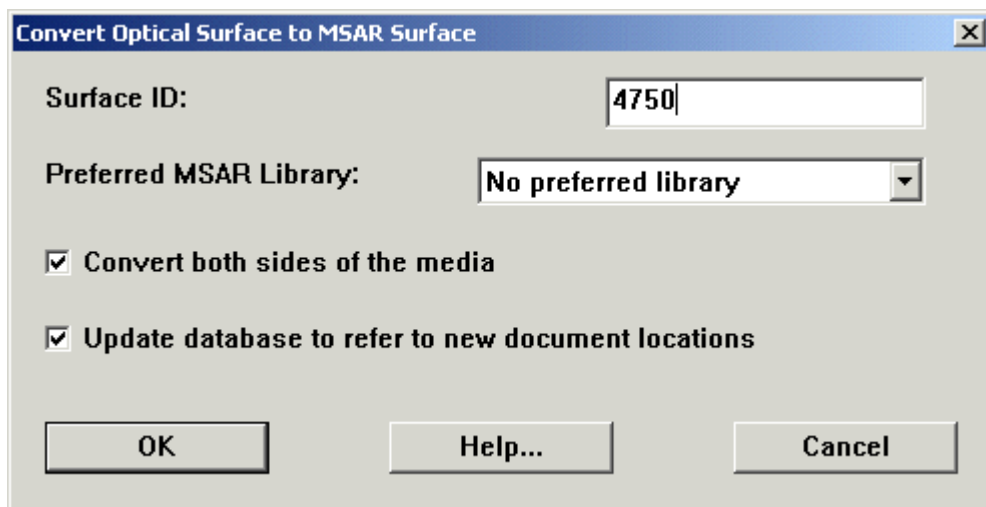
Conversion Options

When you run the Convert Optical Surface to MSAR program you will need to make choices for the following options that are presented.

- **Surface ID**
  This is the surface ID of the optical surface you are converting.

- **Preferred MSAR Library**
  This option allows you to select a preferred MSAR library. (The default is No preferred library.) If you have more than one MSAR library, you can select the preferred library to add the converted surfaces to. If no library is selected, the convert program will attempt to insert the surface into an MSAR library that is not full.

- **Convert Both Sides of the Media**
  This option gives you a choice to convert one side, or both sides, of the optical media. (The default is both sides, the box is checked.) Unless the check mark is removed, as long as there is data on both sides of the two-sided optical disk, two MSAR surfaces will be created.

- **Update Database to Refer to New Document Locations**
  This option gives you a choice to have the database updated to refer to new document locations. (The default is to update database, the box is checked.) When this option is checked, the docs table entries for the MSAR surface will be consistent with the entries for the optical surface being converted, and any deleted documents will not be inserted into the docs table.

In addition, only references to optical surfaces in the docs table will be updated. For example, if a document is in the docs table but the locator surface_ID field does not reference the optical surface that you are converting, the entry in the docs table will remain unchanged.

1 Open the FileNet Image Services Application Executive and select Background Job Control from the Applications menu.

2 From the New menu, select Convert Optical Surface to MSAR.

Convert Optical Surface to MSAR Surface	✕
Surface ID:	`4750`
Preferred MSAR Library:	No preferred library ▼
☑ **Convert both sides of the media**	
☑ **Update database to refer to new document locations**	
OK	Help...	Cancel

3 In the Convert Optical Surface to MSAR Surface dialog box that opens, enter the surface ID, choose the other options that you prefer, and click **OK**. There is also online help available if needed.

CAUTION The Convert background job will write-disable the source optical surface. **Do not** write-enable the optical surface while it is being con-

verted. If documents are written to an optical surface while the surface is being converted, these documents may not be copied to the new MSAR surface.
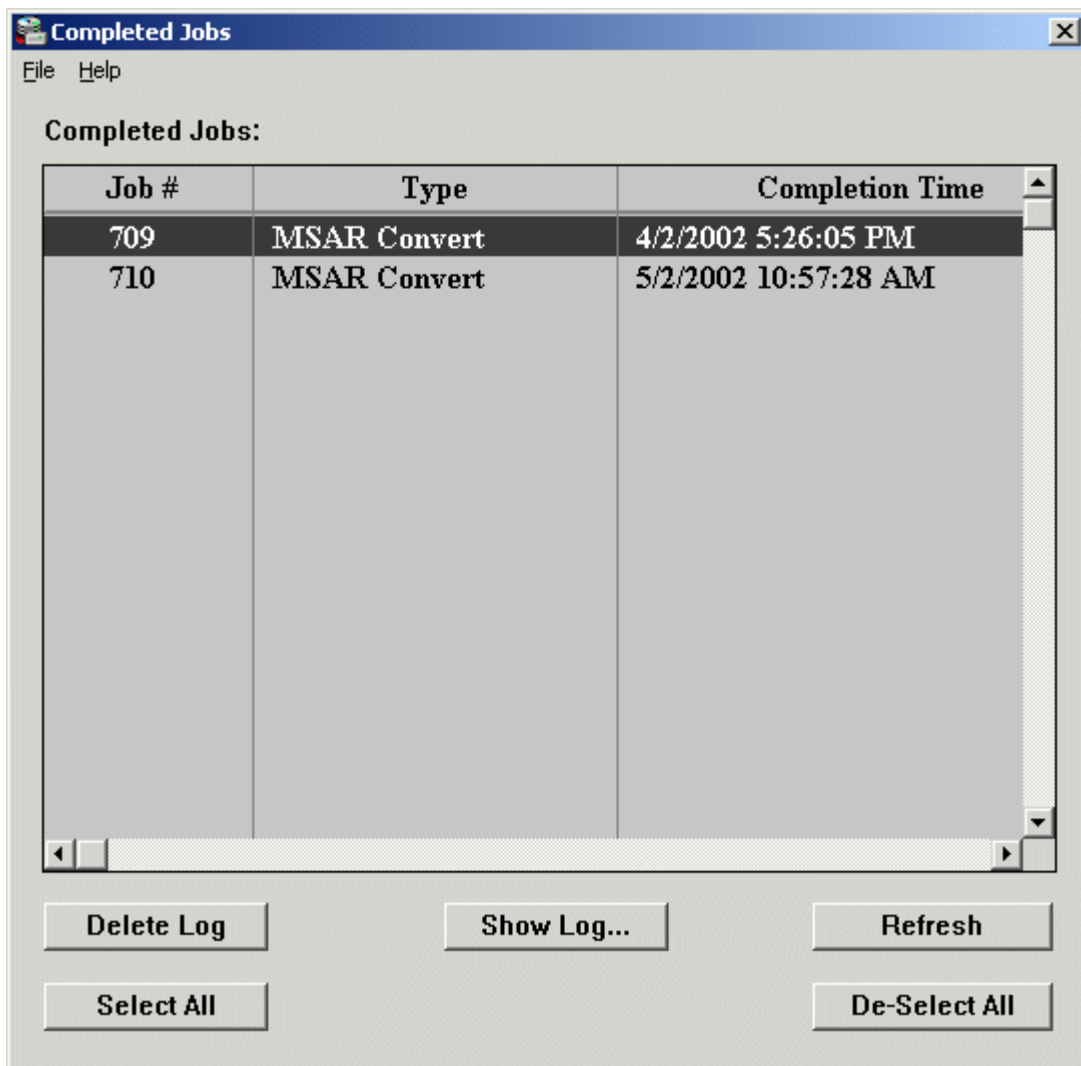
During the conversion process, the progress of the convert background job can be viewed in the Background Job Control window as shown below.

Note Scroll to the right of the Background Job Control window to see the Current Objects column (not shown in the screen below). The Current Objects column shows the number of sectors that have been copied to the new MSAR surface during the job.
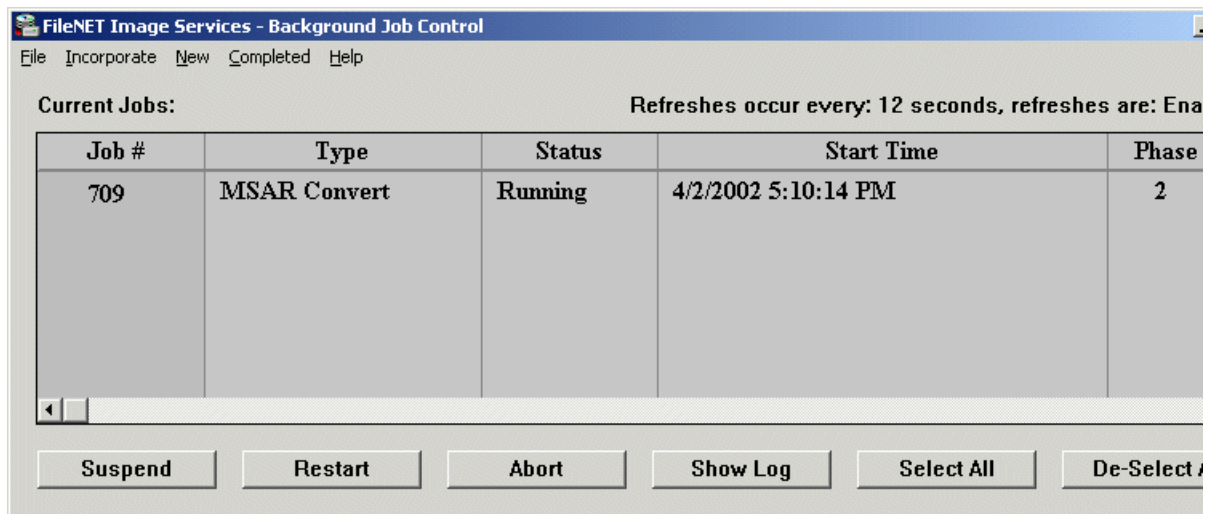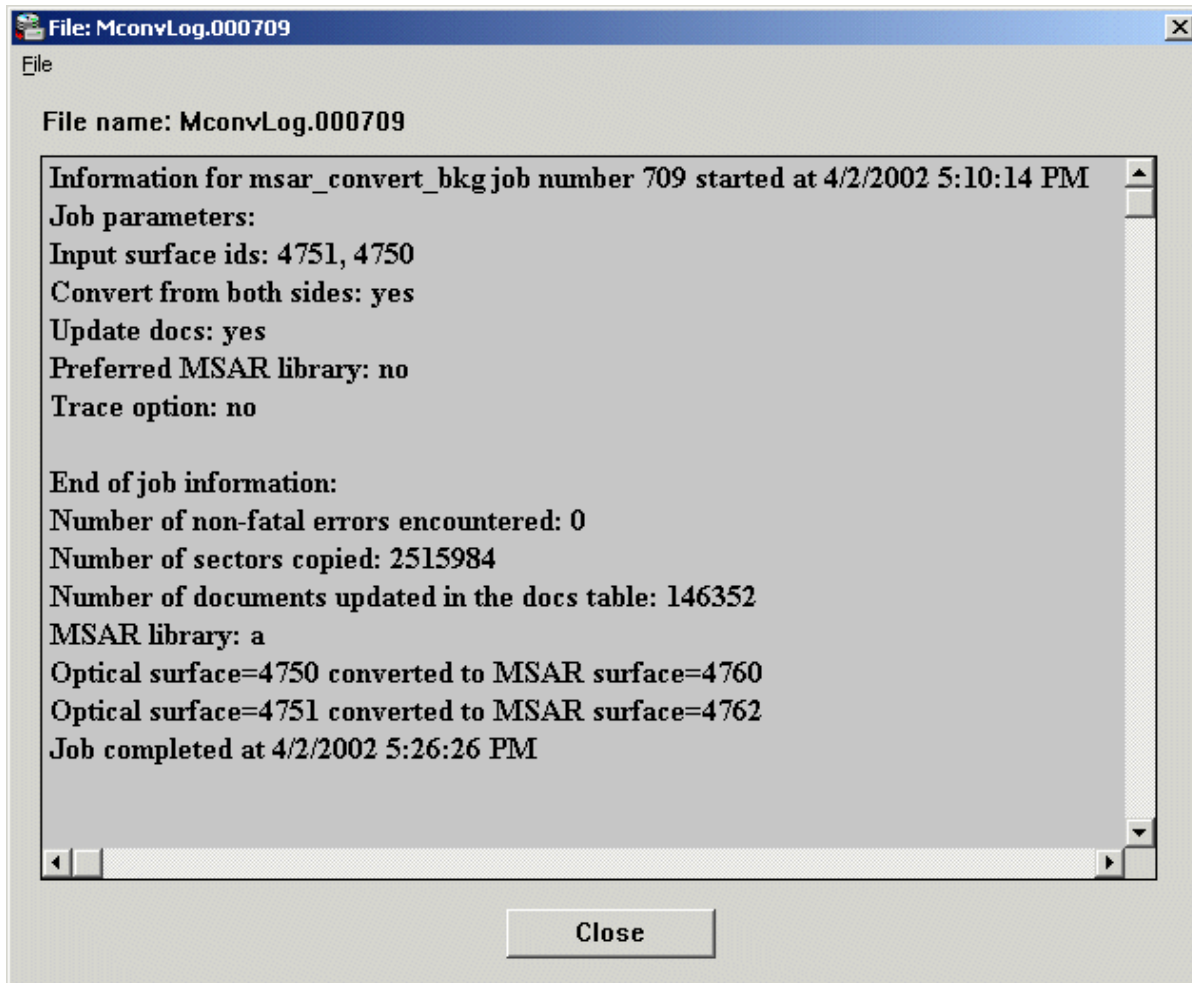

4 Once the conversion background job is complete, you can view the completion log to see if any errors were encountered or see other conversion information. To view the log, select *Completed Jobs* from the

Background Job Control Completed menu. A screen similar to the following will appear.

Job #	Type	Completion Time
709	MSAR Convert	4/2/2002 5:26:05 PM
710	MSAR Convert	5/2/2002 10:57:28 AM

Completed Jobs

File Help

Completed Jobs:

Delete Log   Show Log...   Refresh

Select All   De-Select All

5 In the Competed Jobs window, select the completed job that you want to view and click the **Show Log** button.

Tip You can also double-click on the job you want to open the log window.

File: MconvLog.000709   ✕

File

File name: MconvLog.000709

Information for msar_convert_bkg job number 709 started at 4/2/2002 5:10:14 PM
Job parameters:
Input surface ids: 4751, 4750
Convert from both sides: yes
Update docs: yes
Preferred MSAR library: no
Trace option: no

End of job information:
Number of non-fatal errors encountered: 0
Number of sectors copied: 2515984
Number of documents updated in the docs table: 146352
MSAR library: a
Optical surface=4750 converted to MSAR surface=4760
Optical surface=4751 converted to MSAR surface=4762
Job completed at 4/2/2002 5:26:26 PM

Close

The completion log displays important details of the conversion process including:

- number of non-fatal errors

- number of sectors copied

- number of documents updated in the docs table

- MSAR library that the new surface is in

- original optical surface ID, and the new MSAR surface ID

Note   If a two-sided optical media is converted, the log shows both of the original optical surface IDs and the corresponding new MSAR surface IDs. Note that the new MSAR surface IDs for both sides of the converted optical media are even numbers. This is because MSAR surfaces are single sided, so all MSAR surfaces are side A surfaces.

Converting an Optical Storage Library Server to an MSAR-Only Server

This procedure describes how to convert an **entire** optical storage library server to an MSAR-only storage library server. To convert a single optical surface to an MSAR surface, refer to the section, **"Converting a Single Optical Surface to an MSAR Surface" on page 66**.

Note   This is not an automated procedure. Each optical surface must still be manually converted.

To convert an entire optical storage library server perform the following steps:

1 Configure MSAR libraries.

2 Configure MSAR media families.

3 Edit all current document classes to use the new MSAR families. Select the Define/Update Document Classes option from the Classes menu in Database Maintenance.

Note Prior to redirecting document classes, verify that all outstanding batches have been committed.

4 Identify all optical surfaces that you want to convert that are physically located in optical storage libraries (in-box). You should convert these surfaces first.

5 Convert all optical surfaces that are currently in-box. Refer to the procedure **"Converting a Single Optical Surface to an MSAR Surface" on page 66**.

6 Identify all optical surfaces that you want to convert that are currently not physically in the storage library (out_of_box).

7 Insert the surface(s) you want to convert and refer to the procedure, **"Converting a Single Optical Surface to an MSAR Surface" on page 66** to convert these surfaces. To convert foreign surfaces, use the Consolidate Media procedure below.
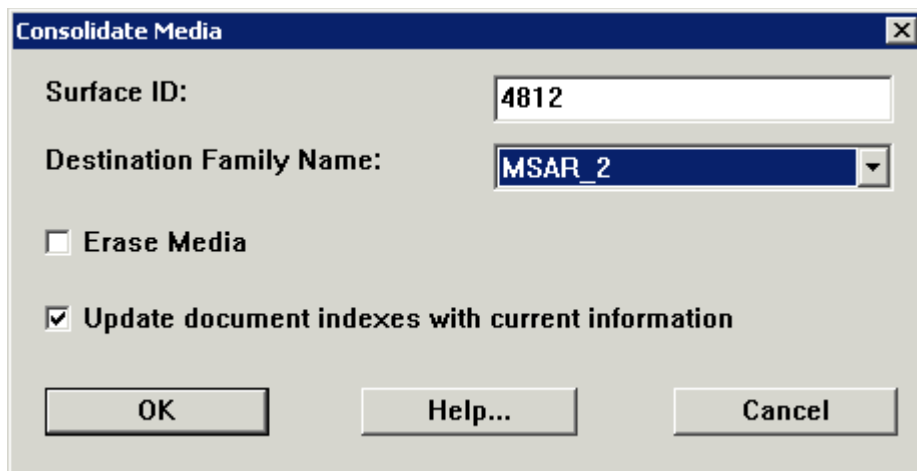
Using Consolidate Media to Copy Foreign Optical Surfaces (Optional)

If, for some reason, you do not want to use the MSAR Convert procedure to convert foreign optical surfaces, you can still copy foreign

optical surfaces to MSAR surfaces using the Consolidate Media option in Background Job Control.

1 From Background Job Control, New menu, select Consolidate Media.

The Consolidate Media window opens.

Consolidate Media	⊠
Surface ID:	4812
Destination Family Name:	MSAR_2 ▼
☐ Erase Media	
☑ Update document indexes with current information	
OK	Help...	Cancel

2 Enter the surface ID of the foreign media you want to consolidate.

3 Select from the drop-down list, the Destination MSAR Family Name.

Note Not all the families are listed in the Destination Family Name pull-down list. Only families that are write-compatible with a matching primary/tranlog type, and are local to the server, are listed.

4. Mark the checkboxes that you prefer for the Consolidate Media job.

- Erase Media check box.

If you check this box, you will erase the source media after the consolidate job completes.

- Update document indexes with current information checkbox. (default)

  The original index values entered on the foreign optical media could have been changed in the index database. While consolidating media, you can have the system insert the most recent index data instead of copying the original information from the media.

5 Click **OK** to start the Consolidate Media job.

You can view the progress of the Consolidate Media job in the Background Job Control window.

6 When the Consolidate Media background job is complete, you can view the completion log to see if any errors were encountered and/or see other information. To view the log, select **Completed Jobs** from the Background Job Control Completed menu.

Disconnecting an Optical Storage Device (Optional)

Perform the steps below to disconnect an optical storage device.

CAUTION Prior to disconnecting an optical storage device, identify any optical surfaces that have not been converted or copied to MSAR surfaces. If these surfaces have references in the docs table that point to optical surfaces, it could cause unresolved RSVP's to occur if a surface is requested from a storage device that no longer exists. To resolve this problem, these documents must be copied to MSAR surfaces or deleted from the database.

1   Stop the FileNet Image Services software on the Storage Library Server.

2   Shutdown the operating system using the appropriate shutdown command.

3   Turn off the power to the server.

4   Turn off the power to the storage device and disconnect it.

5   Turn on the power to the Storage Library Server and logon as **fnsw**.

6   Open the FileNet Image Services System Configuration Editor, select the Delete an optical storage library procedure and click *Run*.

7   After you have finished deleting the storage library, exit the FileNet Image Services System Configuration Editor and save your changes.

8   Start the FileNet Image Services software.

Converting a Cache-only Server to use MSAR Libraries

With a cache-only server, you can move all your committed documents to an MSAR library using the Migrate Documents procedure from the Background Job Control application on the Application Executive.

Follow the steps in the procedures below to migrate documents in cache to your new MSAR storage media.

Committing Outstanding Document Batches

The first step in converting a cache-only server to an MSAR storage library server is to verify that all outstanding document batches have been committed. This is very important because modifications of a

document class or family are not supported if there are outstanding batches.

Creating or Editing Media Families and Document Classes

Before you can migrate documents to MSAR, you must first either create new media families or edit existing families.

Choose the method below that is preferable for your system.

- Create new families that write to MSAR media and then edit each document class to use the new families.

- Edit each existing family and change the media type to the appropriate MSAR media size. Use this method if you want to use the existing family names.

Edit all document classes to change the Migration option to **Yes** and the Migration Delay option to **No**.

When converting a cache-only system, you must also verify that **all families** are changed to supported media. Once a single write has gone to an MSAR surface, any committals to unsupported media will end with an invalid media error. It is not possible to support families that write to MSAR and others that will continue to write to the cache-only system as they did before creating a library. For example, a cache-only system has families that write to the non-existent optical media and once the MSAR library is created, all families must be altered to write to MSAR media or all doc classes must be altered to write to families which in turn write to supported media.

Migrating Documents

To migrate documents to MSAR storage media:

1   Open the FileNet Image Services Application Executive and select Background Job Control from the Applications menu.

2   Choose Migrate Documents from the New menu to display the Migrate Documents dialog box.

Migrate Documents
⊙ **All unmigrated documents**
○ **All unmigrated documents older than create date**
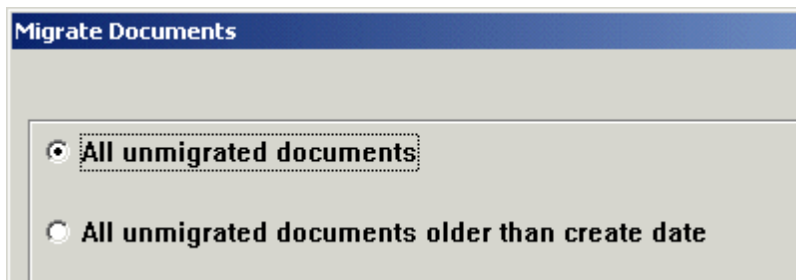
3   Check the radio button, **All unmigrated documents,** to migrate all committed documents in cache to MSAR storage media.

4   Click **OK** to accept your migration choice and exit the dialog box.

5   When the Migrate Docs background job is complete, you can view the completion log to see if any errors were encountered or see other migrate information. To view the log, select **Completed Jobs** from the Background Job Control Completed menu.

3

Managing Your MSAR System

This chapter contains administrative procedures for managing and maintaining your MSAR system. The following procedures are included:

- **"Storage Library Control Window" on page 84**

- **"Improving MSAR Service Identification Process" on page 87**

- **"Ejecting and Inserting MSAR Surfaces" on page 89**

- **"Moving/Relocating MSAR Surface Files on a Local System" on page 98**

- **"Moving an MSAR Surface File to Another System" on page 103**

- **"Increasing MSAR Storage Library Capacity" on page 110**

- **"Changing the MSAR Creation Directory Name" on page 112**

- **"Error Handling" on page 114**

- **"Error Handling" on page 114**

- **"MSAR Backup Mode" on page 128**

- **"Backup Strategy Example" on page 135**

Storage Library Control Window

After you have setup and configured your MSAR system, MSAR storage libraries will be listed in the Storage Library Control application. Examples of these screens are shown below.

This example of the Storage Library Control main window screen shows that three MSAR libraries have been configured. Library A with 128 slots, library B with 256 slots, and library C with 512 slots. In addition, an HP Optical Library has also been configured.
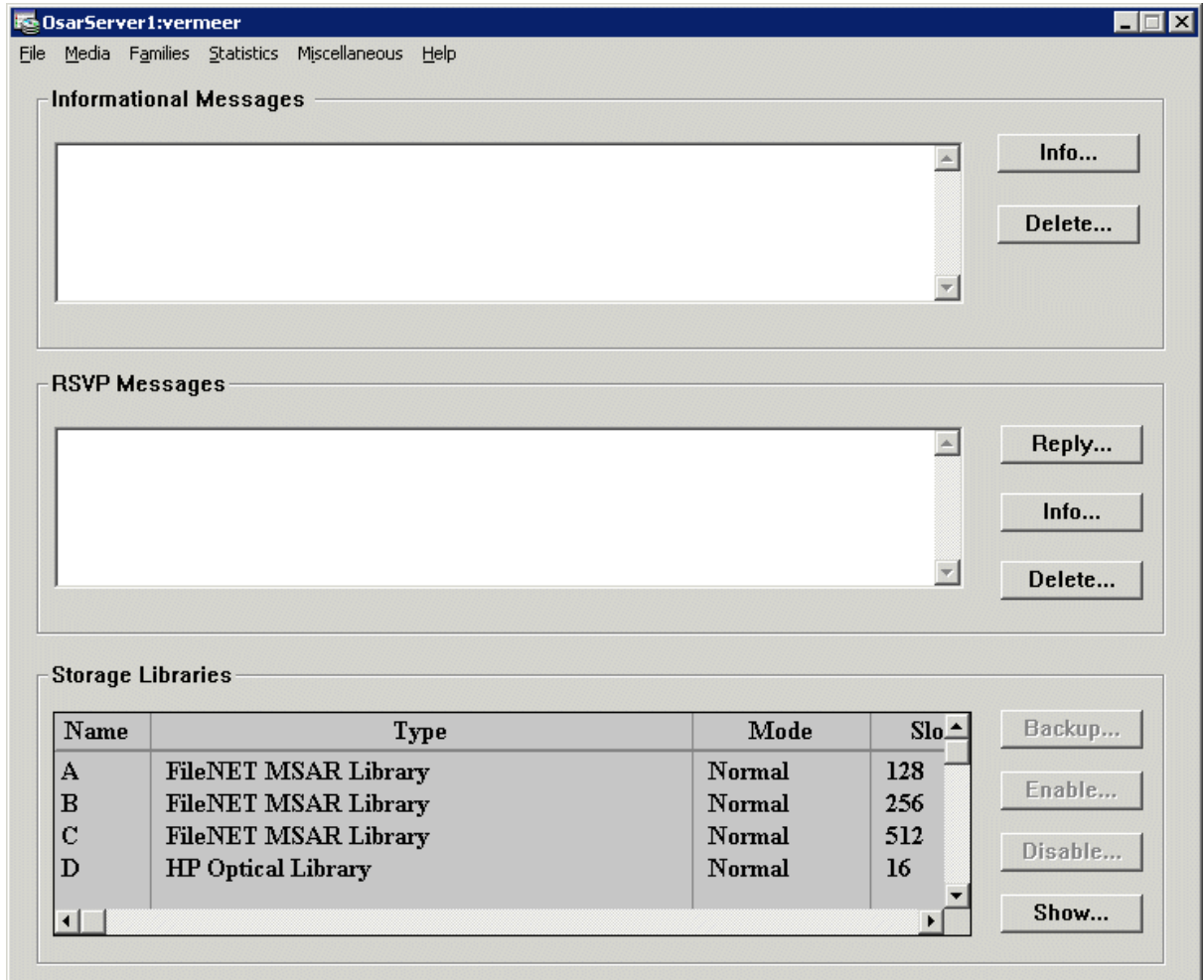
This is an example of the Configuration for Library (n) window for an MSAR storage library. Besides other information, this screen shows the MSAR Surface Creation Directory where new surfaces will be located.
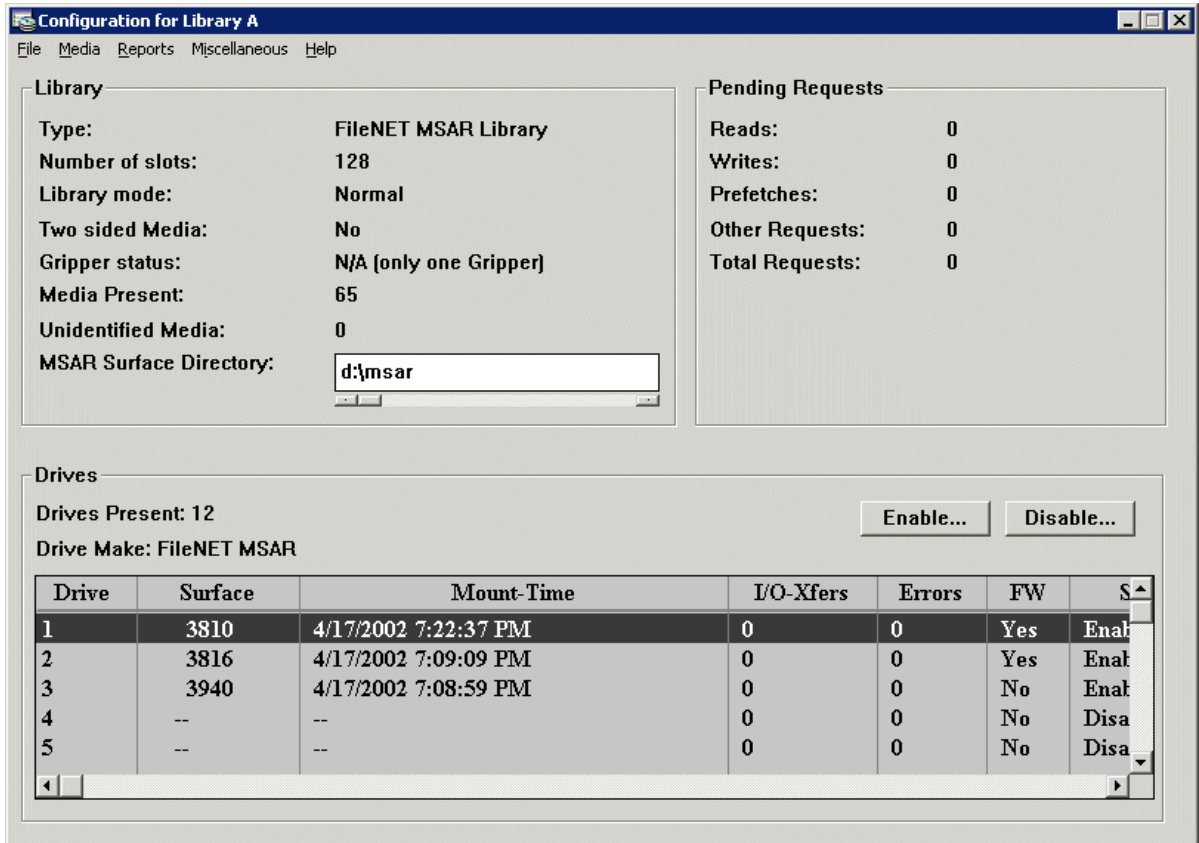
Below is an example of a Detailed Surface Information screen. Besides other information for the surface, this screen shows:

• MSAR FileName (The exact location of the surface file in this box)

• Media type (If this is a converted surface, the original optical media type will be shown here.)

- MSAR Read Only (For more information on this item, see **"Error that Marks a Surface as "MSAR Read-Only"" on page 115**.)

Improving MSAR Service Identification Process

Image Services automatically verifies and identifies MSAR surface files whenever the IS software is restarted. The identification process (whether the MSAR files are in the SAN or a tape library) requires that each surface in the library be moved from a virtual slot location to one of the twelve virtual drives to be identified, to have the high water marks verified, and then to be returned to its original slot. For a library where all MSAR files reside on a SAN file system, this identification

process is quick, but for a library whose MSAR files reside in a tape library, this process can be very time consuming.

To bypass the surface identification process for tape libraries, you need to create a configurable parameter file, **msar_identify_disable**.

- If this file does not exist, Image Services will continue to perform the surface identification for all MSAR libraries as usual.

- If this file exists, Image Services will skip the surface identification for the specific MSAR libraries listed in the file.

To create this file, follow these steps:

1   Log on as the FileNet user, such as **fnsw**, to the storage library server that is linked to the MSAR tape libraries.

2   Change to the appropriate directory:

   /fnsw/local/sd/1 on UNIX servers

   or

   <drive>:\fnsw_loc\sd\1 on Windows servers.

3   Use a text editor, such as vi on UNIX servers, or Wordpad on Windows servers, to create a plain text file named **msar_identify_disable**.

In this file, type the word "all" to skip the identification process for all MSAR libraries at startup. The word "all" can be either upper or lower case. The file can look like this:

```
ALL
```

Any data listed after "all" will be ignored.

4   If you want only certain individual MSAR libraries to be skipped, list each one on a separate line. The library letters are not case sensitive. The following example shows that the surface identification process will be skipped for libraries A and C during IS startup:

```
Library a
LIBRARY C
```

Each library letter in the file must represent an MSAR library, not an optical library. Any data in the file that is not recognized as an MSAR library is logged in the system log.

All MSAR libraries that skip surface identification are logged in the system log.

5   Save the file and exit the text editor. The next time you restart Image Services, the surface identification for the MSAR tape libraries you have specified will be skipped.

Ejecting and Inserting MSAR Surfaces

There are two types of MSAR surface files. The MSAR surface data file (.dat file) and the MSAR surface link file (.lnk file).

*   The .dat file contains the actual surface data, images, text, and so on.

*   The .lnk file is created in the out_of_box directory when a surface is ejected. The .lnk file contains the location of the .dat file, unless the .dat file was moved after it was ejected from a storage library. If the surface was not moved after it was ejected, it is usually easier to use the .lnk file when re-inserting a surface.

You should avoid modifying the contents of link files (using **vi**, or another text editor) because you could get an error (For example, <202,100,10> FCL error) when you attempt to insert that MSAR surface. The text editor adds extra characters when it is saved.

Note   The DOC_tool command line utility also supports ejecting and inserting MSAR surfaces. See the *System Tools Reference Manual* for information. To download this manual from the IBM support page, see **"Accessing IBM FileNet documentation" on page 14**.

Use the following procedures to eject or insert MSAR surface files.

Ejecting MSAR Surfaces

The Eject Media option in the Storage Library Control application allows you to eject MSAR media by entering its drive number, slot number, or surface ID number. When a surface is ejected, it is no longer available to the Image Services system.

If you attempt to eject a surface with a pending request, the system will prompt you to see if you really want to do this. Answer Yes to continue.

Note   Unlabeled surfaces cannot be ejected.

Ejecting MSAR Surfaces When You Know the Surface ID

You can use this procedure when you know the surface ID.

1   Open the Storage Library Control application main window, select the Media menu, and choose Eject Media (by Surface ID).

**2**   Enter the surface ID in the dialog box and click *OK*.
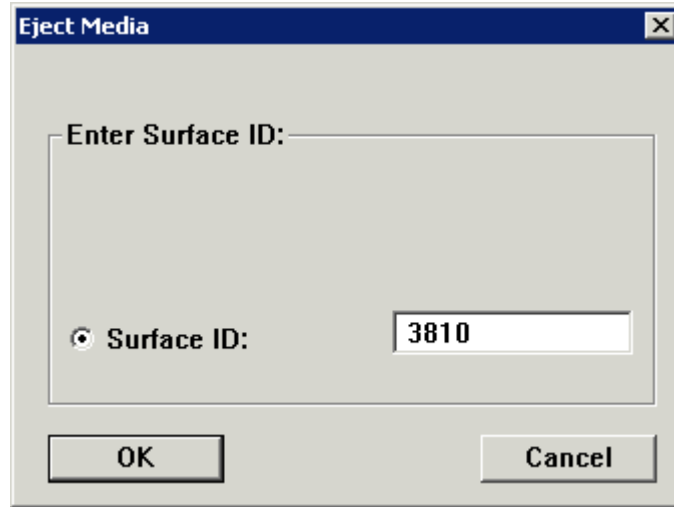
Eject Media

Enter Surface ID:

⊙ **Surface ID:**   3810

OK   Cancel

Note   If you receive a pop-up checksum error message, note the error tuple and refer to the section **"Checksum Errors" on page 120** for information on this error. Click OK in the error message window to continue.

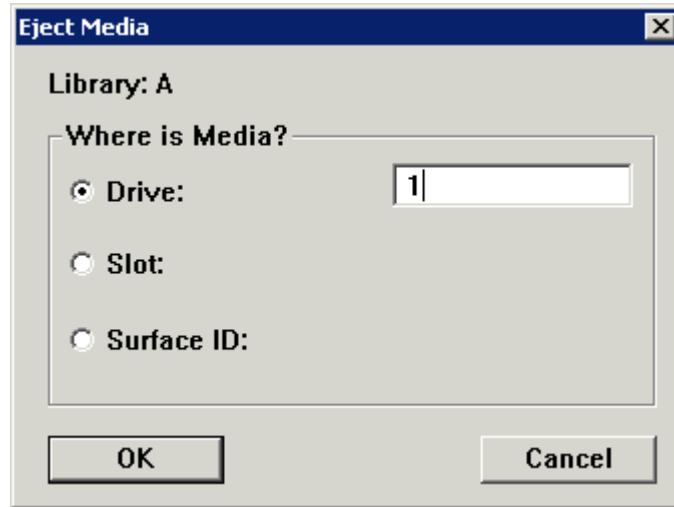
Ejecting MSAR Surfaces When You Know the Location

You can use this procedure when you know the MSAR surface location.

Note   You can also use this procedure if you only know the surface ID.

---

1   Open the Storage Library Control application main window, select a storage library from the list of libraries, and click **Show** to display the Configuration for Library (n) window.
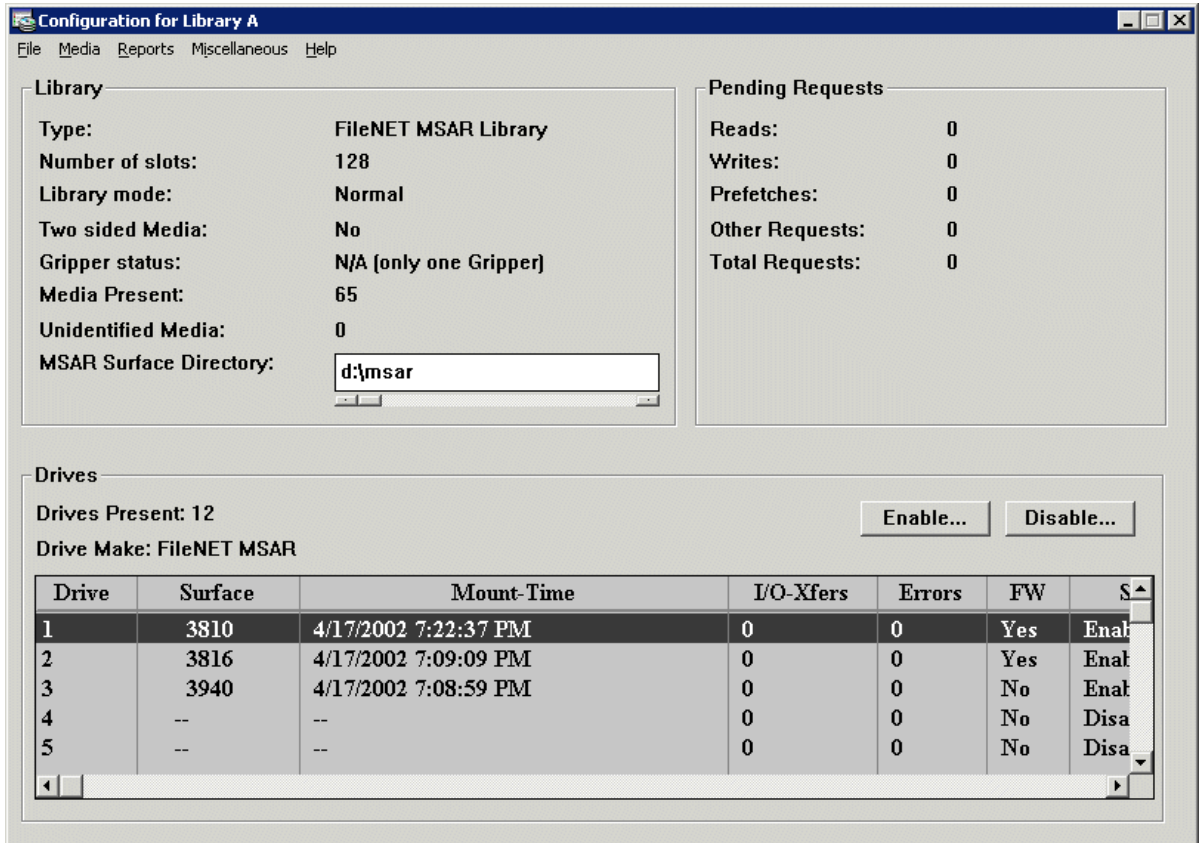
2 From the Configuration for Library (n) window, select the Media menu and choose Eject Media.

3 Select the appropriate radio button: drive, if the media is in a drive; slot, if the media is in a slot, or Surface ID.

Eject Media   ☒

Library: A

┌─ **Where is Media?** ──────────────────┐
│   │
│   ⦿ **Drive:**   │ 1 │   │
│   │
│   ○ **Slot:**   │
│   │
│   ○ **Surface ID:**   │
│   │
└────────────────────────────────────┘

       OK   **Cancel**

4   In the box that appears to the right of your selection, enter the drive number, slot number, or surface ID and click **OK**.

In the example above, the surface we want to eject is in drive 1.

Note   If you receive a pop-up checksum error message, note the error tuple and refer to the section **"Checksum Errors" on page 120** for information on this error. Click **OK** in the error message window to continue.

5   In a few moments the Configuration for Library (n) screen is updated and shows that the surface that was in drive 1 (surface ID 3810) was ejected and is no longer in the library. See the screen example below.
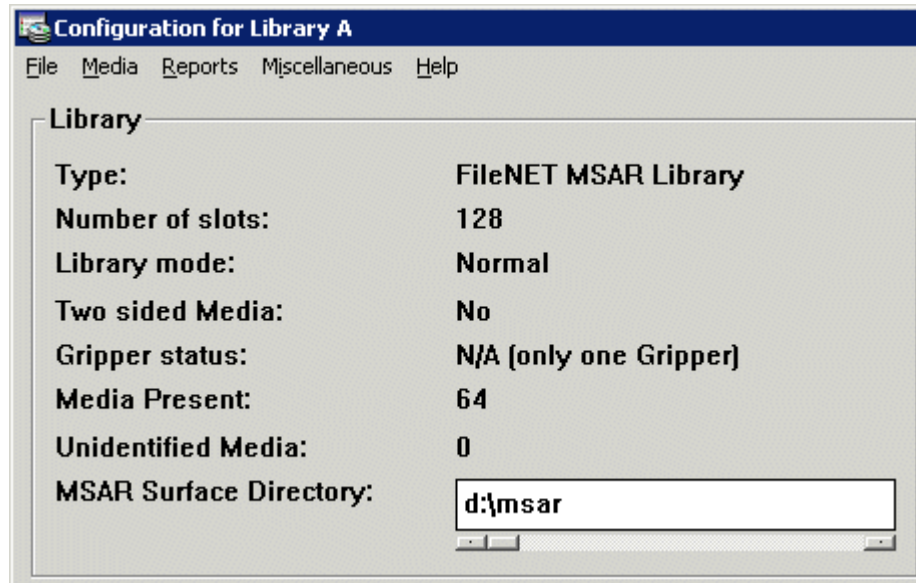
Inserting MSAR Surfaces

Use this procedure to insert MSAR surfaces.

Note   If you attempt to insert a surface into a **full** library, the system prompts you to see if you really want to do this. If you answer yes, the system ejects the surface it determines the least likely surface to be used.

1 In the Storage Library Control main window, select the library you want to insert the surface in, and click the **Show** button (or double-click on the library).

The Configuration for Library (n) window opens.

**2** From the Media menu, select Insert Media.

The "Select MSAR Surface (.dat or .lnk) File to Insert into Library (n)" dialog box opens with the out_of_box folder in the Look in box.

For Windows, the out_of_box directory is located at <drive>:\fnsw_loc\msar\out_of_box.

For UNIX, the out_of_box directory is located at /fnsw/local/msar/out_ of_box.

Note   The application remembers where the last file was inserted from and opens in that directory on subsequent inserts. This information is lost when the Storage Library Control application restarts.

Also, the application would not open in the out_of_box directory if the directory had not yet been created. This could happen on a new system if no surfaces had ever been ejected because the out_of_box directory is created when the first surface is ejected.
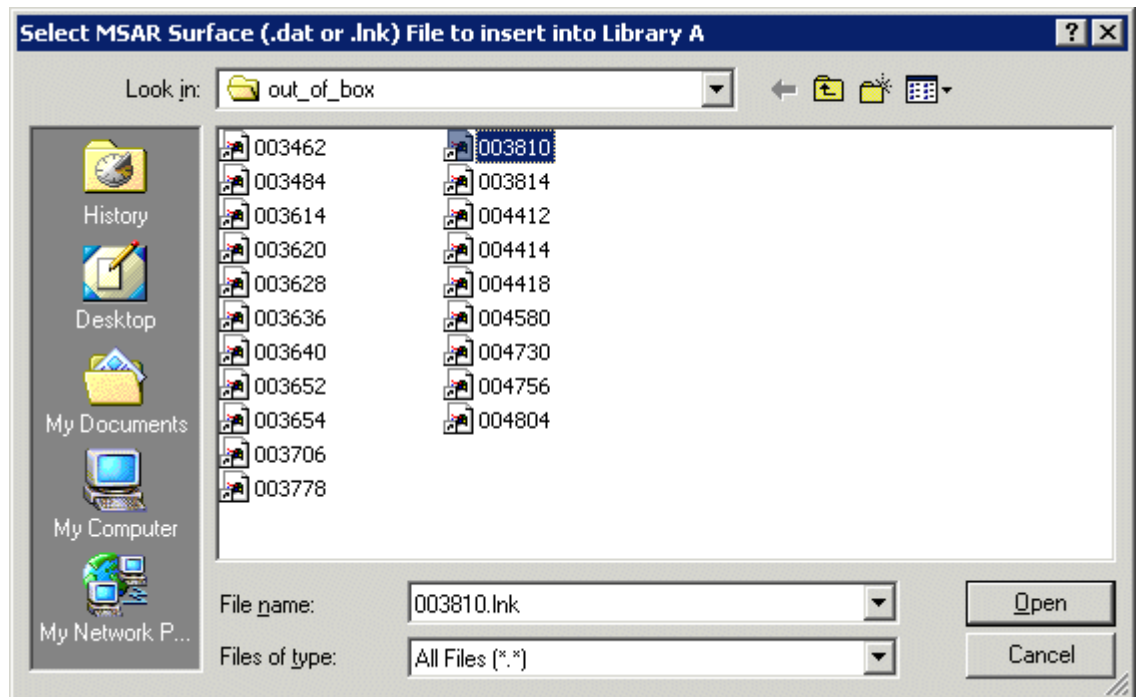
3 In the dialog above, choose the surface file your want to insert from the list and click *Open.*

Note the following when choosing a surface file to insert:

- Only MSAR data or link files (**.dat** or **.lnk** extensions) can be inserted.

- If the file was **not** moved after being ejected, it is easier to insert with the .lnk file because you only need to know the surface ID and then pick the matching .lnk file.

- If the .dat file **was** moved after being ejected, you **must** insert the .dat file and to do this you need to determine the .dat file location.
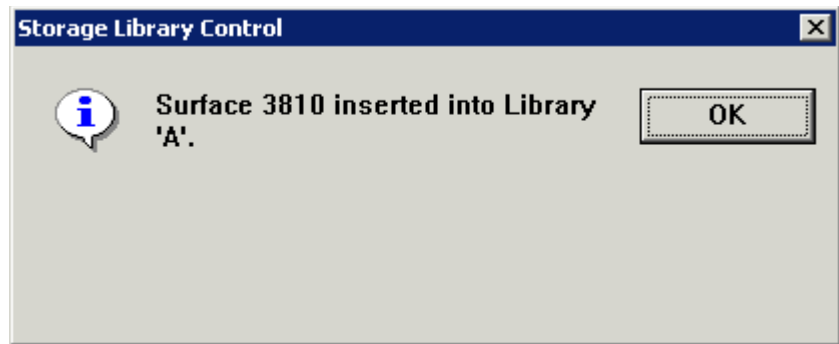
Note If you receive a pop-up checksum error message, note the error tuple and refer to the section **"Checksum Errors" on page 120** for information on this error. Click OK in the error message window to continue.

4 When you see the message confirming that the surface was inserted into library, click **OK** to complete the procedure.

Moving/Relocating MSAR Surface Files on a Local System

Sometimes it is advantageous to move MSAR surface files to another directory location. Below are a few reasons why you would want to do this.

- If the directory location where the surface files are located is running low on space, you could relocate some of the surface files to a new location.

- You want to separate active write surfaces from the other surfaces for Backup purposes. Creating separate locations for active write surfaces would save time when running a backup since only the active write surfaces need to be backed up.

- You want to move surfaces that are not often used to less expensive storage media.

To move MSAR surface files, use the following procedures.

Determine the Current Location of the Surface You Want to Move

If you're not sure where the surface you want to move is currently located, perform the following steps. If you already have this information, continue to the procedure .

1 Open the Storage Library Control application main window, select the Media menu and choose *Detailed Surface Information*.

2 In the Detailed Surface Information window that opens, enter the Surface ID and click the *Display* button.

3 Note the location of the surface that displays in the MSAR FileName box at the bottom of the Surface Description group box.

Note Surface data files, as shown in the above example, always use a .dat file extension.

Move the Surface File

To move the surface file, you will need to perform the following steps:

- Eject the surface

- Move the surface data file (.dat) to new location

- Insert the surface

- Verify the new surface location (optional)

CAUTION   Do not move a surface that has not been ejected. This could result in an incomplete data (.dat) file or a checksum error.

1   Open the Storage Library Control application main window, select a storage library from the list of libraries, and click **Show**.

2   From the Configuration for Library (n) window, select the Media menu and choose Eject Media.
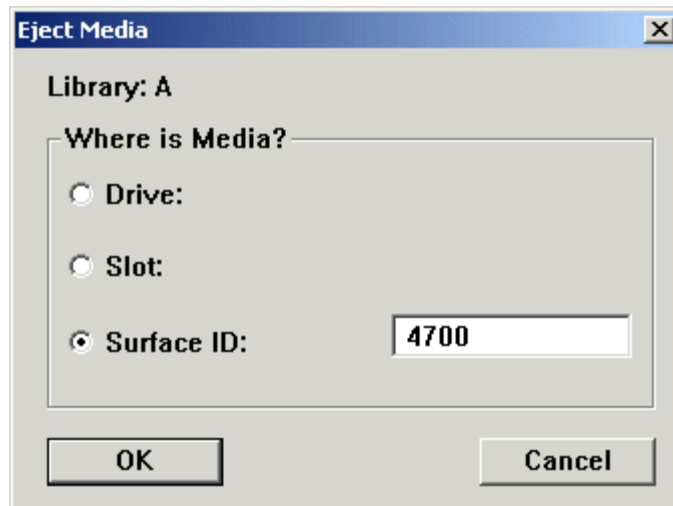
3   Enter the Surface ID for the surface you want to eject and click **OK**.

**4**   Use the appropriate commands for the operating system running on your server to move the surface data file to the new directory location you want. For example, a Windows server would use a command similar to the one below.

```
move d:\msar\004700.dat d:\msar_new\004700.dat
```

Tip   For Windows servers, it could be easiest to use Windows Explorer to drag the file to the new directory.

CAUTION   To prevent an "Operating File Size Limit" error (on UNIX systems), verify that the file system you are moving the surface into supports large files regardless of the size of the file you are moving. For more information, see **"Setting File Size and ulimit (UNIX Systems Only)" on page 36**.
You also need to verify that the target directory you're moving the surface into has the proper permissions. See **"Setting MSAR Directory Permissions" on page 52**.

5   From the Configuration for Library (n) window, select the Media menu and choose **Insert Media**.
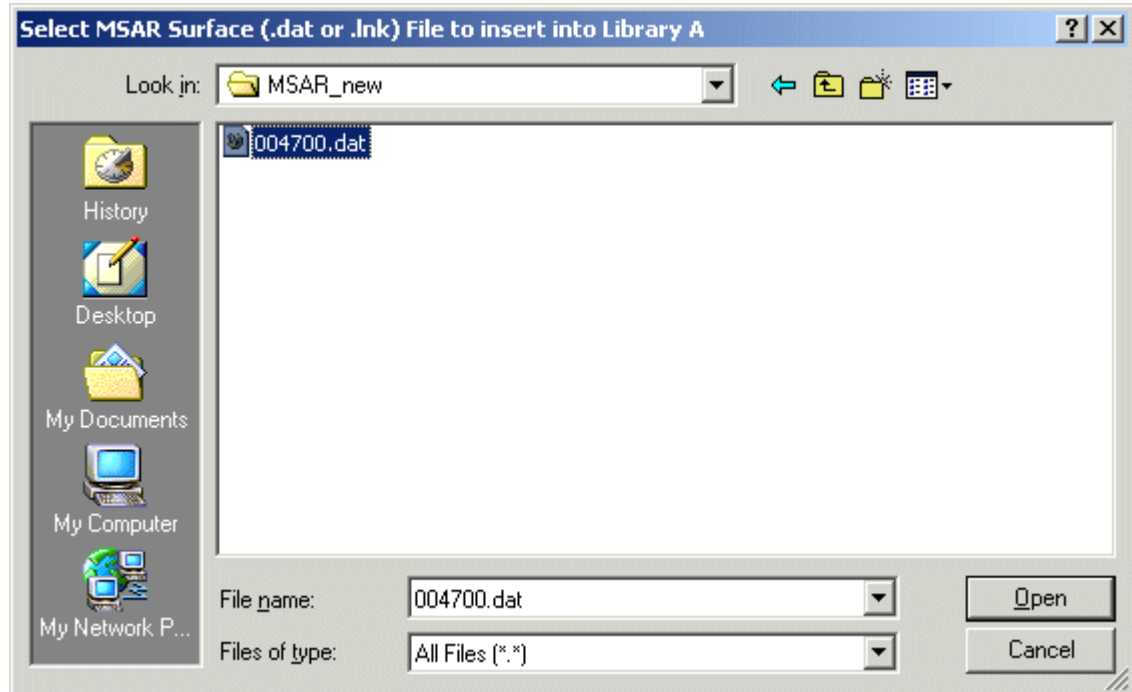
6 In the dialog box that opens, browse to the new location of the surface, choose the data file and click **Open**.

Note   Verify that you do not select the surface link file (.lnk) from the out_of_box directory.

7 If you want to verify that the surface was moved, do the following.

Open the Detailed Surface Information window, enter the Surface ID number and click **Display**. The new location of the surface appears in the MSAR FileName box as shown in the screen below.

Moving an MSAR Surface File to Another System

This procedure has instructions for using ftp to move an MSAR surface files to another system and then incorporating that surface into an MSAR library.

Before using this procedure, you must first determine the following:

• The surface ID of the file you want to move.

• The location of the file you want to move.

- The directory you want to move the file into.

  - Choose a directory separate from the local MSAR Creation directory. A convention such as using the source system domain name will prevent naming conflicts.

  - If the directory is on a UNIX system, it must support large files. For more information, see **"Setting File Size and ulimit (UNIX Systems Only)" on page 36**.

  - The target directory you're moving the surface into must have the proper permissions. See **"Setting MSAR Directory Permissions" on page 52**.

  - The directory must have enough space for the surface file.

- The storage library you want to incorporate the file into.

Note   The DOC_tool command line utility also supports ejecting and incorporating MSAR surfaces. See the *System Tools Reference Manual* for information. To download this manual from the IBM support page, see **"Accessing IBM FileNet documentation" on page 14**.

After the file has been moved to the other system, you will use the Incorporate Foreign Media option in Background Job Control to incorporate the file into the new system.

Use ftp to Move a Surface File

In this example, we are moving a surface file from an AIX (source) system to a Windows (target) system.

1   At the AIX (source) system, eject the surface that will be moved.

CAUTION	Do not move a surface that has not been ejected. This could result in an incomplete data (.dat) file or a checksum error.

2 On the Windows (target) system, open a Command Prompt window.

3 Change to the directory where you want to move the surface file into.

Note	Verify that the surface you are moving does not already exist in this directory.

4 Connect to the source system you want to move the surface file from using the command **ftp <server>**. In our example, the system we are connecting to is called ibmmsar, so our command would look like:

   ftp ibmmsar
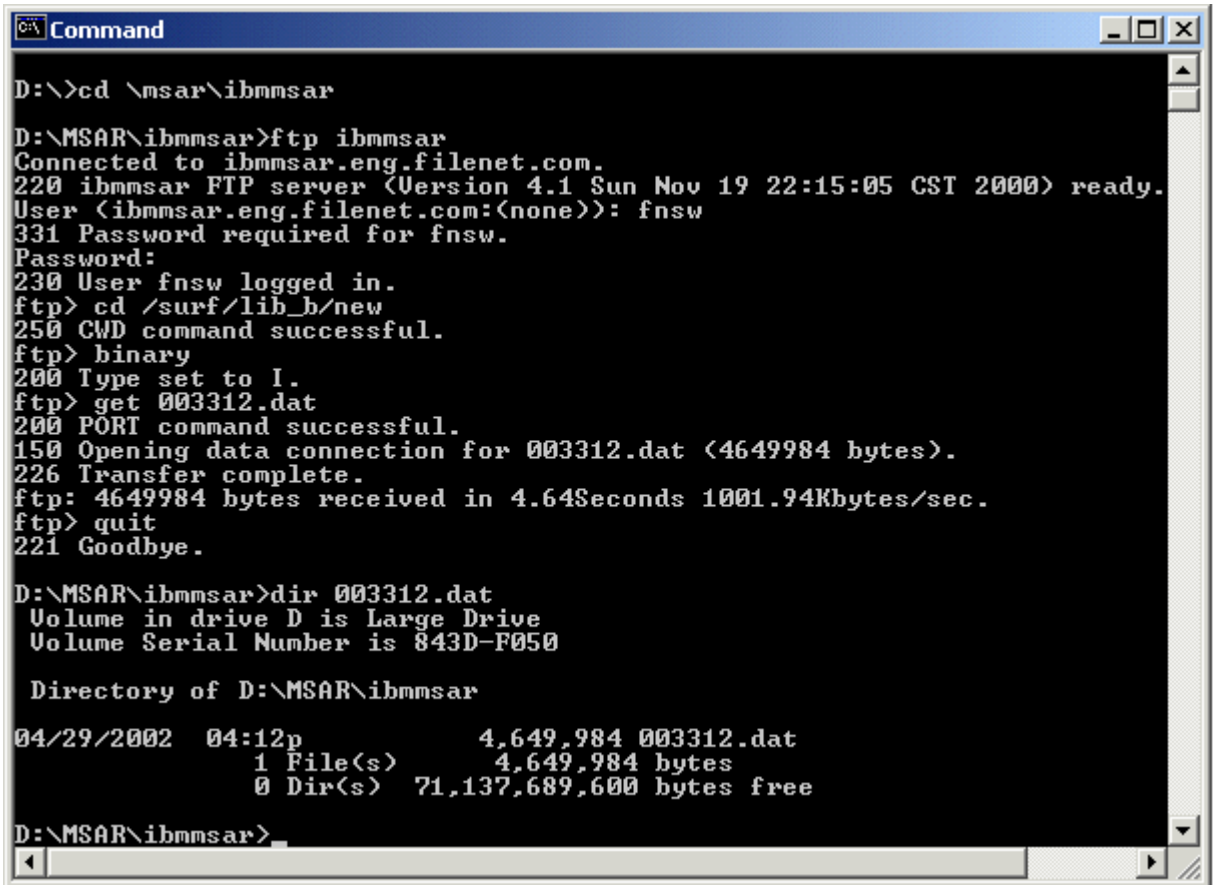
5 Enter the user name.

6 Enter the password.

7 Change to the directory where the surface file is located on the source server. In our example, the surface file is located in the directory, /surf/lib_b/new

8 Because you are transferring a binary data file, enter the command:

   binary

9 Enter the following ftp **get** command to transfer the MSAR surface file (.dat) from the source server:

   get 003312.dat

The following screen shows all the commands entered in the steps above.

```
Command                                                                    _ □ ×

D:\>cd \msar\ibmmsar

D:\MSAR\ibmmsar>ftp ibmmsar
Connected to ibmmsar.eng.filenet.com.
220 ibmmsar FTP server (Version 4.1 Sun Nov 19 22:15:05 CST 2000) ready.
User (ibmmsar.eng.filenet.com:(none)): fnsw
331 Password required for fnsw.
Password:
230 User fnsw logged in.
ftp> cd /surf/lib_b/new
250 CWD command successful.
ftp> binary
200 Type set to I.
ftp> get 003312.dat
200 PORT command successful.
150 Opening data connection for 003312.dat (4649984 bytes).
226 Transfer complete.
ftp: 4649984 bytes received in 4.64Seconds 1001.94Kbytes/sec.
ftp> quit
221 Goodbye.

D:\MSAR\ibmmsar>dir 003312.dat
 Volume in drive D is Large Drive
 Volume Serial Number is 843D-F050

 Directory of D:\MSAR\ibmmsar

04/29/2002  04:12p            4,649,984 003312.dat
               1 File(s)      4,649,984 bytes
               0 Dir(s)  71,137,689,600 bytes free

D:\MSAR\ibmmsar>_
```

10   After the transfer is complete, verify that the entire file was transferred successfully by comparing the file size shown on the source system to the file size shown on the target system.

a At the source system, enter the command:

ls -l <file name>

Because the source system is AIX, we use the **ls -l** command.

b At the target system, enter the command:

dir <file name>

Because the target system is Windows, we use the **dir** command.

c Compare the file sizes. In our example, the file size is 4,649,984 bytes.

Incorporate the Foreign Surface File

After the file has been moved to the target system, you must use the Incorporate Foreign Media option in Background Job Control to incorporate the file into the new system.

Note If you are incorporating a foreign surface file that was originally converted from optical media on another IS system, verify that a media family for the original optical media type has been defined on the target system.

You can incorporate the foreign surface into this family or any other compatible media family you choose.

1 From Background Job Control, New menu, select **Incorporate Foreign Media**.

The Incorporate Foreign Media Setup window opens.
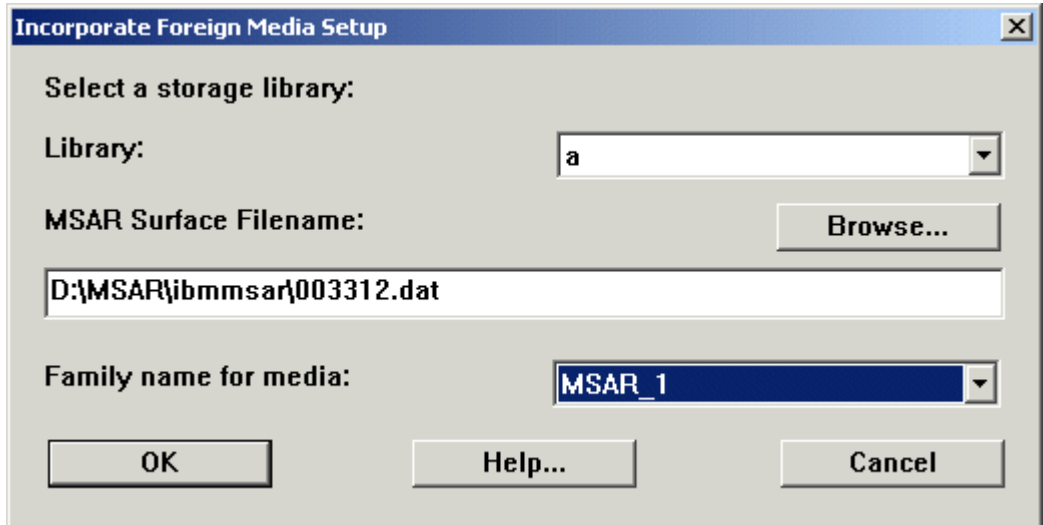
2 Select the Storage Library where you want to incorporate the new surface.

3 Click the **Browse** button, browse to the directory location of the surface you want to incorporate, and select the .dat file that you transferred in .

Note This is the directory you used in step .

4 Select the family name you want to use from the drop-down list.

5 Click **OK**.

The Incorporate Foreign Media window appears showing the new storage library and family name, and the original system serial number and original surface ID.
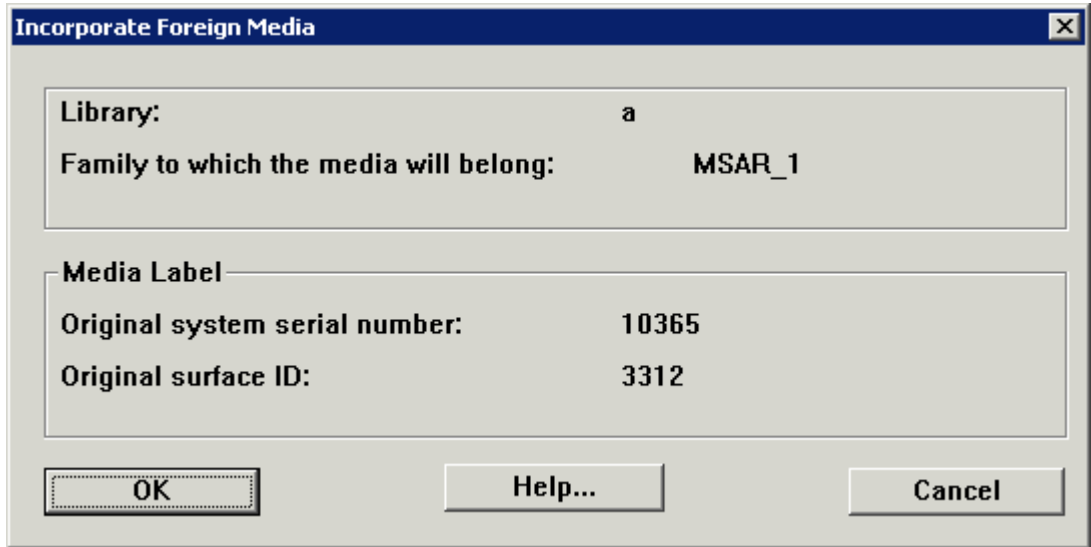
Incorporate Foreign Media

Library: a

Family to which the media will belong: MSAR_1

Media Label

Original system serial number: 10365

Original surface ID: 3312

OK   Help...   Cancel

Note   If you receive a pop-up checksum error message, note the error tuple and refer to the section **"Checksum Errors" on page 120** for information on this error. Click **OK** in the error message window to continue.

   6   If you are satisfied with these values, click **OK** to continue.

xbjc

Surface 4818 inserted into Library 'A'. Original SSN=10365, Original surfid=3312.   OK
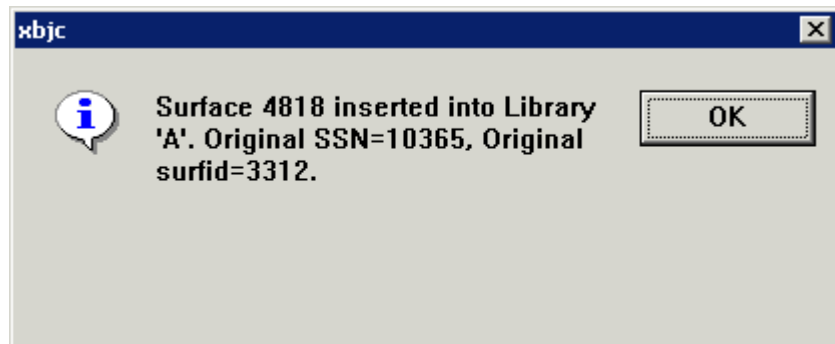
7 When the job is completed, you see the above screen. Click **OK** to complete the procedure.

Increasing MSAR Storage Library Capacity

If it becomes necessary to increase the storage capacity of an MSAR storage library, you can do so by selecting a different library type using the Storage Libraries tab in the System Configuration Editor.

Note With this procedure you will be changing the MSAR storage library type to one that has a higher capacity. To do this you need to have the proper license agreement for the MSAR model type you plan to select.

1 Open the System Configuration Editor and select the Storage Libraries tab.

Services	Network Addresses	Server Appl. Services	Relational Databases	**Storage Libraries**

Storage Libraries | Storage Drives

Server Name	Library Name	Library Type		Devi Addr
vermeer	Library E	FileNET MSAR Model 128	↓	0 0 0
vermeer	Library C	FileNET MSAR Model 512	↓	0 0 0
vermeer	Library B	FileNET MSAR Model 256	↓	0 0 0

The storage library model name | IMS | EDIT mode

2 Click the drop-down arrow next to the MSAR library where you want to increase storage capacity, and select a library type with a higher model number (higher number of slots) than the current library.

Increasing the number of slots effectively increases the storage capacity of the storage library. You must have a license for the library type you select.

Note The model number refers to the number of slots in the library, that is Model 128 has 128 slots, Model 256 has 256 slots, and so on. Furthermore, if you change the library type from a lower model number to a higher model number (for example from Model 128 to Model 256) and save this change, you will not be able to change back to a lower model number. In fact, model numbers lower than what is currently listed in the Library Type list box, will not even be available in the drop-down list.

3 Exit the System Configuration Editor and save your changes.

4 Recycle the FileNet Image Services software to have the changes you made take effect.

Changing the MSAR Creation Directory Name

If, after creating an MSAR Creation Directory, you decide that you want to change the directory name, you can do this on the Storage Libraries tab in the System Configuration Editor. For example, you could need to do this if the creation directory runs out of space.

Note The new creation directory will be where all subsequent **new** surfaces will be stored and directory locations for these new surfaces will point to the new creation directory. Surfaces that were created in the previous creation directory, however, do not get moved. (This includes the active current write surface.) They remain in the previous creation directory unless they are deliberately moved. For more information on Creation Directories, see **"MSAR Creation Directories" on page 42**.

1   Open the System Configuration Editor.

2   Select the Storage Libraries tab.

Note Verify that the directory you're creating has the proper permissions. See **"Setting MSAR Directory Permissions" on page 52**.

Also, to prevent an "Operating File Size Limit" error (on UNIX systems), verify that the file system, where you are creating the directory, supports large files. For more information, see **"Setting File Size and ulimit (UNIX Systems Only)" on page 36**.

Services	Network Addresses	Server Appl. Services	Relational Databases	**Storage Libraries**

Storage Libraries | Storage Drives

Server Name	Device Address	MSAR Surface Creation Directory	
vermeer	0 0 0 0	d:\MSAR3	
vermeer	0 0 0 0	d:\MSAR2	
vermeer	0 0 0 0	d:\MSAR1	

The storage directory for the MSAR surfaces | **IMS** | **EDIT mode**

   3   On the Storage Libraries sub tab, scroll to the MSAR Surface Creation Directory field.

   4   Delete the directory name that you want to change and type in the new name that you want.

   Note   If the new directory does not yet exist, it will be automatically created when the first surface is added to the directory as long as the permissions of the parent directory are properly set.

   5   After changing the directory name, click any other field on the Storage Libraries tab. This is necessary to verify that the length of the directory path does not exceed the maximum limit.

6 Exit the FileNet Image Services System Configuration Editor and save your changes.

7 Recycle the FileNet Image Services software to have the changes you made take effect.

Error Handling

MSAR surfaces are stored as files and therefore subject to a set of error conditions that are associated with file systems. Below are three categories of error messages that generate RSVP or Information messages. They are:

- **"Error that Marks a Surface as "MSAR Read-Only"" on page 115**

- **"Errors that Mark a Surface as "Do-Not-Use"" on page 117**

- **"Errors that Eject a Surface and Generate Information Messages" on page 119**

Note You can also get information on these errors by using the error tuple listed in the tables that follow. Use the command: fn_msg <n> where n is the error tuple.

Three other error handling situations are also included in this section. They are:

- **"Checksum Errors" on page 120**

- **"MSAR Surface Overlap" on page 125**
  (self-correcting error condition)

- **"MSAR Insertion RSVP" on page 126**

If the information in this section does not resolve your problem, contact your service representative.

Error that Marks a Surface as "MSAR Read-Only"

The following table shows an error condition that results in the problem surface being put into the "MSAR Read-Only" mode due to a directory containing a write surface that is out of space. An RSVP message is also generated.

Committals and retrievals continue to operate normally as long as there is room in page cache. Committed images remain locked in page cache until the RSVP is resolved. After the RSVP is resolved, documents in page cache are migrated to an MSAR surface

.

Error that Marks a Surface as "MSAR Read-Only"

Error condition (Error Tuple)	RSVP Message	Recovery
No space left in directory. error tuple 202,100,30	MSAR surface \<n> directory '\<path name>' is out of space.	When you respond to this RSVP, a dialog box is displayed allowing you to retry writing to the same surface, or to reassign the surface. *See dialog box below.

* The following dialog box will display when you respond to this RSVP.

MSAR Out of Space

- ⦿ **Retry writing to the same surface after adding space**

- ○ **Write disable this surface and re-assign a new current write surface**

| OK | Help | Cancel |
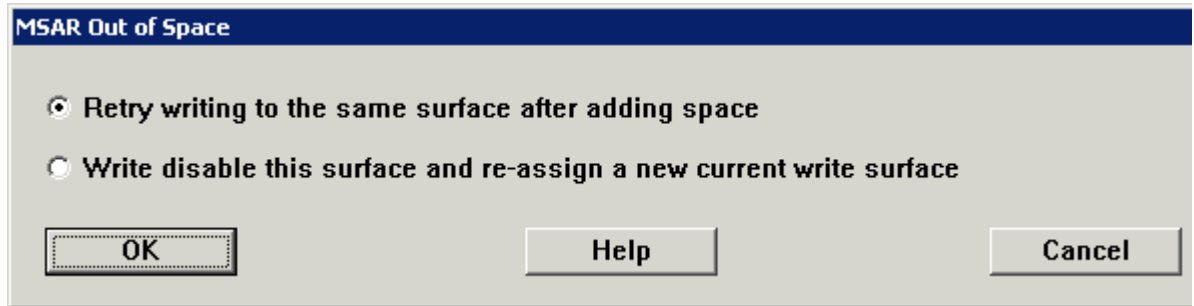
- If you are able to add more space to the directory, add the space first, then choose the "Retry writing ..." radio button, and click **OK**.

- If it is not possible, or desirable, to add more space, choose the "Write disable this surface ..." radio button and click *OK*. A new current write surface will be created in the MSAR creation directory.

Note Prior to choosing the above "Write disable this surface ..." option, check the current MSAR creation directory to see if it has adequate space. If you need to change the MSAR creation directory name, see, **"Changing the MSAR Creation Directory Name" on page 112**

Errors that Mark a Surface as "Do-Not-Use"

The following table shows errors that result in the problem surface being put into the "Do-Not-Use" mode and that generate an RSVP message.

Errors that Mark a Surface as "Do-Not-Use"

Error condition (Error Tuple)	RSVP Message	Recovery
Insufficient permission to operate on an MSAR surface file error tuple 202,100,11	MSAR surface \<n\> file '\<file name\>' has a permission problem. Change the permission before responding to this RSVP.	Check the permissions for this file. It should be: For UNIX: Read/Write by fnsw owner and fnusr group. For Windows: Set permissions for groups fnadmin, fnop, and fnusr as shown in the section, **"Setting Permissions on Windows Servers" on page 53**.
System resource limit was encountered error tuple 202,100,20	MSAR surface \<n\> encountered system limit error. Fix the problem before responding to this RSVP.	Check your system resources and add resources as necessary.
Cannot create directory containing an MSAR surface file error tuple 236,0,9	MSAR surface \<n\> failed to create directory path '\<path-name\>'. Fix the problem before responding to this RSVP.	For all platforms: Check the parent directory for proper permissions. For Windows ONLY: The MSAR directory path could have the wrong drive letter. Use the System Configuration Editor to change the drive letter of the problem directory. Then recycle the IS software.

Errors that Mark a Surface as "Do-Not-Use", continued

Error condition (Error Tuple)	RSVP Message	Recovery
Bad MSAR file error tuple 30,0,136	MSAR surface <n> file '<file name>' is not an MSAR file. Move the file out of the directory before responding to this RSVP.	Move the file out of the directory and then respond to the RSVP. Also try to find out why there was a non-MSAR file with an MSAR file name in the directory.
MSAR file too large error tuple 202,100,31	MSAR surface <n> has reached the Operating System file size limit. Increase the system file size before responding to this RSVP.	This is a UNIX error. The MSAR file size exceeds the file size limit. See **"Setting File Size and ulimit (UNIX Systems Only)" on page 36**.
Network Errors error tuple 202,100,33	MSAR surface <n> encountered network related errors. Refer to elog for the error number. Fix the problem before responding to this RSVP.	Refer to the system log for information on fixing this network problem. On Sun Solaris platforms, reboot the server after resolving this problem.
Unmapped Errors error tuple 202,100,17	"MSAR surface <n> file '<file-name>' has an error. Error <202,100,17>. Fix the problem before responding to this RSVP."	The system error number (errno) will be logged in the system log. This will indicate what the vendor specific problem is. Because MSAR creation directories can be used on any file system that adheres to the criteria specified in this document, (see **"MSAR Creation Directories" on page 42**) the IS software could encounter different system error numbers from storage systems such as HSM, SAN, and so on. These are vendor specific error conditions. After the problem has been resolved, you can respond to the RSVP.

Errors that Eject a Surface and Generate Information Messages

The following table shows error conditions, that eject the problem surface and generate an Information message.

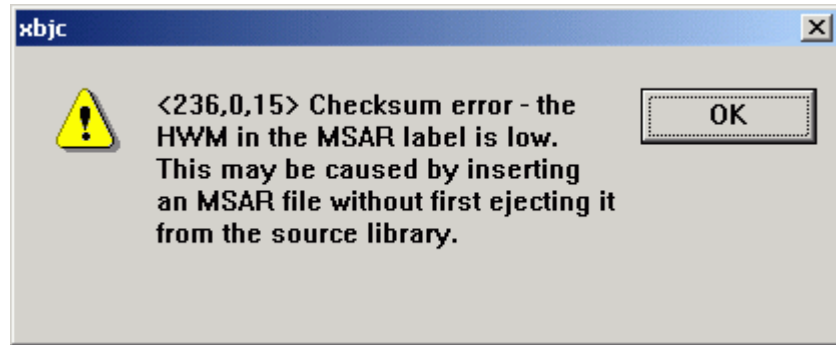Errors that Eject a Surface and Generate Information Message

Error condition (Error Tuple)	Information Message	Recovery
Wrong label error tuple 30,0,20	MSAR surface <n> file '<file name>' has been ejected from Library <n>. It had an unexpected orig_surf_id in volume label, expected=<n> found=<n>.	Insert the correct MSAR surface data file.
MSAR surface is out of sync error tuple 30,0,134	MSAR surface <n> file '<file name>' has been ejected from Library <n>. It is out-of-sync with the database. Error <nn,nn,nn>.	The MSAR surface file is out of sync with the database. Restore the correct version of the file before continuing or some documents will exist in the database but be missing in the surface file. This problem could be caused by having a creation directory that does not support synchronous writes. See **"Determining if Your MSAR Creation Directory Supports Synchronous Writes" on page 44**.
MSAR surface file cannot be found error tuple 202,100,10	MSAR surface <n> file '<file name>' cannot be found. Insert the correct MSAR file.	Insert the correct MSAR file.
Bad volume label error tuple 30,0,136	MSAR surface <n> file '<file name>' has been ejected from Library <n>. It had an unrecognized MSAR format level or volume label name. Error <nn,nn,nn>.	This problem occurs when a bad MSAR file is being used. Identify or restore a good MSAR file and reinsert it.

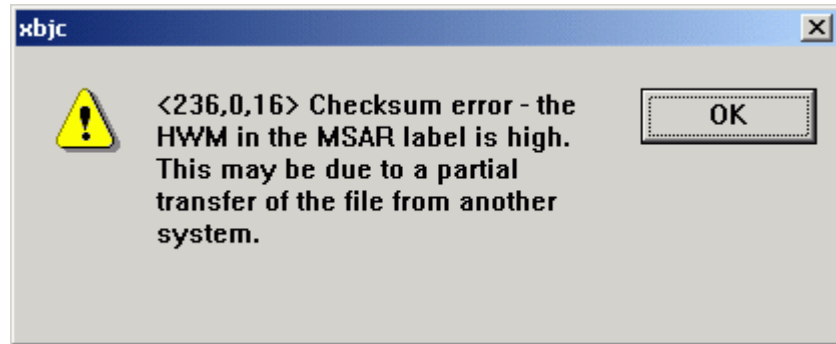Errors that Eject a Surface and Generate Information Message, continued

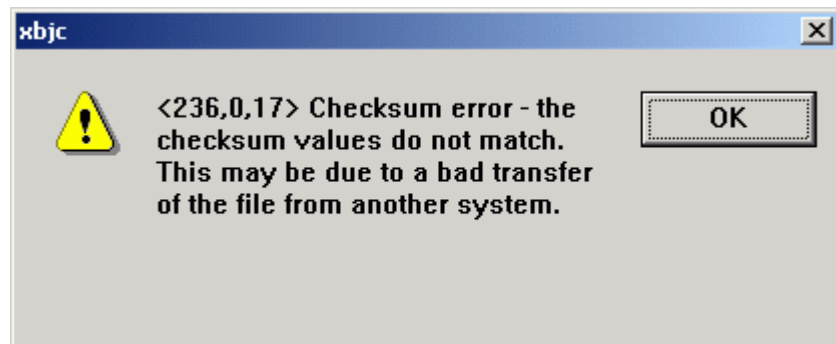| Error condition (Error Tuple)	Information Message	Recovery
Write error error tuple 30,0,129	MSAR surface \<n> file '\<file name>' has write error and has been ejected from Library \<n>.	This is an I/O error. Check the operating system, file system, or drive to correct this problem. When the problem is resolved, reinsert the surface.
Read error error tuple 30,0,130	MSAR surface \<n> file '\<file name>' has read error and has been ejected from Library \<n>.	This is an I/O error. Check the operating system, file system, or drive to correct this problem. When the problem is resolved, reinsert the surface.
Seek error error tuple 30,0,131	MSAR surface \<n> file '\<file name>' has seek error and has been ejected from Library \<n>.	This is an I/O error. Check the operating system, file system, or drive to correct this problem. When the problem is resolved, reinsert the surface.
Cannot update surface management area during backup mode. error tuple 76,0,264	MSAR surface \<n> file '\<file name>' has been ejected from library \<n>. Cannot update surface management area during backup mode.	When the backup is complete, put the library back in Normal mode and reinsert the surface.

Checksum Errors

The following error pop-up message windows show error conditions that can occur as a result of checksum problems.

Checksum error - error tuple 236,0,15

Additional notes and Recovery Action

This error message could display while inserting or incorporating an MSAR surface. Another reason for this error is that the surface was ejected but the checksum did not get updated due to an error. The surface was subsequently copied to another server and an incorporation/ insertion was attempted. To resolve this problem, either eject the surface from the source library or re-insert the surface from the source library and then eject it again before making a copy. If the surface cannot be inserted or incorporated back into the original system, call your service representative for further assistance.

Checksum error - error tuple 236,0,16

```
xbjc                                                    ×

  ⚠   <236,0,16> Checksum error - the        ┌─────────────┐
      HWM in the MSAR label is high.         │     OK      │
      This may be due to a partial           └─────────────┘
      transfer of the file from another
      system.
```

Additional notes and Recovery Action

This error message could display while inserting or incorporating an MSAR surface. Transfer the file from the source system and retry the operation. If you are using ftp to transfer the MSAR surface file, be sure to use the binary setting.

Checksum error - error tuple 236,0,17

```
xbjc                                                    ×

  ⚠   <236,0,17> Checksum error - the        ┌─────────────┐
      checksum values do not match.          │     OK      │
      This may be due to a bad transfer      └─────────────┘
      of the file from another system.
```

Additional notes and Recovery Action

This error message could display while inserting or incorporating an MSAR surface. Run vl to get more information from the system log. If necessary, transfer the file from the source system and retry the operation.
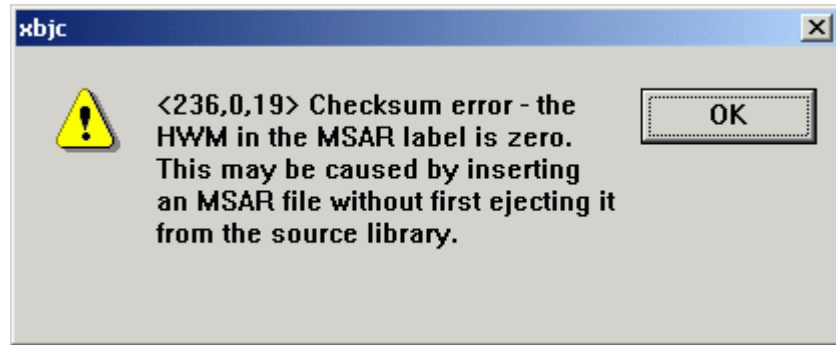
Checksum error - error tuple 236,0,18
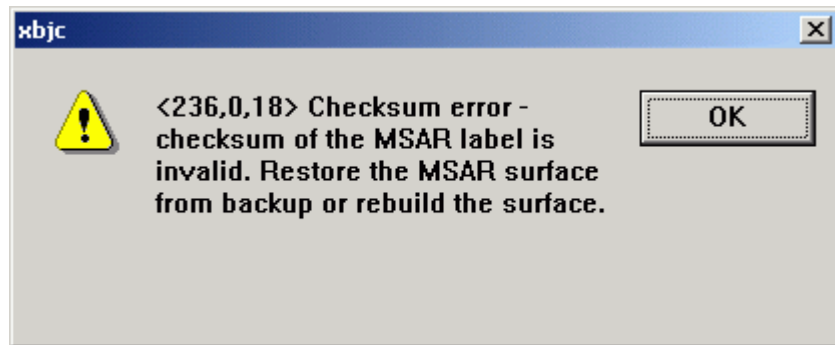
Additional notes and Recovery Action

This error message could display while inserting or incorporating an MSAR surface. The file you are attempting to insert or incorporate is probably not an MSAR file, or it is a corrupted MSAR file. Restore the MSAR surface from backup or rebuild the surface.

Checksum error - error tuple 236,0,19

Additional notes and Recovery Action

This error message could display while inserting or incorporating an MSAR surface. Another reason for this error is that the surface was ejected but the checksum did not get updated due to an error. The surface was subsequently copied to another server and an incorporation/ insertion was attempted. To resolve this problem, either eject the surface from the source library or re-insert the surface from the source library and then eject it again before making a copy. If the surface cannot be inserted or incorporated back into the original system, call your service representative for further assistance.

Checksum error - error tuple 236,0,20
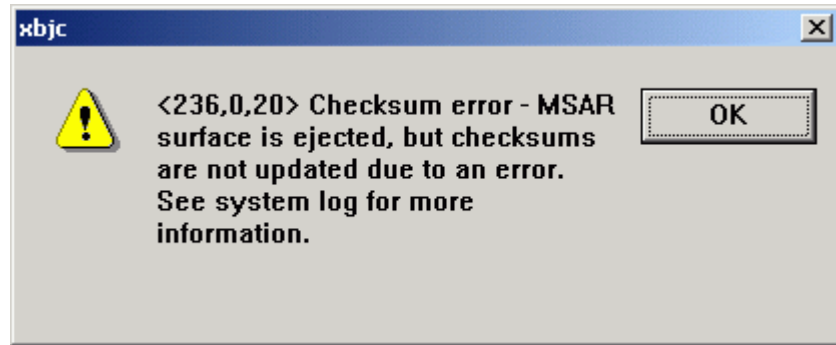
Additional notes and Recovery Action

This error message could display while ejecting an MSAR surface. It is a warning message and the surface is ejected. However, a surface in this state is not necessarily exported to another system. To resolve this problem, fix the original error that caused the checksum problem and then re-insert the surface back into the library. (See the system log for the original error.) An error free ejection is necessary before exporting this surface to another system.

MSAR Surface Overlap

An MSAR surface overlap condition can occur in a couple of ways. It can happen if an incompatible foreign surface is moved to an MSAR creation directory, or if there are two incompatible IS systems sharing an MSAR creation directory.

When a new surface is needed, the new surface ID could overlap, or be the same as, the foreign surface ID. When this happens, the new surface ID is skipped and a system log message is generated. This is a

self-correcting error condition and Image Services will **not** overwrite an existing MSAR surface file when it needs a new current write surface. Here is how this works.

In this example we have an MSAR creation directory that is shared among two IS systems that are incompatible systems. These systems only have one MSAR creation directory and these are new IS systems.

By default a new IS system starts with surface ID 3000. If both systems start with the default first surface ID as 3000, then they are incompatible systems. The potential problem is that both systems will try to create an MSAR surface file with the "003000.dat" name. This would result in a naming conflict.

When a new MSAR current write surface is needed, the IS software looks to see if an MSAR surface of that name has already been created. For example, it will look to see if surface 003000.dat already exists in the MSAR creation directory. If the MSAR surface file already exists (003000.dat) then the software will skip surface ID 3000 and advance the surface ID field in the scalar_number table.

This will continue until a duplicate MSAR surface file is **not** found. The IS software will also generate a system log error message indicating that an overlap error (error tuple XXXX) had occurred. There is no loss of data and every thing continues to work normally.

MSAR Insertion RSVP

An insertion RSVP is generated when a request is made for a surface that is not in the MSAR storage library (the surface is in the out_of_box directory). To resolve this RSVP, do the following:

1 Respond to the insertion RSVP.

When you respond to the insertion RSVP, the following dialog box opens.
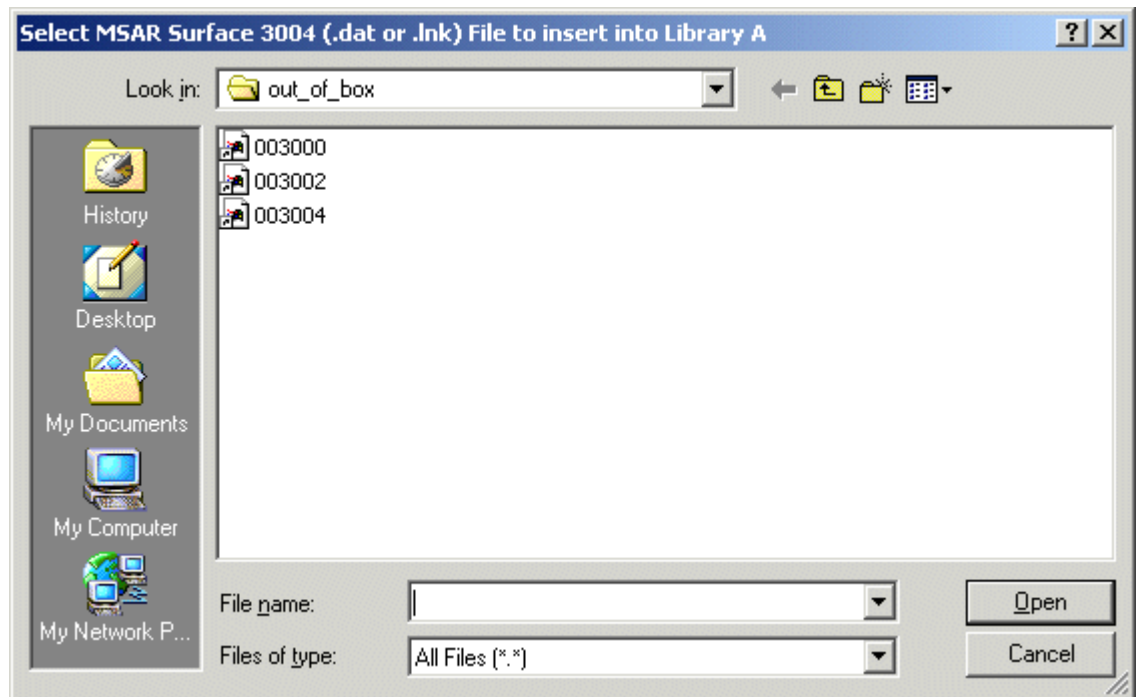
Note   The surface ID is shown in this window (in the title bar in this example).

2   Select the surface to insert and click **Open**.

The surface will be inserted back into the storage library.

MSAR Backup Mode

Backup mode is a new feature provided by the Storage Library Control application within the FileNet Image Services Application Executive. Clicking the Backup button on the Storage Library Control main window will toggle the selected MSAR storage library in or out of Backup mode. This feature allows you to easily place MSAR libraries in a read-only mode for backup purposes, and take them out of Backup mode as well.

Note   You can also use DOC_tool to put MSAR libraries into Backup mode. Refer to the *System Tools Reference Manual* for information on using DOC_tool for this purpose. To download this manual from the IBM support page, see **"Accessing IBM FileNet documentation" on page 14**.

The Backup mode feature is only available for MSAR storage libraries, therefore, the Backup button is only enabled when an MSAR library is selected. (It is grayed out if an optical library is selected.)

It is recommended that you put all MSAR libraries into Backup mode at the same time. If you don't, you will not be allowed to insert any surface into an MSAR library. This prevents you from ejecting a surface from a library that is in Backup (read-only) mode and then inadvertently insert it into a library in normal (read/write) mode. If this were to happen, the surface file could easily be altered.

Furthermore, for the same reason as above, be aware that **all** of the MSAR libraries on the server must be in Backup mode in order for you to insert media.

Backup mode is also persistent across an Image Services software restart. For example, the library mode will remain in Backup and not switch back to Normal after a restart.

Once all MSAR libraries are put into Backup mode, online backup of databases (permanent and relational) can be done in conjunction with MSAR surface file backup.

While MSAR libraries are in Backup mode, documents can still be committed to cache but will not be migrated to MSAR surfaces. MSAR surfaces are also available for reads as well.

CAUTION Once a library is in Backup mode, **DO NOT** change any library's configuration (optical or MSAR) in fn_edit. Doing so will invalidate the checkpoint file where the library mode is being stored. This will cause the library to lose the Backup mode after Image Services is recycled and go back to Normal mode. When the library is in Normal mode, all pending write requests will be processed and the surface files will be written to. This is undesirable when the surface files are still being backed up.

## Putting MSAR Storage Libraries in Backup Mode

Follow these steps to put your storage libraries in backup mode.

1 Open the Application Executive and select the Storage Library Control application. The Storage Library Control main window appears.
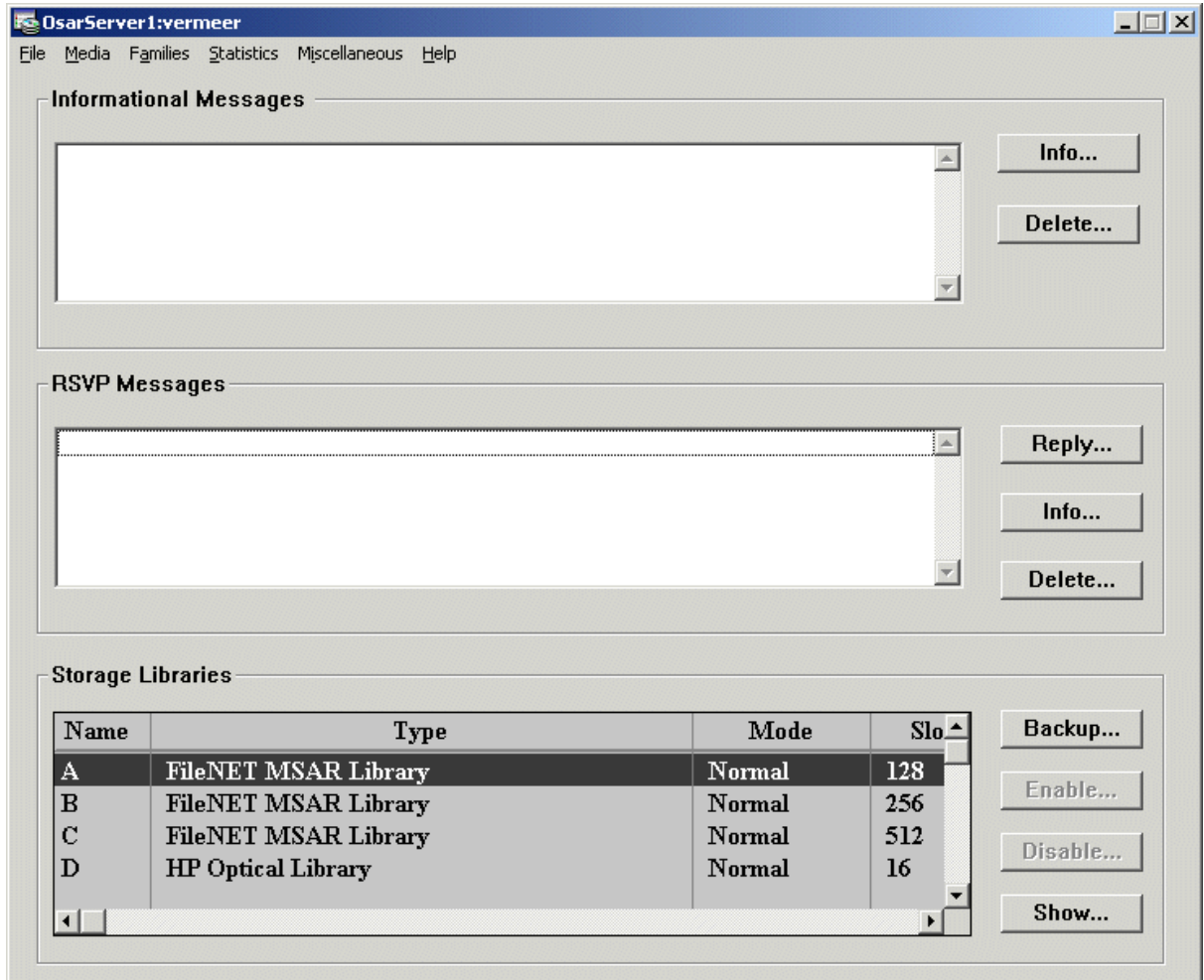
2 Select the MSAR library you want to put into Backup mode and click the Backup button.

Note   The Backup button is only enabled when MSAR libraries are selected.

Storage Library Control

   ❓   Are you sure you want to put MSAR
         Library 'A' into Backup mode?

         [Cancel]

         [**OK**]
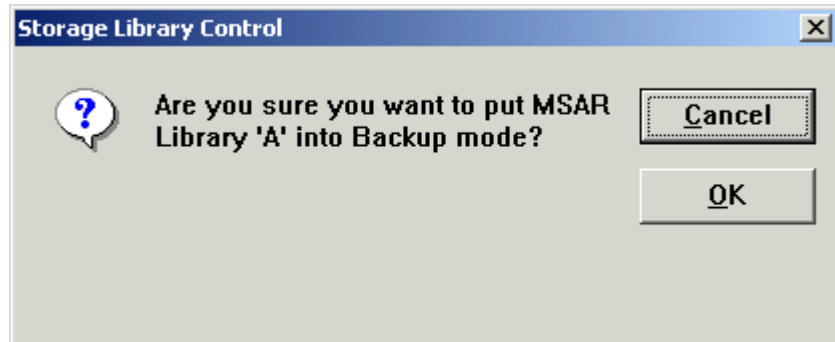
3   To confirm that you want to put the selected library into Backup mode, Click **OK**.

Storage Library Control

   ℹ️   Request successfully queued.   [OK]
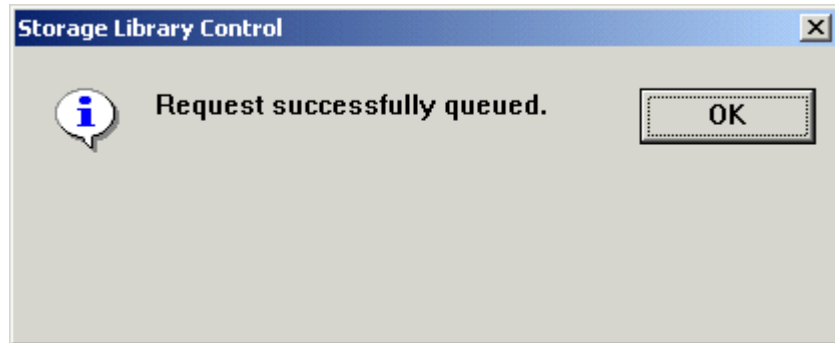
4   Click *OK* to continue.

5   To see if a library is in Backup mode, check the Storage Library Control main window and look under the 'Mode' column. The window is updated and displays the new status of the storage library.

Note If the storage library does not go into backup mode, view the system log for instructions on correcting this problem.
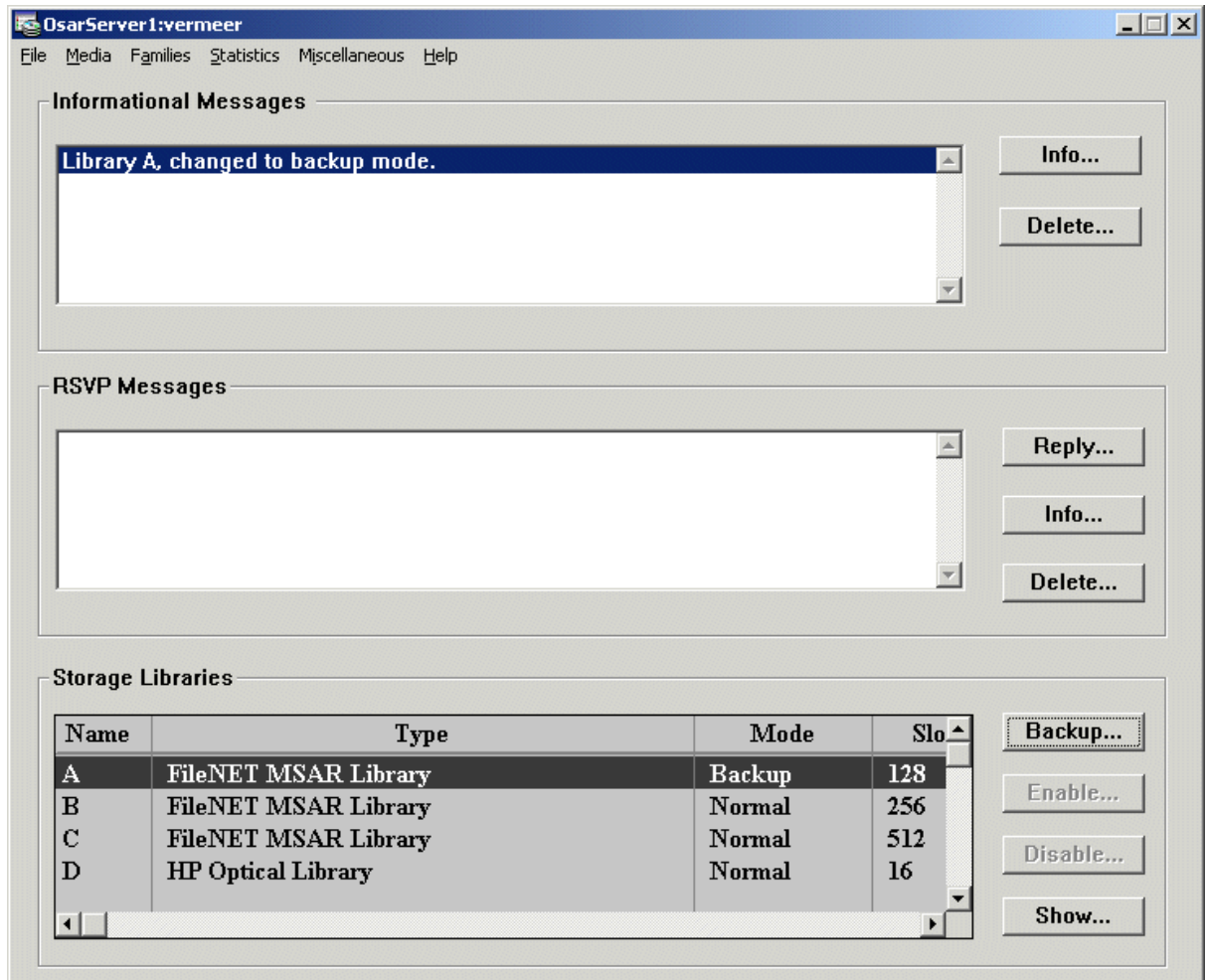
Note	The request to enter or exit Backup mode is not processed by Storage Library Control, but rather it is queued to be processed by the scheduler. Therefore, the request is not be processed immediately. To verify that a queued request has been done, check the system log. Also, in some instances, you will not be able to enter Backup mode. For example, if one drive is reserved in the library, and so on.

6 Repeat **Step 2** thru **5** for the remaining MSAR storage libraries to put them all into Backup mode.

7 Once all of your MSAR libraries are in Backup mode, all active MSAR write surfaces can be backed up. Use your backup utility to backup your MSAR surfaces.

8 Do an online backup of all databases except the transient database.

If you use the FileNet EBR backup utility, refer to the *Enterprise Backup and Restore User's Guide*. If you use a third-party backup utility, refer to the *Third-Party Backup/Restore Guidelines*. To download these documents from the IBM support page, see **"Accessing IBM FileNet documentation" on page 14**.

| Note	When MSAR libraries are set to Backup Mode, all open surfaces are closed and then re-opened as read-only surfaces.

9 After completing the backup of all your MSAR surfaces, put all MSAR libraries back into Normal mode.

Putting MSAR Storage Libraries Back into Normal Mode

Follow these steps to put your storage libraries back into Normal mode.

1   From the Storage Library Control main window, select the MSAR library you want to put into Normal mode and click the Backup button.
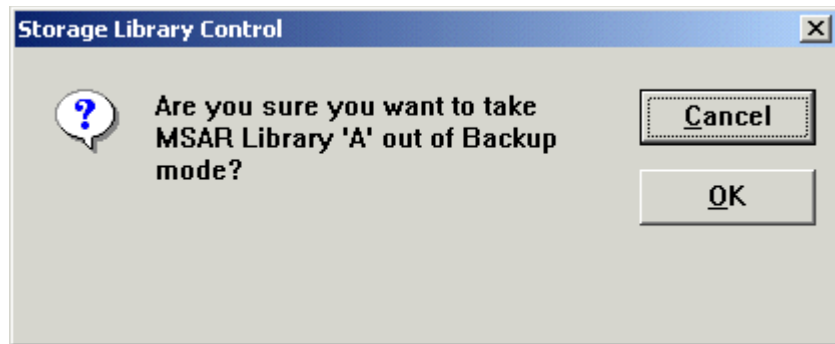
2   To confirm that you want to put the selected library back into Normal mode, click **OK**.

3   When you get the message that your request has been successfully queued, click **OK** to continue.

After the selected MSAR storage library has been put into Normal mode, the Storage Library Control window is updated and displays the new status of the storage library.

4   Repeat Step 1 through 3 for the remaining MSAR storage libraries to put them all back into Normal mode.

Backup Strategy Example

The following is an example of a strategy that can be used for backing up MSAR data in an MSAR only system, and how to recover in the event of a disaster. This example is not meant to be comprehensive in scope, but some of the concepts could be adapted to your recovery strategy.

Backup Steps

- Backup surfaces that are not active write surfaces.

- Put all MSAR storage libraries in Backup mode.

- Do online backup of all databases except the transient database. If you use the FileNet EBR backup utility, refer to the *Enterprise Backup and Restore User's Guide* for details. To download this guide from the IBM support page, see **"Accessing IBM FileNet documentation" on page 14**.

- Backup all active write surfaces.

- Backup all locked cache objects in page cache. Refer to the "Backup" chapter in the *System Administrator's Companion for Windows Server* or *System Administrator's Companion for UNIX.* If you prefer to use a command line tool, see the "Commands" chapter of the *System Administrator's Handbook* for instructions on using the CSM_exim tool.

Note To avoid an excessive number of locked cache objects, set the Migration option to Yes, and Migration Delay option to No. Use Database Maintenance to update the document classes. See the *System Administrator's Handbook* for more information. To download any of the aforementioned documents from the IBM support page, see **"Accessing IBM FileNet documentation" on page 14**.

- Put storage libraries back in Normal mode.

Restore Steps

- Restore all databases except transient database. If you use the FileNet EBR backup utility, refer to the *Enterprise Backup and Restore User's Guide* for details.

- Initialize cache and restore locked cache objects.

- Use the Migrate Documents background job, or doc_migrate command line tool, to restore write requests in cache.

- Identify locked fast batch cache objects. Use DOC_dumpfb to identify any uncommitted documents in the fast batch objects. See the *System Tools Reference Manual* for information.

- Remove fast batch cache objects.

- Re-scan uncommitted documents.

To download any of the aforementioned documents from the IBM support page, see **"Accessing IBM FileNet documentation" on page 14**.

Appendix A – Windows Network Security Settings for Accessing Remote Shared Drives

In order to access MSAR files located on remote network storage devices, such as NAS or SAN, or remote Windows devices, such as a Windows shared drive or disk array in a Windows environment, your system must be configured properly.

Important   Create a folder for the MSAR creation directory with this procedure before committing any documents.

Creating a Domain Account for Image Services MSAR

Create, or verify, a domain group account in a domain where both the Image Services server and the remote storage device are members.

For example, <domain>\domain fnadmin

The domain account you use should include the owner of the IS Control Service and any other users that would need to administer MSAR surfaces.

Note   In the example screens shown in this appendix, we use **domain1** for the domain name and **domain fnadmin** for the user name.

Setting Security Properties for Remote Network Storage Devices

Use this procedure if you will be accessing a remote **network storage device**, such as NAS or SAN.

Note   If you will be accessing a remote Windows storage device, skip this section and continue to, **"Setting Security Properties for Remote Windows Server Storage Devices"**.

Perform the following steps on the remote network storage device.

1   Create the MSAR directory, making sure that there is ample space allocated for your MSAR surfaces.

2   Set up permissions for the MSAR directory so that <domain>\domain fnadmin has full control.

3   Continue to the section, **"Stopping Image Services Software and IS ControlService" on page 148**.

Setting Security Properties for Remote Windows Server Storage Devices

Use this procedure if you will be accessing a remote **Windows storage device** such as a Windows shared drive or disk array in a Windows environment. The security properties must give full control to the domain user account that the IMSService is using.

Note   The remote Windows server, containing the shared device, does not need to have IS installed.

Perform the steps in this procedure on the **remote Windows Server** with the Storage Device.

1   In Windows Explorer, create a directory folder for MSAR.

**Note**   In this procedure the directory folder is named MSAR_Share.

2   Right-click on the MSAR folder (MSAR_Share) and select *Properties*. The properties window for the folder opens.

3   In the properties window, select Security tab to display the Security tab dialog box.
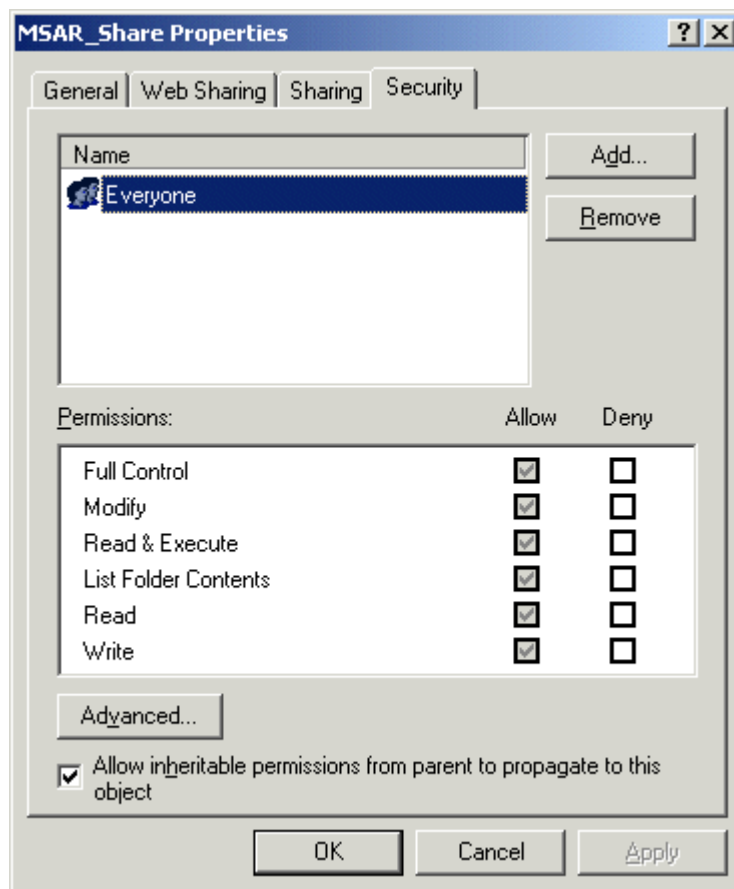
4 Click the **Add** button to open the Select Users, Computers, or Groups window.
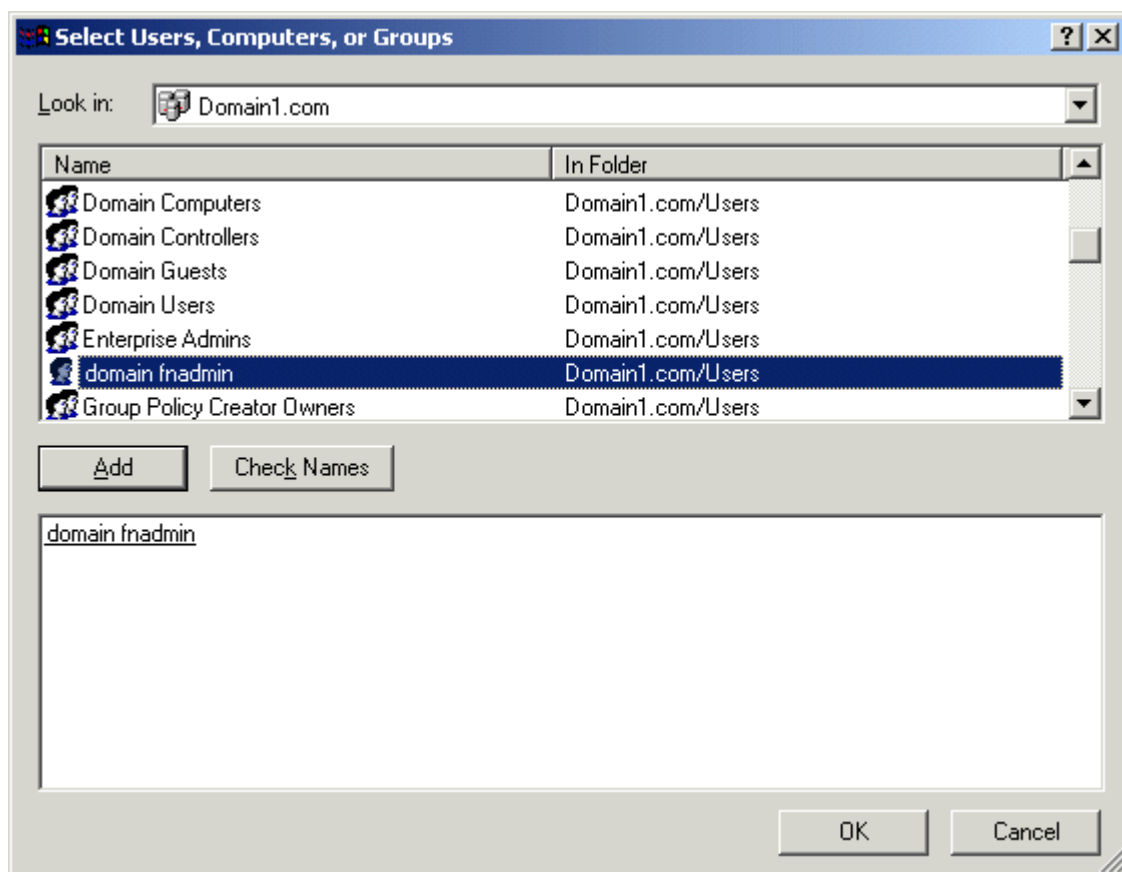
5 From the drop-down list in the Look in: box, select the domain.

6 Select the domain user you created in the section, **"Creating a Domain Account for Image Services MSAR" on page 137**, click **Add**, and then click **OK**. The Security tab dialog box reappears.
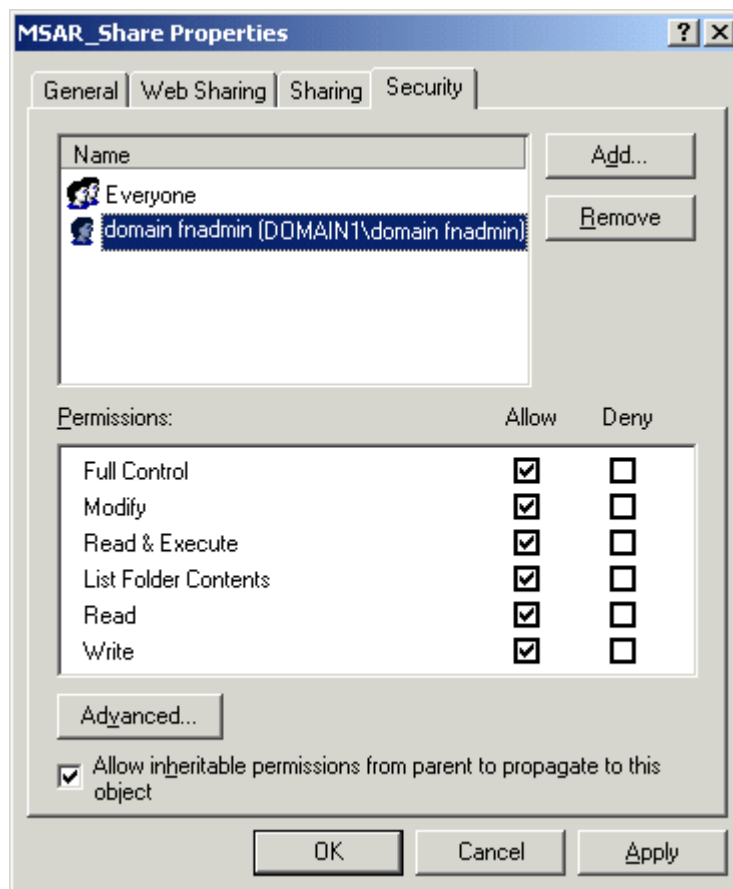
7 Select the domain user and check the **Full Control** checkbox, under the **Allow** column, to grant full control permissions for the domain user selected. Leave the properties window open.

Configuring the MSAR Directory to be Shared

The share permissions for the MSAR directory must give full control to the domain user account that the IMSservice is using.

Note   Perform the steps in this procedure on the **remote Windows server** with the storage device.

1   In the properties window, select the Sharing tab.
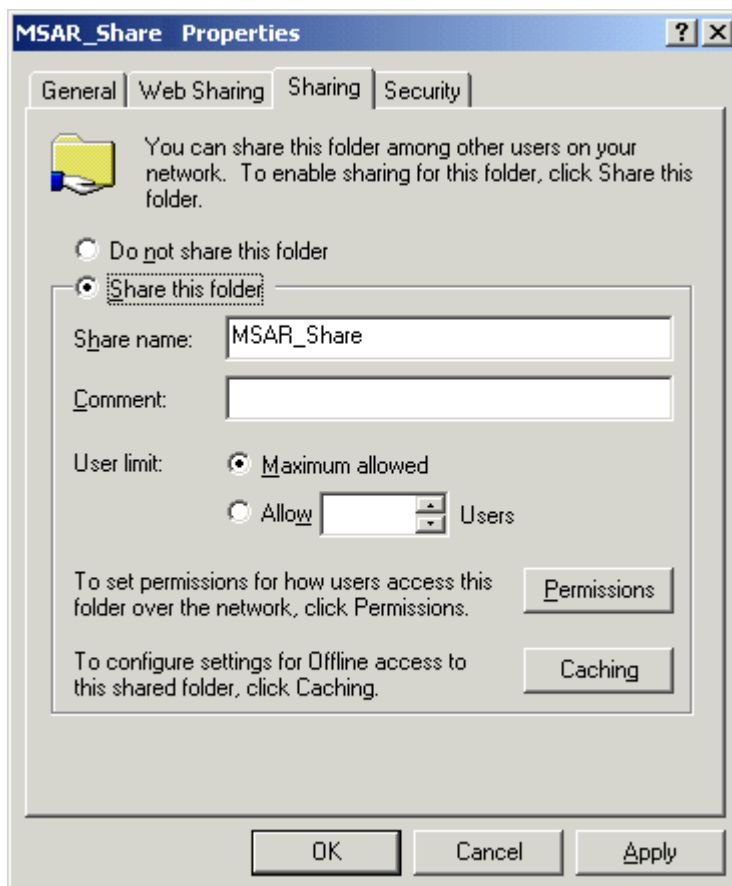
2   Click the **Share this folder** radio button.

3   Accept the default share name, or enter new name if desired, and click the **Permissions** button.

CAUTION   Do not change the share name after you have created surfaces. Doing so would require that all surfaces be ejected, the MSAR surface creation directory share folder be updated with the new folder name, and all surfaces be inserted into the new folder.
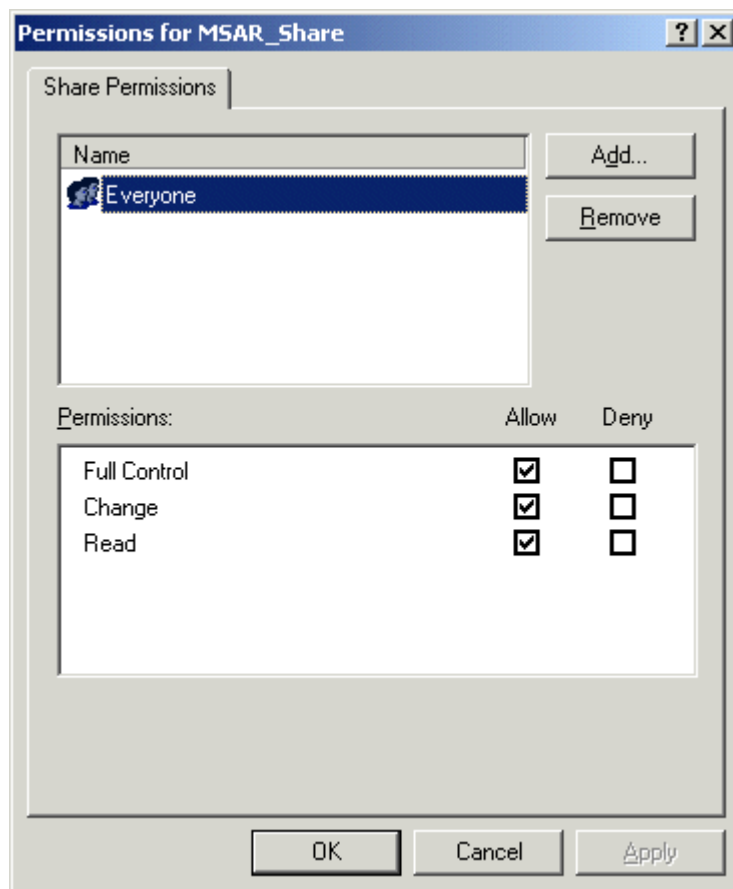
4   In the Share Permissions window, click Add to open the Select Users, Computers, or Groups dialog box.
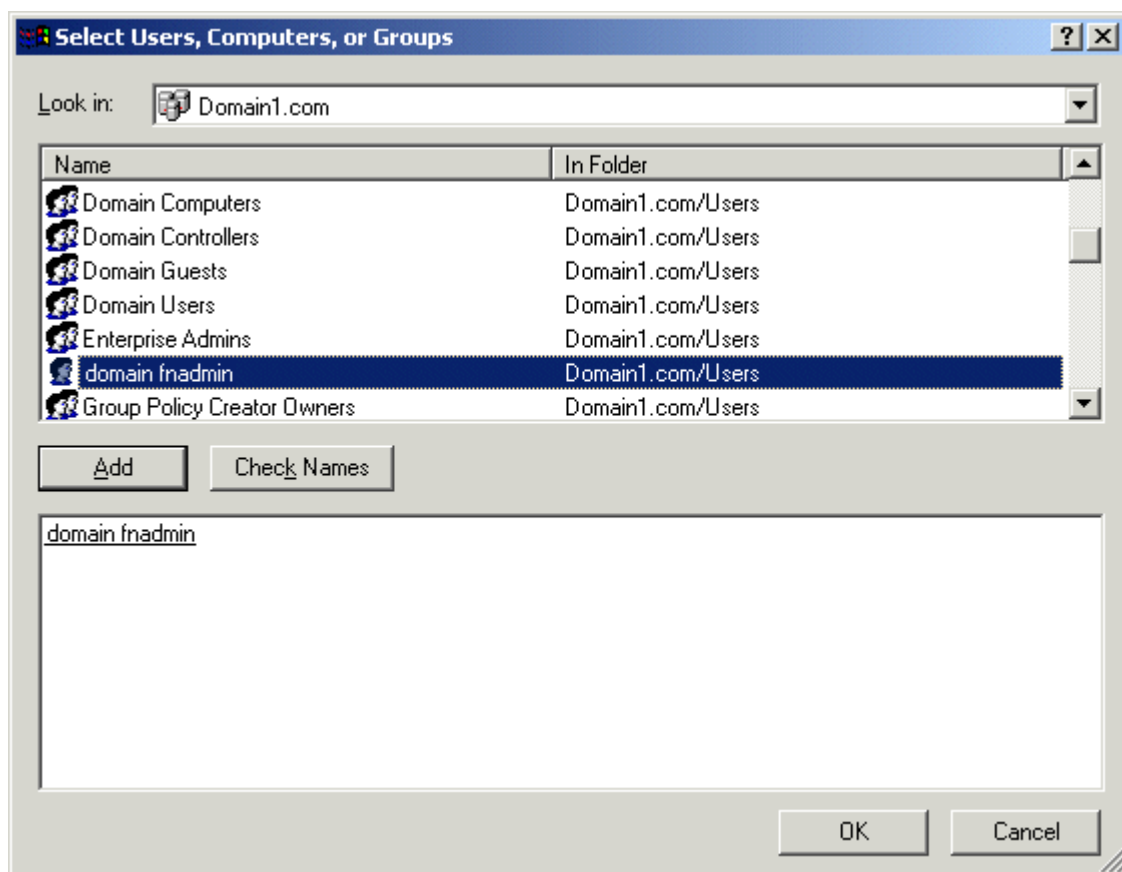
5   From the drop-down list in the Look in: box, select the domain.

6   Select the domain user you created in the section, **"Creating a Domain Account for Image Services MSAR" on page 137**, click **Add**, and then click **OK**.

Permissions for MSAR_Share   ? ✕

Share Permissions

Name		Add...
domain fnadmin (DOMAIN1\domain fnadmin)		Remove
Everyone		

Permissions:	Allow	Deny
Full Control	☑	☐
Change	☑	☐
Read	☑	☐

                    OK   Cancel   Apply
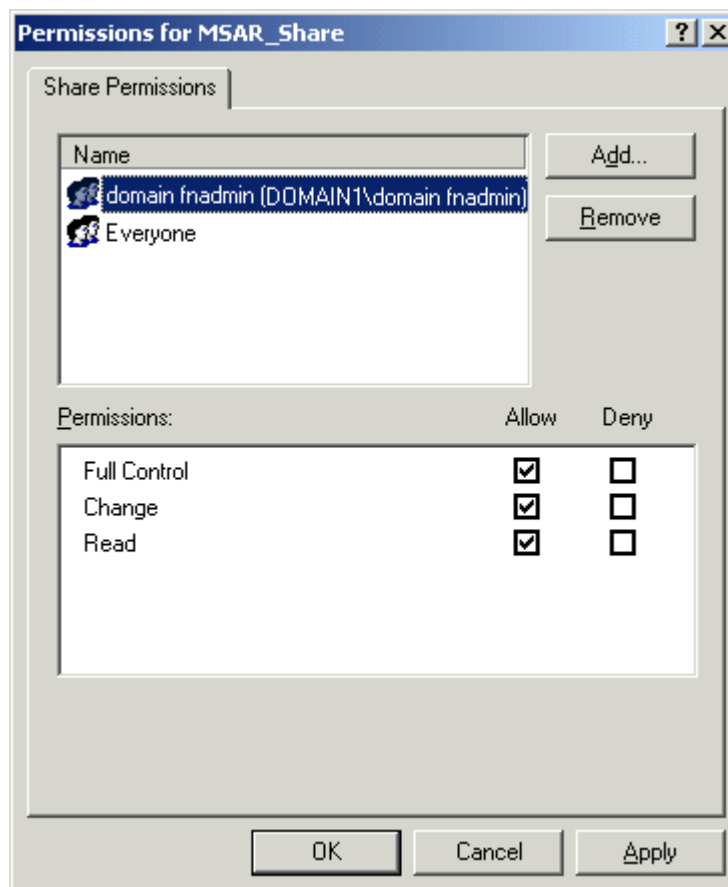
7   In the permissions dialog box, select the domain user name, check the **Full Control** checkbox under the **Allow** column, and click **OK**.

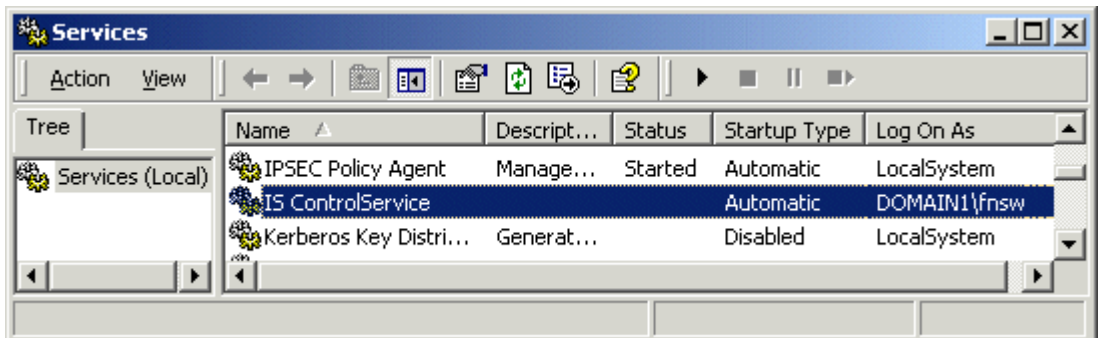**8**   Click **OK** in the Properties window to exit.

Stopping Image Services Software and IS ControlService

Perform the steps in this procedure on the **Image Services Server**.

1 Open a Command Prompt and stop Image Services by entering the following command.

initfnsw -y stop

2 From the Control Panel, open Administrative Tools and then open Services. The Services window displays.

3 In the Services window, right-click IS ControlService and select **Stop**.

In a few seconds, the service status in the Properties window will indicate that the service has stopped.

Note You can also click the ■ button on the tool bar at the top of the Services window to stop the IS Control Service.

Modifying the IS ControlService to use the domain account

Perform the steps in this procedure on the **Image Services Server**.

1   In the IS ControlService Properties window, select the Log On tab.
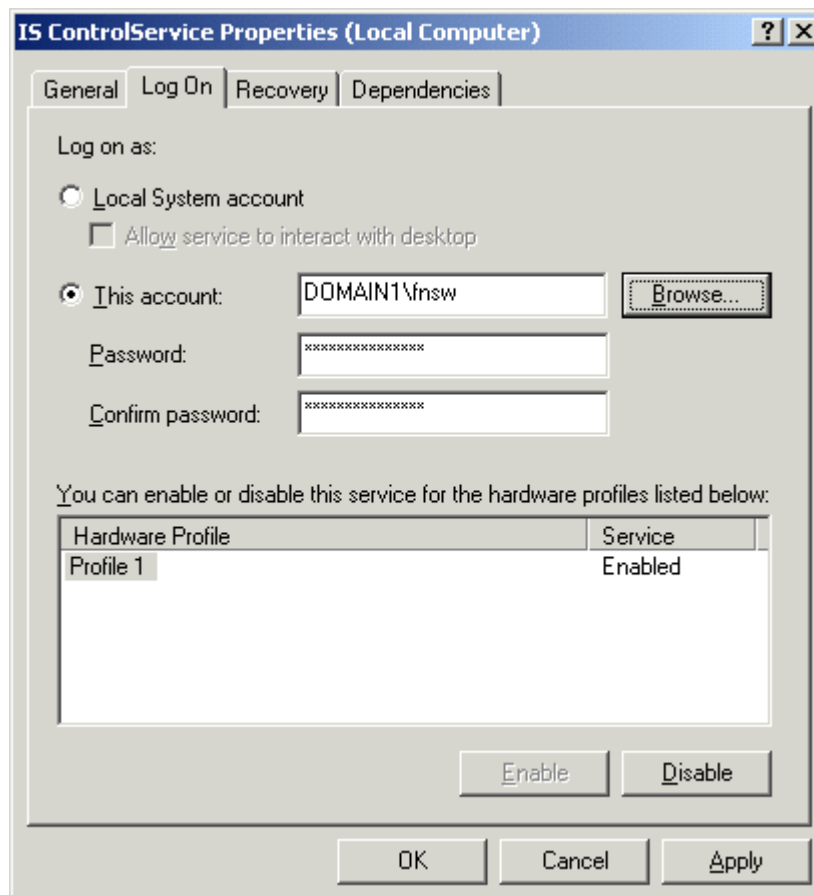
2 From the Log On tab, click the **Browse** button. The Select User window opens.
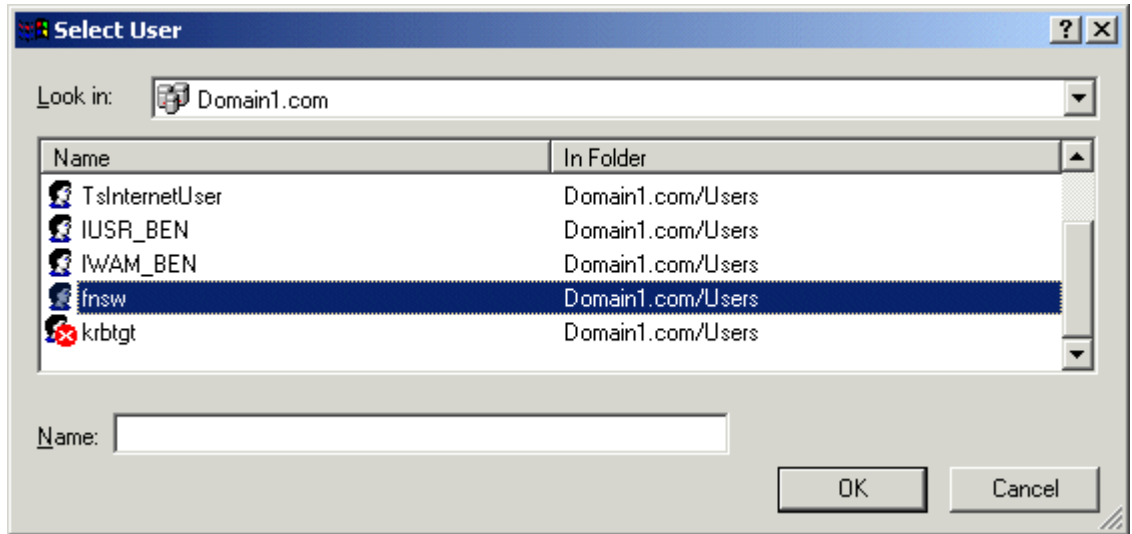
3 From the drop-down list in the Look in: box, select your domain.

4 Select your domain user name and click **OK**.

5 In the IS ControlService window, enter the domain user password, confirm the password entry, and click **OK**.

6 In the Services window, right-click IS ControlService and select **Start**.

Note You can also click the ▶ button on the Services tool bar at the top of the window to start the IS Control Service.

7 After verifying that the IS ControlService starts successfully, close the Services window.

Adding the domain account to the following groups: Administrators, FNADMIN, FNOP, FNUSR

Perform the steps in this procedure on the **Image Services Server**.

1 From the Taskbar, click Start, point to Programs, point to the **Administrative Tools**, and click **Computer Management**.
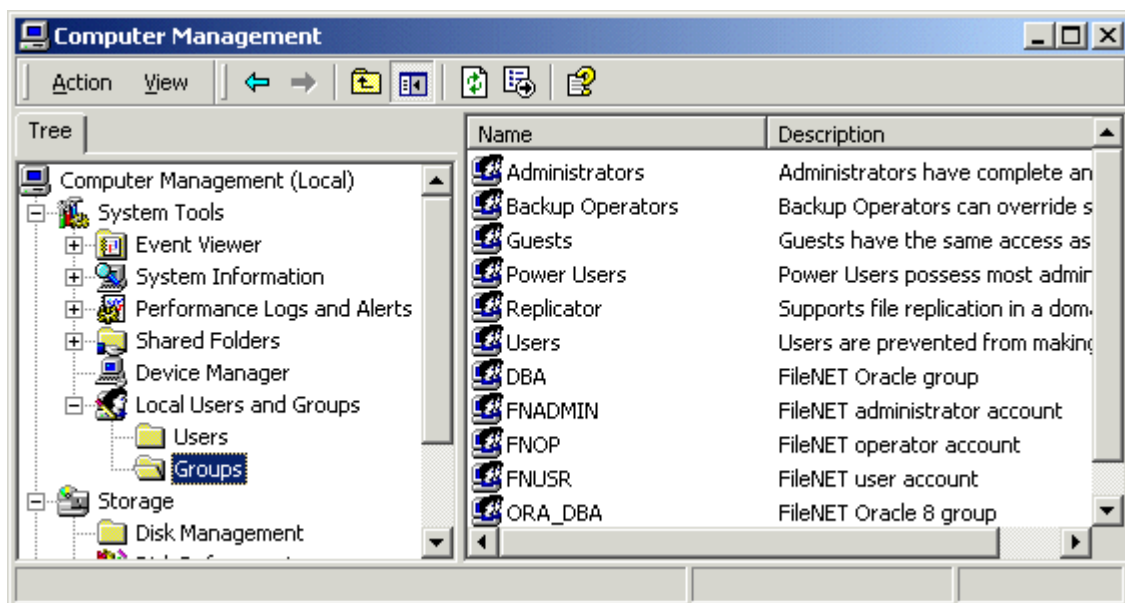
2 Expand the Local Users and Groups folder and select **Groups**.

3 Double-click the Administrators group to open the Administrators Properties window.
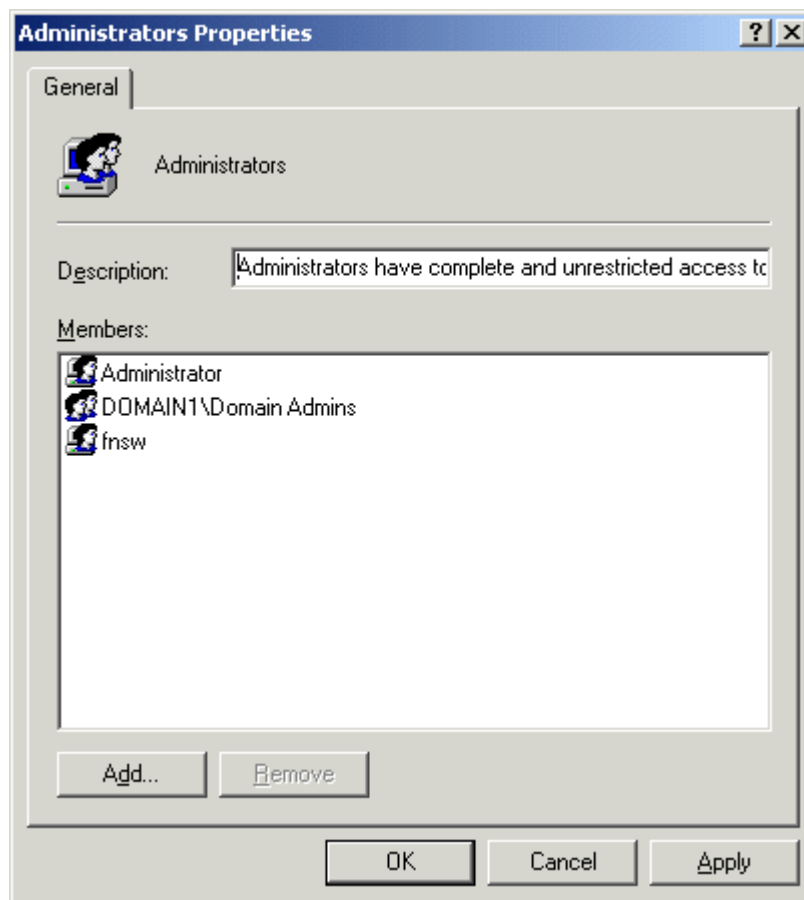
4   Click **Add** to open the Select Users or Groups window.
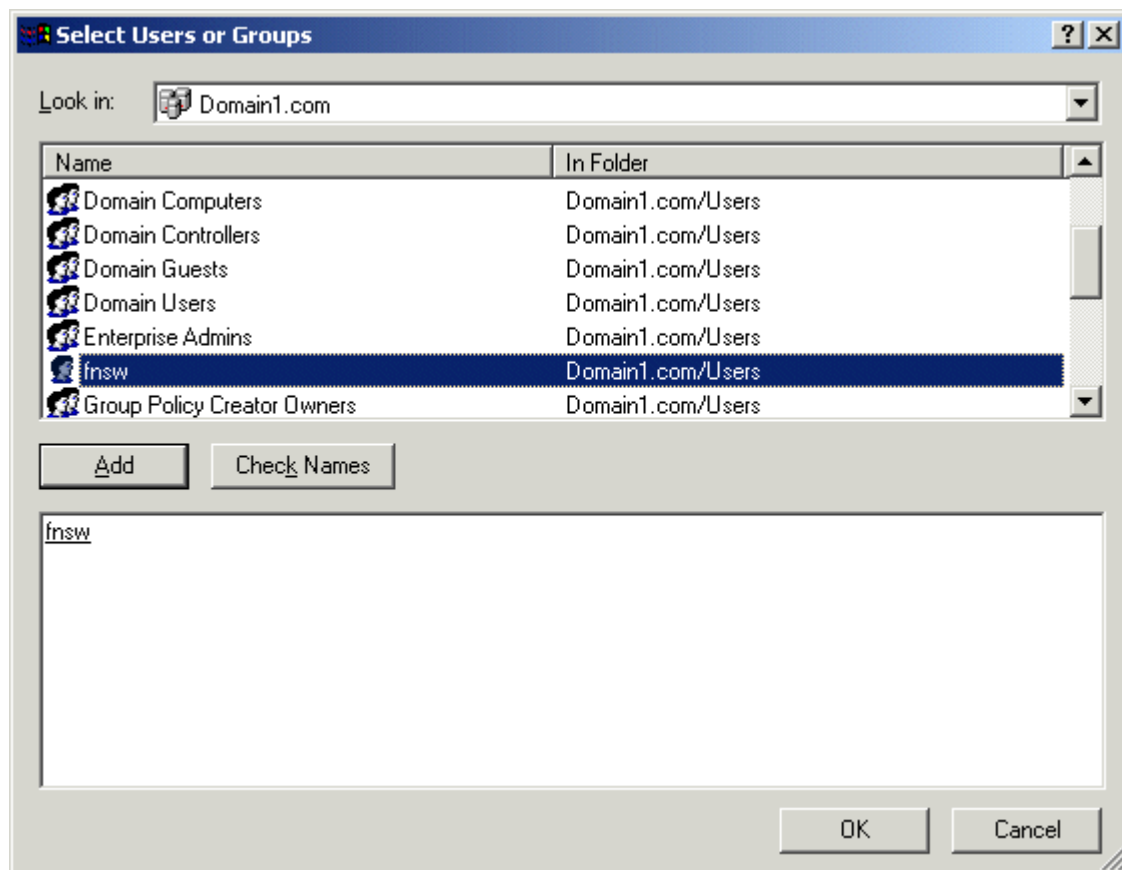
5   From the drop-down list in the Look in: box, select your domain.

6   Select the domain user name you created in the section, **"Creating a Domain Account for Image Services MSAR" on page 137**, click **Add** and then **OK**. The Administrator Properties window is updated (see below) showing that the domain user has been added to the Administrator group.

7   Click **OK** to close the Administrators Properties window.

8   Repeat **step 3** through **7** for the remaining groups: FNADMIN, FNOP, and FNUSR.

Modifying the local security policy for Domain Account

Perform the steps in this procedure on the **Image Services Server**.

Modify the local security policy to give the domain account permissions for the following policies:

- Act as part of the operating System

- Log on as a service

- Increase quotas

- Replace a process token

1   From the Taskbar, click Start, point to Programs, point to the **Administrative Tools**, and click **Local Security Policy**.

The Local Security Settings screen opens.
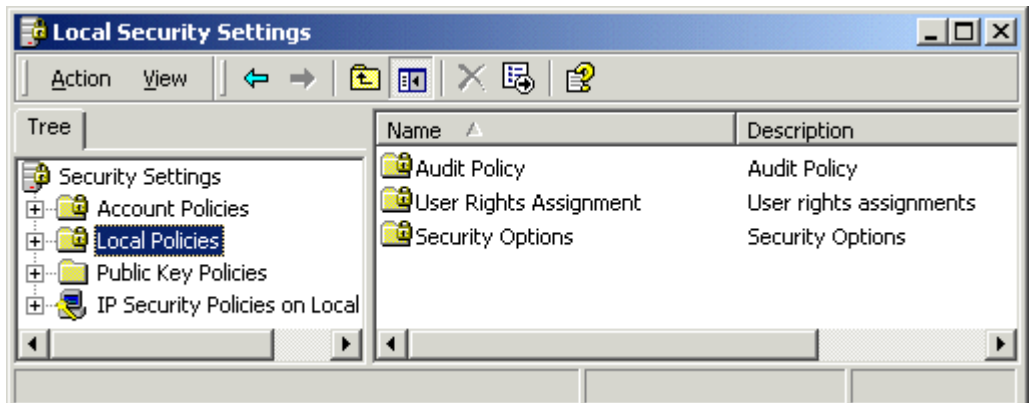
2   Expand the Local Policies folder and select the **User Rights Assignment** folder.
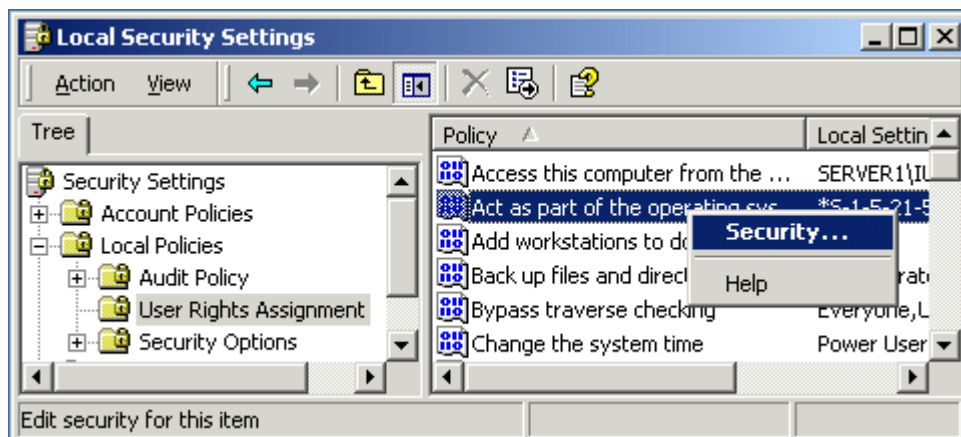
3   Right-click on the policy selection you want to add and select **Security**.

Note   There are four policy selections that you will be adding. The first one, Act as part of the operating system, is shown in the following example screens.

The Local Security Policy Setting window opens.
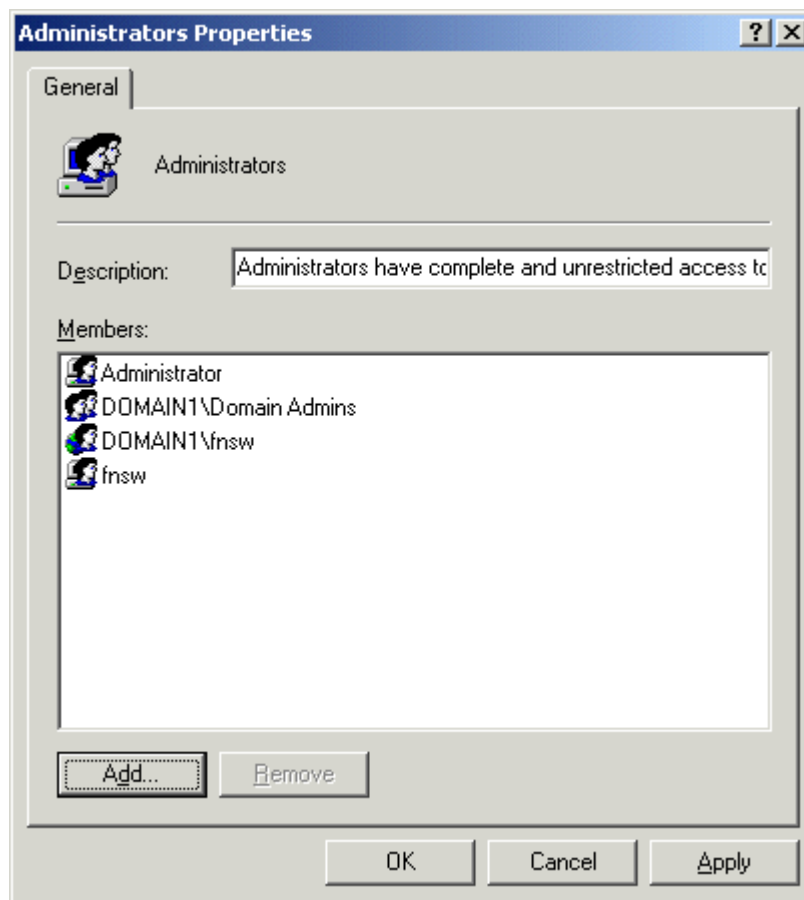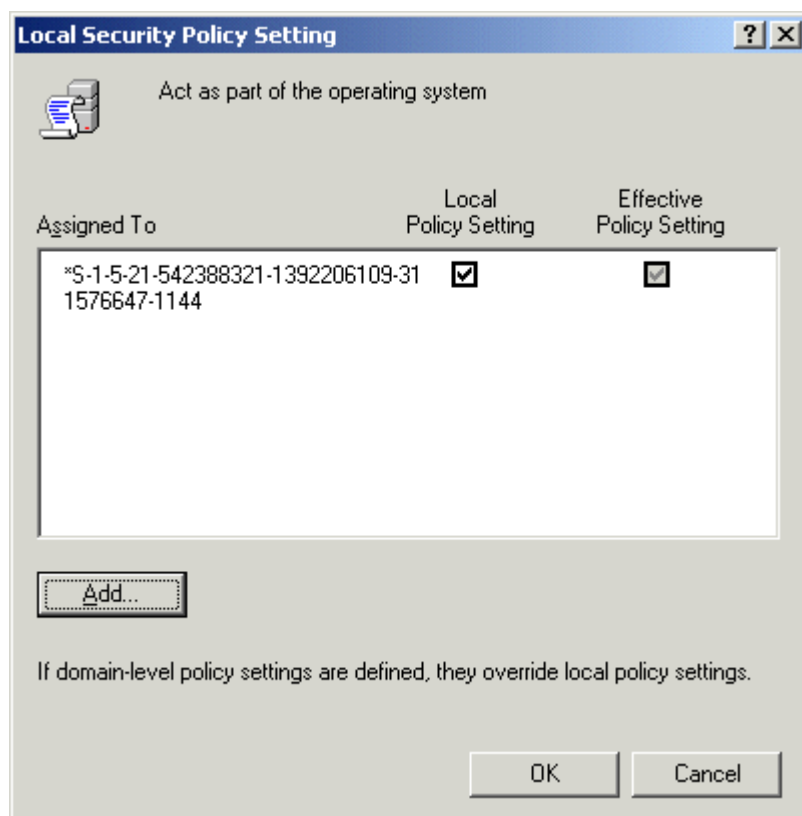
4 Click the **Add** button to open the Select Users or Groups window.
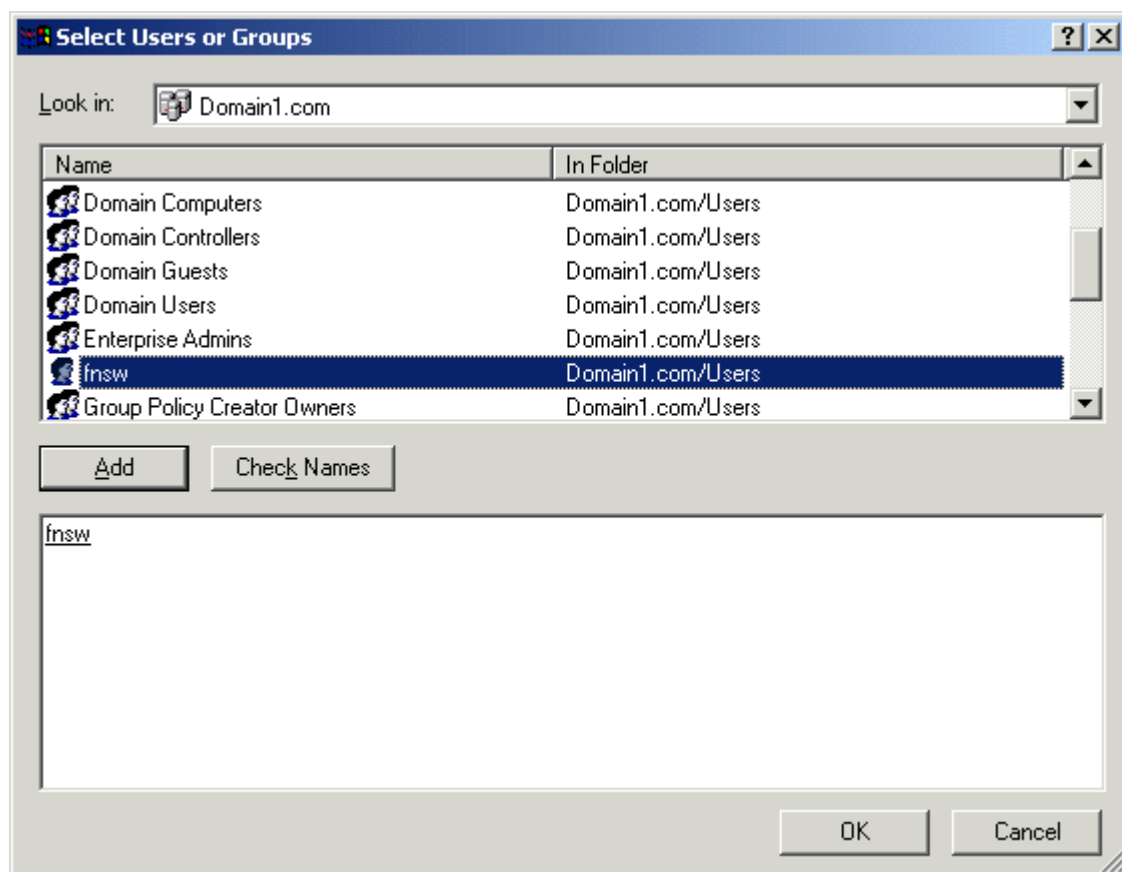
5 From the drop-down list in the Look in: box, select your domain name.

6 Select the user name you created in the section, **"Creating a Domain Account for Image Services MSAR" on page 137**, click the **Add** button, and click **OK**.

7 Click *OK* to close the Local Security Policy Setting window. The Local Security Policy Setting window (as shown below) is updated to show that the domain user has been added to the security settings for the policy selected.
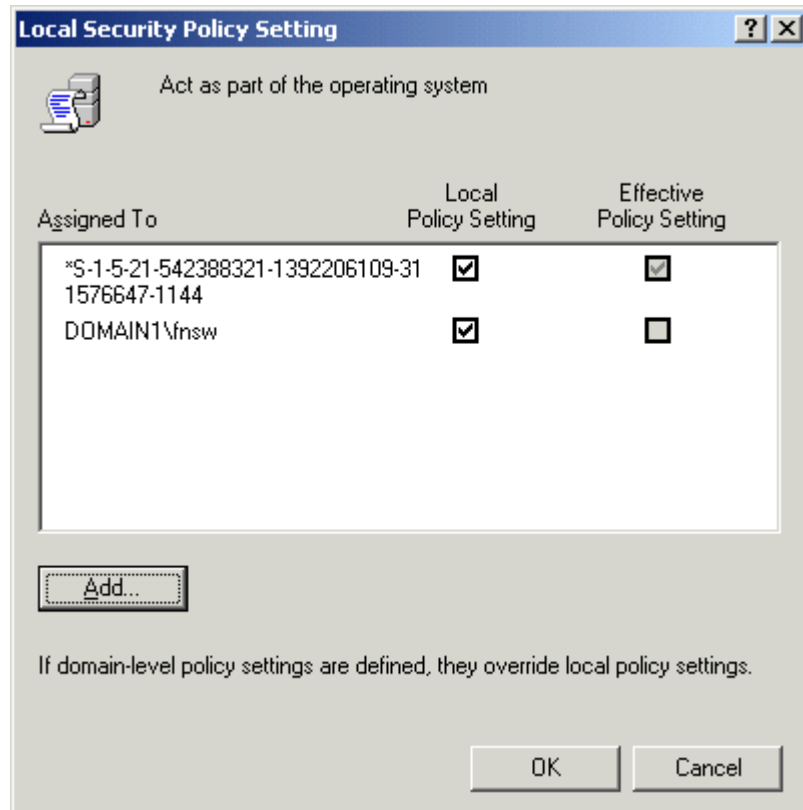
8 Repeat **step 3** - 7 for the remaining Policy selections. After all Policy selections have been modified, continue to the next section.

Configuring a Storage Library to Use the MSAR Directory

Perform the steps in this procedure on the **Image Services Server**.

Use the System Configuration Editor to configure a storage library for the remote server.

1   Open the System Configuration Editor. The Procedures tab opens by default.

2   Select the Configure an MSAR Storage Library procedure and click **Run**.

3   Respond to the prompts in the procedure as appropriate for your site. When you get to the step where you enter the MSAR surface directory for the MSAR Library, enter the UNC (Unified Naming Convention) path to the share name you created in **Step 2 on page 144**.

Note	**Do Not** use a drive letter in the path. Because this is a remote shared drive, you **must** use the UNC path. For example: \\<servername>\sharename

4   Complete the remaining steps of the procedure, exit the System Configuration Editor and save your changes.

Starting the Image Services Software

Open a Command Prompt and start the Image Services software by entering the command:

initfnsw start

Appendix B – MSAR Media Format Layout

The disk format for MSAR surfaces is the same as for optical surfaces, with the exception of the MSAR label. The optical disk format, therefore, is largely unchanged.

Note   Converted MSAR surfaces keep the original optical volume label stored in sector 25.

MSAR surfaces are transparent to higher level software with the exception of opening a blank MSAR surface. When opening a blank MSAR surface, the surface type and size are assigned to the MSAR surface.

MSAR and Optical Disk Surface Format

Content	Locations (Sectors)	Remarks
MSAR Label	0	MSAR surface only
Old Label	1 – 10	
Preformat Label	11 – 15	
Volume Label	16 – 19	
SurfUpdate Label	20 – 23	
Original Label	25	MSAR converted surface has the original optical volume label
File Directory Extent	64 – 983	
Event Log Extent	984 – 1999	

MSAR and Optical Disk Surface Format, continued

Content	Locations (Sectors)	Remarks
1st Short Descriptor File	2000 – N	The size of a short descriptor file is allocated as roundup of 0.1% of the media capacity. For MSAR 1GB media type, the size will be 2000 and N will be 3999.
Images	(N+1) – M	The maximum of M is the Media Capacity if no more short descriptor files are being created.
…….		
Reserves at the EOF	Media Capacity – (Media Capacity + Reserved Area)	Reserved Area is used for short descriptors such as annotations or SurfUpdate document headers. The size of this area is 10,000 sectors for 1KB sector size, 5,000 sectors for 2KB sector size, and 2500 sectors for 4KB sector size.

Appendix C – MSAR Checksumming

MSAR Surface Checksumming

For performance reasons, MSAR surface checksumming relies on "checkpointing," as opposed to calculating a CRC for the entire MSAR file. This should not be confused with page-level checksumming.

MSAR surface checksumming was implemented to detect the insertion of a corrupted file and prevent spoofing or unintentional re-insertion of an older version of an MSAR surface file. Since MSAR runs on any standard file system and cannot be WORM-protected while the surface is still being written to, a surface file always runs the risk of being opened and tampered with by an external process. This possibility exists since the file can be accessed by several Image Services processes concurrently with the DTP process and is opened in Read/Write, non-exclusive mode.

The MSAR surface checksumming process does two things:

- At ejection time, it selects 10 data segments evenly over the entire MSAR surface file, which are different at every eject as the surface grows in size. It also calculates a checksum for each of them that it stores in the MSAR file header.

- At injection time, it validates the checksum information in the header against the 10 segments in the MSAR surface file. If a discrepancy is found, the MSAR file is rejected.

On MSAR Compliance to SEC 17a-4 Standard

The MSAR technology cannot be deemed compliant with the SEC 17a-4 Standard. MSAR writes surface files in a standard file system and must always have Read/Write access to the files. By using H-MSAR, a customer can move closed MSAR surface files to an HDS DRU-controlled device that blocks writes at the volume level once locked down under retention. This is the only WORM capability currently offered with MSAR.

MSAR Surface Identification

MSAR surface identification is the process that validates that the label of the MSAR surface that is being swapped in drive is the expected surface. It also makes sure that the high watermarks of the various internal structures of the file are consistent with the information in the MKF database. This information is needed to indicate to the DTP and other processes where they left off last time the surface was in drive and where to write next. During this process, a fair amount of small I/Os are generated as a result.

In Image Services 4.0 and later, surface identification takes place at Image Services startup time by simply swapping in and out all surfaces of each MSAR library. This is to detect problems and prevent disruption of operations later on. However, this process will negatively impact Image Services startup time in proportion to the number of MSAR surface in the libraries, the number of libraries, and the device speed. Extreme delays can be expected when MSAR is used in combination with an HSM fronting a tape library, for example. To prevent this from happening, system administrators can disable/enable MSAR surface identification at startup for all individual MSAR libraries using a trigger file. This will provide maximum operational flexibility.

Glossary

Background Job Control

Background Job Control is an Image Services application you use to start, control, and monitor background jobs.

background jobs

Background jobs are time-intensive FileNet software functions designed to run at lower priority and without user attention (for example, in the background). As such, they do not interfere with other tasks. Copying media, importing documents from storage media, and consolidating media are examples of functions that are performed as background jobs. Background job progress is check-pointed and will automatically restart from where it stopped if the software is recycled.

backup

A backup is a duplicate copy of data placed in a separate location, perhaps on different media from the main (or production) body of data. It is intended to guard against total data loss in the event the original data somehow becomes inaccessible.To make a backup is the act of creating such a copy. FileNet Image Services provides tools to assist with backups.

blank surface

When an optical surface is blank every sector is unwritten. Blank surfaces do not exist on MSAR.

cache

Cache is the magnetic disk space used to store documents on the way to and from storage media. Cache can also act as permanent storage if you do not use optical or MSAR storage media. Portions of cache (referred to as logical caches) are allocated for storage of different document types. FileNet Image Services uses multiple cache types.

Cache-only

Some FileNet Image Services customers do not choose to use optical or MSAR storage libraries for their systems. All of their committed documents stay locked in page cache. This type of configuration is called a Cache-only system. It could also be referred to as an OSAR-less system.

CIFS (Common Internet File System)

CIFS, formally known as Server Message Block (SMB), defines a remote file-access protocol that allows resource sharing between multiple computer platforms. Clients typically connect to servers using NetBIOS over TCP and are able to map drives or use UNC connections. CIFS connections are typically made between Windows and UNIX platforms. For details of the CIFS protocol **click here.**

committal

Committal is the stage at which scanned images become retrievable documents. Index values are written to the index database (see cataloging) and an entry in the document locator table of the permanent database is inserted. For systems equipped with a storage library, requests to migrate the documents to the storage library are written to the write_request table.

compatible system
> A compatible system is a system that does not have conflicting surface IDs or document numbers.

database
> A database is a collection of logically related records or files managed by a database management subsystem. The FileNet Image Services system uses two types of databases: a third-party relational database for index data and WorkFlo queues and **"MKF (multi-keyed file)"** for document addresses, work in progress, and other purposes.

data (.dat) file
> The MSAR data (.dat) file contains the actual surface data, images, text, and so on. The MSAR surface file name is created with the surface ID. For example, surface 3000 will have the file name 003000.dat. The location (absolute path) to the data file is stored in the Image Services database so that it can be opened when needed.

document
> Files committed to the FileNet Image Services system are documents. Documents can be images, text, forms, mixed (combinations of types), imported DOS files stored on the Image Services system's storage media, or overlays checked in by Revise users.

Document Class
> A logical grouping of similar documents. A document's scanning, indexing and security characteristics are defined by the document class. All documents assigned to that class share the same characteristics. A document class is associated with a media family.

document ID

A number the Image Services software assigns to a document. It is unique throughout an Image Services system and is used in the tables and databases to identify documents.

domain name

The domain name is the second part of the NCH resource name. The domain name is the system name, which is determined by you and set up by your service representative during FileNet system configuration.

drive - MSAR

In an MSAR storage library system, a virtual drive is used to represent a software process that manages reading and writing to an MSAR surface. MSAR storage libraries always have 12 virtual drives. MSAR drives are very flexible regarding formats. An MSAR drive can read and write any MSAR media type, and can also read any surface converted from optical.

drive - optical

A drive is the physical hardware necessary for reading and writing optical media. Optical storage libraries move media (or surfaces) from a slot to a drive for reading or writing.

Eject - MSAR media

When an MSAR surface is ejected from its storage library it is no longer available to the Image Services system. A link (.lnk) file is also created when the surface is ejected. The link file is used later to locate the surface when it is re-inserted back into the storage library. See **"link (.lnk) file"**.

Eject - optical media

Ejecting optical media from its library causes the arm to move it to the mail slot where the operator removes it. While the system keeps track of the media, it will require an Insert (see below) to put the media back into the storage library in order for documents to be retrieved.

ESE (Extended Storage Edition)

ESE is a special release of FileNet Image Services Release 3.6. ESE refers to the MSAR storage library feature and its extended storage capability.

Fast Batch Committal

Fast batch committal is a quick way of moving documents from batch cache to page cache. In a fast batch committal environment, all documents and all pages of the documents for the batch are in one cache object, so the entire batch is committed in a single operation. Unlike normal committal, fast batch committed documents are not retrievable from the cache. They must be migrated to and then from a storage library before a retrievable copy of the document is in the page cache.

If the "Fast Batch Breakup" option is selected, the fastbatch object remains in the cache after it has been written to a surface. This option also causes the fastbatch object to be broken up so that individual documents are retrieved.

foreign media

Foreign media is media that was formatted and written on a system other than the one into which it is being inserted. When incorporated into the system, it is listed as "foreign" in certain Storage Library

Control reports. The surface could be incompatible if it was created on an incompatible system. An incompatible foreign surface is assigned a different surface ID when it is incorporated. A compatible foreign surface retains its surface ID.

foreign surface

See **"foreign media"** .

foreign system

A foreign system is a FileNet system in a different domain with a different **"SSN (System Serial Number)"** .

HSM (Hierarchical Storage Manager)

A Hierarchical Storage Manager manages at least two levels of storage for online files. Typically, it will provide disk-based magnetic storage for recently acquired or accessed files. At some point, it will migrate the files to less costly but still available storage (like an MSAR library, optical library or a tape library), leaving very small pointer files behind. When the migrated files are needed again, the HSM will automatically arrange for the files to be copied back to disk.

Image Services

Image Services is a set of servers and services providing a single document image database. The database includes a single index database, a single document locator database, and the collection of document images on storage media.

Import

For the Image Services software, import means to bring documents into the system from **"foreign media"** (media created by another Image Services system).

incompatible system

An incompatible system is a system that could have conflicting surface IDs and document numbers.

Incorporate

For the Image Services software, incorporate means to accept media created on another Image Services system. This media is managed as **"foreign media"**.

index

An index contains the information used for retrieving documents. All index information is stored in the index database and also on storage media in page zero of the document. The Image Services software looks in this database for index information to satisfy a retrieval query.

index database

The index database contains document and folder information. It is implemented as using a relational database management system (either Oracle, DB2®, or Microsoft® SQL Server™).

Insert - MSAR

When MSAR surfaces are inserted in a storage library they are inserted from the **"out_of_box directory"**. (The out_of_box directory is where surfaces are placed when they are ejected.) Either a link

file or data file can be inserted. See **"link (.lnk) file"** or **"data (.dat) file"**.

Insert - optical

Before a storage library can use an optical surface, it must be inserted. When there is space available in the library, the user can insert blank or written optical media at will. When the system needs blank media to write documents or needs to retrieve documents from previously ejected media, it will request that the operator insert the needed media.

Jukebox

A jukebox is a device that holds optical media in storage slots and has one or more drives for reading and writing the media surfaces. A jukebox can swap media in and out of the drive as needed. It will also have a mail slot through which it can accept media from an operator or return disks no longer needed.

link (.lnk) file

The link (.lnk) file is created, with the MSAR surface ID, in the **"out_of_box directory"** when an MSAR surface is ejected. The .lnk file contains the location of the **"data (.dat) file"**, unless the .dat file was moved after it was ejected from an MSAR storage library. If the surface was not moved after it was ejected, the link file is usually used when re-inserting a surface.

locked object

Images not yet written to storage media are "locked" in cache and cannot be aged out (for example, deleted or moved). In a system without a storage library, all documents are locked objects in page cache.

magnetic disk

Usually an internal hard disk on your system where the Image Services software, cache, databases, and MSAR storage library images are stored.

magnetic disk cache

See **"cache"**.

media

Media is any material on which data is stored (magnetic disk, optical disk, magnetic tape).

media family

The media family defines what type of storage media a document class uses. In general, the media family controls which media surfaces will be used by the document classes that use the family. Primary and tranlog are the two types of media families.

media type - MSAR

MSAR surfaces are physically stored as files in a file system and, unlike optical media, are always considered one-sided. The MSAR media type is associated with the media capacity. MSAR supports 1GB, 2GB, 4GB, 8GB, 16GB, and 32GB media types. In all supported media types, 1K sector sizes are used for MSAR surfaces.

media type - optical

Media type is a combination of the media's physical (footprint) size, capacity, and capability (write-once, or re-writeable), for example, 5.25" 2.5 Gb, re-writeable.

Migration

Migration is the process of writing documents from page cache to the storage library. It can also be used to describe the retrieval of documents from the storage library back into page cache.

MKF (multi-keyed file)

The MKF stands for multi-keyed file databases. They include the transient database, the permanent database, the NCH database, and the security database.

MSAR

Magnetic Storage and Retrieval library. This is a term for utilizing available magnetic storage for Image Services documents and treating this space as a storage library.

MSAR Creation Directory

The MSAR Creation Directory is where all new MSAR surfaces are created and stored. Each MSAR storage library has one creation directory for storing newly created surfaces. This directory is also referred to as the MSAR Surface Creation Directory.

NAS (Network Attached Storage)

A specialized file server that connects to the network. It uses traditional LAN protocols such as Ethernet and TCP/IP and processes only file I/O requests such as NFS (UNIX) and CIFS.

NCH (network clearinghouse)

The NCH (network clearinghouse) is an **"MKF (multi-keyed file)"** database that keeps track of resources and their addresses. A resource (such as a user ID or a printer) is identified by a three-part name stored in the NCH database.

network clearinghouse
See **"NCH (network clearinghouse)"** .

NFS (Network File System)
NFS provides similar functionality as **"CIFS (Common Internet File System)"** and allows clients to mount disk partitions that reside on remote servers. NFS is the common protocol used between UNIX system connections and was originally developed by Sun Microsystems. NFS is stateless and allows servers to be rebooted without crashing any clients. Details on the NFS protocol can be found at the **Sun Microsystems** web site.

optical disk media
An optical disk media is a high-capacity, removable storage device that uses laser technology to store data. Optical disk media accepts and retains information in the form of marks in a recording layer that a laser beam can read.

OSAR
OSAR is an acronym for an Image Services proprietary Optical Storage and Retrieval unit. An OSAR is a type of storage library.

out_of_box directory
The out_of_box directory is a special directory that is created for each MSAR Storage Library Server under the general Image Services directory structure. Whenever an MSAR surface is ejected, a link file with the same name (but with a .lnk extension) is placed in the out_of_box directory. The link file contains the absolute path of the original data file and can be used to locate that file (for example, when doing an Insert operation).

page cache

Page cache, also known as retrieval cache, is a cache containing all documents being committed to or retrieved from storage media. Page cache is an ageable cache, meaning that documents not locked can be deleted if needed to make room for newer documents.

permanent database

The permanent database stores the media location of each document entered into the system and contains tables for media surfaces, media families, and notes. See **"database"**, MKF.

primary family

A collection of media that stores documents from one or more document classes. Before you can complete the definition of a document class, you must assign it to a media family so the system knows where to store the documents in that class. You can also create a primary family to be used exclusively for archiving the index and permanent databases.

RAID

An industry-standard acronym for Redundant Array of Independent Disks. RAID is a hardware and operating system software implementation of data protection through simultaneous duplication of data on multiple identical disks.

Root/Index server

The server that checks security, locates devices, and manages the index database. On large systems, you can separate root functions (security checking and device location) and index functions from

storage library functions by setting up separate servers for each function.

restore

The act of using a Backup of the system data to replace the current, probably damaged data files in an effort to return the system to a known-working state.

RSVP message

An RSVP message requires the operator to respond and perform some action, such as loading storage media. RSVPs are displayed by the **"SLC (Storage Library Control)"** UI program.

SAN (Storage Area Network)

A relatively new concept in mass storage. Very large amounts of storage independently managed for access by many different users across a network.

server

A server is a station that provides a service in the FileNet system. Types of servers include root server, index server, batch entry server, storage library server, and application server. See also, **"Root/Index server"**.

SLC (Storage Library Control)

SLC is an Image Services application that monitors the status of storage libraries on the server where SLC is running and provides messages about the media. SLC also provides status information, reports, and a user interface to initiate such actions as enabling or disabling drives, pre-formatting media, and so on.

slot

A slot is a storage area for media in an optical storage library. In an MSAR storage library system, a virtual slot is used to represent a place for an MSAR surface when it is in the library.

SSN (System Serial Number)

When installing new Image Services systems, you are now required to construct your own ten-digit SSNs using any combination of numeric digits that you choose. This identifier is vital to Image Services, as the SSN is included in the metadata of each committed record. Each IS system must have its own unique SSN to configure peer systems in a cross-system committal environment, and to prevent potential problems if media are ever transferred from one IS system to another.

storage library - MSAR

A storage library that usually uses magnetic disk media instead of using optical media or large magnetic disk caches (cache-only systems) to store data. However, it also supports more than just magnetic disk drives, for example, an **"HSM (Hierarchical Storage Manager)"** file system which stores data on tape, writable DVD, and magnetic disk drives.

The MSAR storage library uses virtual slots and drives that function similarly to optical storage libraries. Each MSAR storage library has 1 **"MSAR Creation Directory"** that is used to store newly created MSAR surfaces.

storage library - optical

A storage library that uses optical media to store data. It often uses a storage media jukebox, a unit that has a number of slots for containing storage media and a robotic arm that moves the media between slots, drives, and the input/output slot.

storage library server

In a system with two Image Services servers, the second server manages the storage libraries and includes cache storage as well as the related databases.

A system can have multiple storage library servers, each of which can manage up to 8 storage libraries. Up to 64 storage library servers can be configured on one IS domain/system. In a system with multiple storage library servers, one serves as the document locator server that keeps track of the contents of all storage libraries.

storage media

See **"media"**.

surface

For an optical system, this is one side of an optical disk. For an MSAR system it is a single file on magnetic storage.

surface ID

An Image Services assigned unique number by which a surface is tracked.

surface label

See **"volume label"**.

synchronized

A condition in which certain FileNet datasets are updated to exactly the same point in time. This is also known as datasets being "in sync."

system - Image Services

A FileNet Image Services server, or multiple servers, in its own domain is often referred to as a system.

tranlog (or transaction log)

The Image Services system is configured to write one or more extra copies of committed documents to transaction log media. A media family can be configured to be a tranlog family. A primary family can be configured to use a tranlog family. Tranlogs, when they exist, are always written before the primary.

transient database

A directory of documents, images, cache space information, and other cache objects which is constantly changing. The transient database tracks work in progress, including the status of batches, requests to read and write media, migrate documents to storage libraries, and print requests.

unlabeled MSAR surfaces

When a new current write surface is needed, an unlabeled MSAR surface is created in an empty slot. An unlabeled MSAR surface is unique in that no MSAR surface file has yet been created. In addition, unlabeled MSAR surfaces cannot be ejected.

When an unlabeled surface is put into an MSAR drive, the surface file is created and a volume label is written on the surface file.

volume label

Written to a surface to provide identifying information to the Image Services system, particularly the surface ID number.

Notices

This information was developed for products and services offered in the U.S.A.

IBM may not offer the products, services, or features discussed in this document in other countries. Consult your local IBM representative for information on the products and services currently available in your area. Any reference to an IBM product, program, or service is not intended to state or imply that only that IBM product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any IBM intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any non-IBM product, program, or service.

IBM may have patents or pending patent applications covering subject matter described in this document. The furnishing of this document does not grant you any license to these patents. You can send license inquiries, in writing, to:

IBM Director of Licensing
IBM Corporation
North Castle Drive Armonk, NY 10504-1785
U.S.A.

For license inquiries regarding double-byte (DBCS) information, contact the IBM Intellectual Property Department in your country or send inquiries, in writing, to:

IBM World Trade Asia Corporation
Licensing

2-31 Roppongi 3-chome, Minato-ku
Tokyo 106-0032, Japan

The following paragraph does not apply to the United Kingdom or any other country where such provisions are inconsistent with local law: INTERNATIONAL BUSINESS MACHINES CORPORATION PROVIDES THIS PUBLICATION "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF NON-INFRINGE-MENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Some states do not allow disclaimer of express or implied warranties in certain transactions, therefore, this statement may not apply to you.

This information could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. IBM may make improvements and/or changes in the product(s) and/or the program(s) described in this publication at any time without notice.

Any references in this information to non-IBM Web sites are provided for convenience only and do not in any manner serve as an endorse-ment of those Web sites. The materials at those Web sites are not part of the materials for this IBM product and use of those Web sites is at your own risk.

IBM may use or distribute any of the information you supply in any way it believes appropriate without incurring any obligation to you.

Licensees of this program who wish to have information about it for the purpose of enabling: (i) the exchange of information between indepen-dently created programs and other programs (including this one) and

(ii) the mutual use of the information which has been exchanged, should contact:

IBM Corporation
J46A/G4
555 Bailey Avenue
San Jose, CA 95141-1003
U.S.A.

Such information may be available, subject to appropriate terms and conditions, including in some cases, payment of a fee.

The licensed program described in this document and all licensed material available for it are provided by IBM under terms of the IBM Customer Agreement, IBM International Program License Agreement or any equivalent agreement between us.

Any performance data contained herein was determined in a controlled environment. Therefore, the results obtained in other operating environments may vary significantly. Some measurements may have been made on development-level systems and there is no guarantee that these measurements will be the same on generally available systems. Furthermore, some measurements may have been estimated through extrapolation. Actual results may vary. Users of this document should verify the applicable data for their specific environment.

Information concerning non-IBM products was obtained from the suppliers of those products, their published announcements or other publicly available sources. IBM has not tested those products and cannot confirm the accuracy of performance, compatibility or any other claims related to non-IBM products. Questions on the capabilities of non-IBM products should be addressed to the suppliers of those products.

All statements regarding IBM's future direction or intent are subject to change or withdrawal without notice, and represent goals and objectives only.

This information contains examples of data and reports used in daily business operations. To illustrate them as completely as possible, the examples include the names of individuals, companies, brands, and products. All of these names are fictitious and any similarity to the names and addresses used by an actual business enterprise is entirely coincidental.

COPYRIGHT LICENSE:

This information contains sample application programs in source language, which illustrate programming techniques on various operating platforms. You may copy, modify, and distribute these sample programs in any form without payment to IBM, for the purposes of developing, using, marketing or distributing application programs conforming to the application programming interface for the operating platform for which the sample programs are written. These examples have not been thoroughly tested under all conditions. IBM, therefore, cannot guarantee or imply reliability, serviceability, or function of these programs.

Trademarks

IBM, the IBM logo, and ibm.com are trademarks or registered trademarks of International Business Machines Corporation in the United States, other countries, or both. If these and other IBM trademarked terms are marked on their first occurrence in this information with a trademark symbol (® or ™), these symbols indicate U.S. registered or common law trademarks owned by IBM at the time this information was published. Such trademarks may also be registered or common law trademarks in other countries. A current list of IBM trademarks is

available on the Web at "Copyright and trademark information" at **www.ibm.com/legal/copytrade.shtml**.

Microsoft and Windows are trademarks of Microsoft Corporation in the United States, other countries, or both.

UNIX is a registered trademark of The Open Group in the United States and other countries.

Other company, product, and service names may be trademarks or service marks of others.

U.S. Patents Disclosure

This product incorporates technology covered by one or more of the following patents: U.S. Patent Numbers: 6,094,505; 5,768,416; 5,625,465; 5,369,508; 5,258,855.

IBM ®

Program Number: 5724-R95

Printed in USA