



Problem Determination Guide



Problem Determination Guide

Note

Before using this information and the product it supports, read the information in “Notices” on page 235.

This edition applies to Version 6.1 of IBM Tivoli Storage Manager and to all subsequent releases and modifications until otherwise indicated in new editions or technical newsletters.

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Preface

This publication helps you determine the source of problems with the servers and clients in your IBM® Tivoli® Storage Manager environment.

Before using this publication, you should be familiar with the following areas:

- The operating systems on which your Tivoli Storage Manager servers and clients reside
- The communication protocols installed on your client and server computers

Who should read this guide

This guide was written for anyone administering or managing Tivoli Storage Manager. Similarly, information provided by this guide might be useful to business partners and anyone with the responsibility to support Tivoli Storage Manager.

You should be familiar with the Tivoli Storage Manager and the operating systems used for the configured Tivoli Storage Manager environment.

This document references error logs, trace facilities, and other diagnostic information for the Tivoli Storage Manager. These trace facilities and diagnostic tools are not a programming interface for the product. The Tivoli Storage Manager product development and support use these tools for diagnosing and debugging problems. For this guide, these are provided only to aid in diagnosing and debugging any problems. Trace facilities are subject to change without notice and might vary depending upon the version and release of the product or the platform on which the product is being run. Information referenced within this guide might not be supported or applicable to all versions or releases of the product. Changes are periodically made to the information herein. IBM might make improvements and changes in the products and the programs described in this publication at any time without notice.

Publications

Tivoli Storage Manager publications and other related publications are available online.

You can search all publications in the Tivoli Storage Manager Information Center: <http://publib.boulder.ibm.com/infocenter/tsminfo/v6>.

You can download PDF versions of publications from the Tivoli Storage Manager Information Center or from the IBM Publications Center at <http://www.ibm.com/shop/publications/order/>.

You can also order some related publications from the IBM Publications Center Web site. The Web site provides information for ordering publications from countries other than the United States. In the United States, you can order publications by calling 800-879-2755.

Tivoli Storage Manager publications

Publications are available for the server, storage agent, client, and Data Protection.

Table 1. Tivoli Storage Manager server publications

| Publication title | Order number |
|--|---------------------|
| <i>IBM Tivoli Storage Manager Messages</i> | GC23-9787 |
| <i>IBM Tivoli Storage Manager Performance Tuning Guide</i> | GC23-9788 |
| <i>IBM Tivoli Storage Manager Problem Determination Guide</i> | GC23-9789 |
| <i>IBM Tivoli Storage Manager for AIX Installation Guide</i> | GC23-9781 |
| <i>IBM Tivoli Storage Manager for AIX Administrator's Guide</i> | SC23-9769 |
| <i>IBM Tivoli Storage Manager for AIX Administrator's Reference</i> | SC23-9775 |
| <i>IBM Tivoli Storage Manager for HP-UX Installation Guide</i> | GC23-9782 |
| <i>IBM Tivoli Storage Manager for HP-UX Administrator's Guide</i> | SC23-9770 |
| <i>IBM Tivoli Storage Manager for HP-UX Administrator's Reference</i> | SC23-9776 |
| <i>IBM Tivoli Storage Manager for Linux Installation Guide</i> | GC23-9783 |
| <i>IBM Tivoli Storage Manager for Linux Administrator's Guide</i> | SC23-9771 |
| <i>IBM Tivoli Storage Manager for Linux Administrator's Reference</i> | SC23-9777 |
| <i>IBM Tivoli Storage Manager for Sun Solaris Installation Guide</i> | GC23-9784 |
| <i>IBM Tivoli Storage Manager for Sun Solaris Administrator's Guide</i> | SC23-9772 |
| <i>IBM Tivoli Storage Manager for Sun Solaris Administrator's Reference</i> | SC23-9778 |
| <i>IBM Tivoli Storage Manager for Windows Installation Guide</i> | GC23-9785 |
| <i>IBM Tivoli Storage Manager for Windows Administrator's Guide</i> | SC23-9773 |
| <i>IBM Tivoli Storage Manager for Windows Administrator's Reference</i> | SC23-9779 |
| <i>IBM Tivoli Storage Manager Server Upgrade Guide</i> | SC23-9554 |
| <i>IBM Tivoli Storage Manager for System Backup and Recovery Installation and User's Guide</i> | SC32-6543 |

Table 2. Tivoli Storage Manager storage agent publications

| Publication title | Order number |
|--|---------------------|
| <i>IBM Tivoli Storage Manager for SAN for AIX Storage Agent User's Guide</i> | SC23-9797 |
| <i>IBM Tivoli Storage Manager for SAN for HP-UX Storage Agent User's Guide</i> | SC23-9798 |
| <i>IBM Tivoli Storage Manager for SAN for Linux Storage Agent User's Guide</i> | SC23-9799 |
| <i>IBM Tivoli Storage Manager for SAN for Sun Solaris Storage Agent User's Guide</i> | SC23-9800 |
| <i>IBM Tivoli Storage Manager for SAN for Windows Storage Agent User's Guide</i> | SC23-9553 |

Table 3. Tivoli Storage Manager client publications

| Publication title | Order number |
|--|---------------------|
| <i>IBM Tivoli Storage Manager for UNIX and Linux: Backup-Archive Clients Installation and User's Guide</i> | SC23-9791 |

Table 3. Tivoli Storage Manager client publications (continued)

| Publication title | Order number |
|---|---------------------|
| <i>IBM Tivoli Storage Manager for Windows: Backup-Archive Clients Installation and User's Guide</i> | SC23-9792 |
| <i>IBM Tivoli Storage Manager for Space Management for UNIX and Linux: User's Guide</i> | SC23-9794 |
| <i>IBM Tivoli Storage Manager for HSM for Windows Administration Guide</i> | SC23-9795 |
| <i>IBM Tivoli Storage Manager Using the Application Program Interface</i> | SC23-9793 |
| <i>Program Directory for IBM Tivoli Storage Manager z/OS Edition Backup-Archive Client</i> | GI11-8912 |
| <i>Program Directory for IBM Tivoli Storage Manager z/OS Edition Application Program Interface</i> | GI11-8911 |

Table 4. Tivoli Storage Manager Data Protection publications

| Publication title | Order number |
|--|---------------------|
| <i>IBM Tivoli Storage Manager for Advanced Copy Services: Data Protection for Snapshot Devices Installation and User's Guide</i> | SC33-8331 |
| <i>IBM Tivoli Storage Manager for Databases: Data Protection for Microsoft SQL Server Installation and User's Guide</i> | SC32-9059 |
| <i>IBM Tivoli Storage Manager for Databases: Data Protection for Oracle for UNIX and Linux Installation and User's Guide</i> | SC32-9064 |
| <i>IBM Tivoli Storage Manager for Databases: Data Protection for Oracle for Windows Installation and User's Guide</i> | SC32-9065 |
| <i>IBM Tivoli Storage Manager for Enterprise Resource Planning: Data Protection for SAP Installation and User's Guide for DB2</i> | SC33-6341 |
| <i>IBM Tivoli Storage Manager for Enterprise Resource Planning: Data Protection for SAP Installation and User's Guide for Oracle</i> | SC33-6340 |
| <i>IBM Tivoli Storage Manager for Mail: Data Protection for Lotus Domino for UNIX, Linux, and OS/400 Installation and User's Guide</i> | SC32-9056 |
| <i>IBM Tivoli Storage Manager for Mail: Data Protection for Lotus Domino for Windows Installation and User's Guide</i> | SC32-9057 |
| <i>IBM Tivoli Storage Manager for Mail: Data Protection for Microsoft Exchange Server Installation and User's Guide</i> | SC23-9796 |
| <i>Program Directory for IBM Tivoli Storage Manager for Mail (Data Protection for Lotus Domino)</i> | GI11-8909 |

Support information

You can find support information for IBM products from a variety of sources.

Getting technical training

Information about Tivoli technical training courses is available online.

Go to <http://www.ibm.com/software/tivoli/education/>.

Searching knowledge bases

If you have a problem with Tivoli Storage Manager, there are several knowledge bases that you can search.

You can begin with the Tivoli Storage Manager Information Center at <http://publib.boulder.ibm.com/infocenter/tsminfo/v6>. From this Web site, you can search all Tivoli Storage Manager publications.

Searching the Internet

If you cannot find an answer to your question in the Tivoli Storage Manager information center, search the Internet for the latest, most complete information that might help you resolve your problem.

To search multiple Internet resources, go to the support Web site for Tivoli Storage Manager at <http://www.ibm.com/software/sysmgmt/products/support/IBMTivoliStorageManager.html>. From there, you can search a variety of resources including:

- IBM technotes
- IBM downloads
- IBM Redbooks®

If you still cannot find the solution to the problem, you can search forums and newsgroups on the Internet for the latest information that might help you resolve your problem. To share your experiences and learn from others in the user community, go to the Tivoli Storage Manager wiki at <http://www.ibm.com/developerworks/wikis/display/tivolistoragemanager/Home>.

Using IBM Support Assistant

At no additional cost, you can install on any workstation the IBM Support Assistant, a stand-alone application. You can then enhance the application by installing product-specific plug-in modules for the IBM products that you use.

The IBM Support Assistant helps you gather support information when you need to open a problem management record (PMR), which you can then use to track the problem. The product-specific plug-in modules provide you with the following resources:

- Support links
- Education links
- Ability to submit problem management reports

For more information, see the IBM Support Assistant Web site at <http://www.ibm.com/software/support/isa/>.

Finding product fixes

A product fix to resolve your problem might be available from the IBM Software Support Web site.

You can determine what fixes are available by checking the Web site:

1. Go to the IBM Software Support Web site at <http://www.ibm.com/software/tivoli/products/storage-mgr/product-links.html>.
2. Click the **Support Pages** link for your Tivoli Storage Manager product.
3. Click **Download**, and then click **Fixes by version**.

Getting e-mail notification of product fixes

You can get notifications about fixes and other news about IBM products.

To receive weekly e-mail notifications about fixes and other news about IBM products, follow these steps:

1. From the support page for any IBM product, click **My support** in the upper-right corner of the page.
2. If you have already registered, skip to the next step. If you have not registered, click **Register** in the upper-right corner of the support page to establish your user ID and password.
3. Sign in to **My support**.
4. On the My support page, click **Edit profiles** in the left navigation pane, and scroll to **Select Mail Preferences**. Select a product family and check the appropriate boxes for the type of information you want.
5. Click **Submit**.
6. For e-mail notification for other products, repeat steps 4 and 5.

Contacting IBM Software Support

You can contact IBM Software Support if you have an active IBM software maintenance contract and if you are authorized to submit problems to IBM.

Before you contact IBM Software Support, follow these steps:

1. Set up a software maintenance contract.
2. Determine the business impact of your problem.
3. Describe your problem and gather background information.

Then see “Submit the problem to IBM Software Support” on page xiii for information on contacting IBM Software Support.

Setting up a software maintenance contract

Set up a software maintenance contract. The type of contract that you need depends on the type of product you have.

- For IBM distributed software products (including, but not limited to, Tivoli, Lotus®, and Rational® products, as well as IBM DB2® and IBM WebSphere® products that run on Microsoft® Windows® or UNIX® operating systems), enroll in IBM Passport Advantage® in one of the following ways:
 - **Online:** Go to the Passport Advantage Web page at <http://www.ibm.com/software/lotus/passportadvantage/>, click **How to enroll**, and follow the instructions.
 - **By Phone:** For the phone number to call in your country, go to the IBM Software Support Handbook Web page at <http://www14.software.ibm.com/webapp/set2/sas/f/handbook/home.html> and click **Contacts**.

- For server software products, you can purchase a software maintenance agreement by working directly with an IBM sales representative or an IBM Business Partner. For more information about support for server software products, go to the IBM Technical support advantage Web page at <http://www.ibm.com/servers/>.

If you are not sure what type of software maintenance contract you need, call 1-800-IBMSERV (1-800-426-7378) in the United States. For a list of telephone numbers of people who provide support for your location, go to the Software Support Handbook page at <http://www14.software.ibm.com/webapp/set2/sas/f/handbook/home.html>.

Determine the business impact

When you report a problem to IBM, you are asked to supply a severity level. Therefore, you need to understand and assess the business impact of the problem you are reporting.

| | |
|-------------------|--|
| Severity 1 | Critical business impact: You are unable to use the program, resulting in a critical impact on operations. This condition requires an immediate solution. |
| Severity 2 | Significant business impact: The program is usable but is severely limited. |
| Severity 3 | Some business impact: The program is usable with less significant features (not critical to operations) unavailable. |
| Severity 4 | Minimal business impact: The problem causes little impact on operations, or a reasonable circumvention to the problem has been implemented. |

Describe the problem and gather background information

When explaining a problem to IBM, it is helpful to be as specific as possible. Include all relevant background information so that IBM Software Support specialists can help you solve the problem efficiently.

To save time, know the answers to these questions:

- What software versions were you running when the problem occurred?
- Do you have logs, traces, and messages that are related to the problem symptoms? IBM Software Support is likely to ask for this information.
- Can the problem be recreated? If so, what steps led to the failure?
- Have any changes been made to the system? For example, hardware, operating system, networking software, and so on.
- Are you currently using a workaround for this problem? If so, be prepared to explain it when you report the problem.

Submit the problem to IBM Software Support

You can submit the problem to IBM Software Support online or by phone.

Online

Go to the IBM Software Support Web site at <http://www.ibm.com/software/support/probsub.html>. Enter your information into the appropriate problem submission tool.

By phone

For the phone number to call in your country, go to the contacts page of the IBM Software Support Handbook at <http://www14.software.ibm.com/webapp/set2/sas/f/handbook/home.html>.

If the problem that you submit is for a software defect or for missing or inaccurate documentation, IBM Software Support creates an Authorized Program Analysis Report (APAR). The APAR describes the problem in detail. If a workaround is possible, IBM Software Support provides one for you to implement until the APAR is resolved and a fix is delivered. IBM publishes resolved APARs on the Tivoli Storage Manager product support Web site at <http://www.ibm.com/software/sysmgmt/products/support/IBMTivoliStorageManager.html>, so that users who experience the same problem can benefit from the same resolutions.

New in V6.1

Version 6.1 includes many new features. The most significant change is to the server database, which is DB2.

New for the server in Version 6.1.2

Server fix pack 6.1.2 contains several new features, in addition to fixes for problems.

Enabled functions

Functions that were disabled in Tivoli Storage Manager V6.1.0 and V6.1.1 are now enabled in Version 6.1.2.

Until Tivoli Storage Manager V6.1.2, a database that contained backup sets or tables of contents (TOCs) could not be upgraded to V6. These restrictions no longer exist.

In addition, the following commands have been enabled in Version 6.1.2:

- BACKUP NAS client command if the TOC parameter specifies PREFERRED or YES
- BACKUP NODE if the TOC parameter specifies PREFERRED or YES
- DEFINE BACKUPSET
- GENERATE BACKUPSET
- GENERATE BACKUPSETTOC

Licensing changes

Following the release of Tivoli Storage Manager Version 6.1.2, Tivoli Storage Manager Version 6.1.0 will no longer be available for download or purchase. Due to this unique circumstance, certain 6.1.2 packages will be available with a license module. See the following information for details on how this situation affects your environment.

Existing Version 6.1.0 and 6.1.1 users

If you have installed version 6.1.0 and are using a version 6.1.0 license, you can download the 6.1.2 package from the Service FTP site. You can install the 6.1.2 package using the instructions in Installing a Tivoli Storage Manager fix pack.

Version 5 users

If you have not yet installed a version of the V6.1 server, when you upgrade, you must upgrade directly to version 6.1.2. Version 6.1.2 is available with a license module from Passport Advantage or from your Tivoli Storage Manager sales representative. You can upgrade from V5 to V6.1.2 using the instructions in Upgrading the server.

New users

Version 6.1.2 is available from Passport Advantage or from your Tivoli Storage Manager sales representative. You can install version 6.1.2 using the instructions in Installing Tivoli Storage Manager.

ACSLS functionality for 64-bit Windows systems

Windows

Tivoli Storage Manager Version 6.1.0 requires the installation of StorageTek Library Attach software to utilize Sun StorageTek Automated Cartridge System Library Software (ACSLS) functions for the Windows operating system.

Support for ACSLS library functions is now available for both 32-bit and 64-bit Windows operating systems in fix pack level 6.1.2.

TSMDLST utility for AIX

AIX

The tsmdlst utility is now available for AIX® beginning in Tivoli Storage Manager fix pack level 6.1.2.

Use the tsmdlst utility to obtain information for AIX operating systems about medium-changer, tape, and optical devices controlled by the Tivoli Storage Manager device driver. With this utility you can obtain usage information, device names, serial numbers, and other device information.

Device support for AIX

AIX

The number of devices per driver is extended for AIX.

The Tivoli Storage Manager device driver can configure 1024 devices for each driver.

PREVIEW parameter for DSMSERV INSERTDB

A **PREVIEW** parameter is available for the DSMSERV INSERTDB utility in Tivoli Storage Manager fix pack level 6.1.2. The DSMSERV INSERTDB utility is used only as part of the process for upgrading a V5 Tivoli Storage Manager server to V6.1.

When you use the **PREVIEW=YES** parameter, the operation includes all the steps of the process, except for the actual insertion of data into the new database.

When you preview the insertion operation, you can quickly verify that the source database is readable. You can also identify any data constraint violations before you run the actual upgrade process for your server.

Replacement passthru device driver for HP-UX 11i 3 (IA64 only)

HP-UX

The V6.1.2 passthru driver for HP-UX 11i v3 IA64 replaces the V6.1 passthru driver for HP-UX 11i v3 IA64. The passthru driver in V6.1.2 lets you configure 32 LUNs for each port.

If you are using the passthru driver for the V6.1 version level, reconfigure existing devices using the autoconf configuration script after installing the Tivoli Storage Manager server. You must also load the escl, estape, eschgr, and esdisk drivers

into the HP-UX kernel. The passthru driver is packaged as part of the Tivoli Storage Manager server.

SAN discovery support for Linux on zSeries

Linux

Support for SAN discovery functions is now available for the Linux on zSeries operating system beginning in Tivoli Storage Manager fix pack level 6.1.2.

New server option SANDISCOVERYTIMEOUT

AIX

HP-UX

Linux

Solaris

A new server option is available for SAN discovery functions beginning in Tivoli Storage Manager fix pack level 6.1.2.

The SANDISCOVERYTIMEOUT option specifies the amount of time allowed for host bus adapters to respond when they are queried by the SAN discovery process.

New for the server in Version 6.1.0

Tivoli Storage Manager server version 6.1.0 contains many new features and changes.

Disabled functions in 6.1.0 and 6.1.1

Some functions have been disabled in Tivoli Storage Manager 6.1.0 and 6.1.1.

Note: The restrictions described here have been removed in Tivoli Storage Manager V6.1.2. If your server is at the V6.1.0 or V6.1.1 level, migrate to V6.1.2 to enable these functions.

A database containing backup sets or tables of contents (TOCs) cannot be upgraded to V6.1.0 or 6.1.1. The database upgrade utilities check for defined backup sets and existing TOCs. If either exists, the upgrade stops and a message is issued saying that the upgrade is not possible at the time. In addition, any operation on a V6.1 server that tries to create or load a TOC fails.

When support is restored by a future V6.1 fix pack, the database upgrade and all backup set and TOC operations will be fully enabled.

In the meantime, the following commands have been disabled:

- BACKUP NAS client command if the TOC parameter specifies PREFERRED or YES
- BACKUP NODE if the TOC parameter specifies PREFERRED or YES
- DEFINE BACKUPSET
- GENERATE BACKUPSET
- GENERATE BACKUPSETTOC

Changes to the Version 6.1 Administration Center

Many features in the Tivoli Storage Manager Administration Center Version 6.1 are new for previous users.

Updated Integrated Solutions Console

In V6.1, the Administration Center is hosted by the IBM Integrated Solutions Console (ISC) Advanced Edition Version 7.1. After installation of the Integrated Solutions Console installation completes, open a Web browser and enter the following URL, which will display the logon screen for the Integrated Solutions Console: `https://local_host:9043/ibm/console`. This screen indicates a successful installation of the Integrated Solutions Console.

To learn about console updates:

1. Start the ISC.
2. Click **Help** in the ISC banner.
3. In the Help navigation tree, click **Console Updates**.

Windows

WebSphere Windows service

In V6.1, the WebSphere Windows service is named TSM Administration Center - TsmAC.

Identify managing servers

The table of servers that is the hub of the enterprise-management work page has a column that identifies the managing server, if one exists, for each listed server. By sorting or filtering on the column, you can display the set of servers that are managed by a given server.

Hover help for table links

The Administration Center typically displays Tivoli Storage Manager objects in a table. In V6.1, when the cursor hovers over an object image, hover-help text is displayed. The hover help identifies the default action that results when you click the link that is associated with the object.

Links to information about server messages and Administration Center messages

When a problem or issue occurs with the server or Administration Center, you are immediately notified and provided with a brief message about the problem or issue. The message number is also provided. In V6.1, you can obtain detailed information about a message by clicking the link that is associated with the message number. The information is displayed in a new browser window.

Maintenance script enhancements

Tivoli Storage Manager utilizes a maintenance script to perform scheduled maintenance tasks. In V6.1, you can generate a maintenance script in one of two styles: predefined and custom.

A *predefined* maintenance script is one that is generated through a wizard. This script contains standard commands that cannot be altered. A predefined script can only be modified in the wizard.

A *custom* maintenance script is created using the Administration Center maintenance script editor. To have more control of your maintenance tasks, you can modify the commands that you specify. You can also use the editor to update your custom maintenance script.

Client nodes and backup sets enhancements

The redesigned Administration Center displays information about backup sets, client nodes, and client-node groups in one portlet. The design includes search functions that you can use to find and display information more quickly. When you select a client node, a summary panel is displayed with the current operation status, server actions, and client-node actions.

The work item **Client nodes and backup sets** appears in the ISC navigation tree.

Session and process information available in the health monitor

The Administration Center health monitor now includes information about server processes and sessions. The information is also available in the properties notebooks for servers.

Centralized server-connection management

In V6.1, server-connection tasks, such as adding a server connection, changing a password, and creating a server instance, are consolidated in a single location: the **Manage Servers** work item, located in the ISC navigation tree.

With actions available in this work item, you can quickly upload server-connection information to the Administration Center using an XML file. This file can optionally include a set of server credentials for multiple servers. To help create an XML file, you can download a list of server connections, without the credential information.

Changes to management-class activation

In the V6.1, Tivoli Storage Manager no longer activates changes to existing management classes automatically. You must activate the changes manually. Before the changes take effect, they are validated. Results of the validation are displayed. You or another administrator can review them, and then either confirm or cancel the activation.

Because changes are manually activated, you can prepare the management class in advance and activate the changes at an appropriate time.

Data deduplication

Data deduplication is a method of eliminating redundant data in sequential-access disk (FILE) primary, copy, and active-data storage pools. One unique instance of the data is retained on storage media, and redundant data is replaced with a pointer to the unique data copy. The goal of deduplication is to reduce the overall amount of time that is required to retrieve data by letting you store more data on disk, rather than on tape.

Data deduplication in Tivoli Storage Manager is a two-phase process. In the first phase, duplicate data is identified. During the second phase, duplicate data is removed by certain server processes, such as reclamation processing of storage-pool volumes. By default, a duplicate-identification process begins automatically after you define a storage pool for deduplication. (If you specify a duplicate-identification process when you update a storage pool, it also starts automatically.) Because duplication identification requires extra disk I/O and CPU resources, Tivoli Storage Manager lets you control when identification begins as well as the number and duration of processes.

You can deduplicate any type of data except encrypted data. You can deduplicate client backup and archive data, Tivoli Data Protection data, and so on. Tivoli Storage Manager can deduplicate whole files as well as files that are members of an aggregate. You can deduplicate data that has already been stored. No additional backup, archive, or migration is required.

For optimal efficiency when deduplicating, upgrade to the version 6.1 backup-archive client.

Restriction: You can use the data-deduplication feature with Tivoli Storage Manager Extended Edition only.

Storage devices

New device support and other changes to storage devices are available in Tivoli Storage Manager Version 6.1.

ACSLS functionality for Windows systems

Windows

Tivoli Storage Manager Version 6.1.0 requires the installation of StorageTek Library Attach software to utilize Sun StorageTek Automated Cartridge System Library Software (ACSLS) functions for the Windows operating system.

Support for ACSLS library functions is only available on 32-bit Windows operating systems in version 6.1.0.

Passthru device driver for HP-UX 11i v2 and v3 on the IA64 architecture

HP-UX

The HP-UX passthru device driver replaces the Tivoli Storage Manager device driver tsmcsi and is packaged as part of the Tivoli Storage Manager server. The passthru driver can be used with versions 2 and 3 of the HP-UX 11i operating system.

If you are running either of these versions, reconfigure existing devices using the autoconf configuration script after installing Tivoli Storage Manager.

Tips:

- The passthru driver, Tivoli Storage Manager server, and storage agent packages are available in 64-bit mode only.
- In V6.1, the passthru driver lets you configure eight LUNs for each port. The passthru driver in V6.1.2 lets you configure 32 LUNs for each port.

Support for HP and Quantum DAT160 drives and media

AIX

HP-UX

Linux

Solaris

Windows

With Tivoli Storage Manager, you can now use HP and Quantum DAT160 (DDS6) tape drives and media. New recording formats are available for the 4MM device type.

Support for Sun StorageTek T10000 drives, T10000B drives, and T10000 media

With Tivoli Storage Manager, you can now use Sun StorageTek T10000 drives, T10000B drives, and T10000 media. New recording formats are available for the ECARTRIDGE device type. Tivoli Storage Manager supports Volsafe media with the Sun StorageTek T10000 and T10000B drives.

Disaster recovery manager support for active-data pools

To restore your client systems more quickly and efficiently, you can now use active-data pools in your recovery plans and procedures.

Active-data pools are storage pools that contain only active versions of client backup data. Like copy storage pool volumes, disaster recovery manager lets you:

- Specify the names of active-data pool volumes to be managed by the disaster recovery manager.
- Recycle on-site and off-site active-data pool volumes according to server policies and processes.
- Include active-data pool volumes in the scripts, macros, and documentation that is part of the recovery plan file.
- Track and manage active-data pool media as required by your operations.

By default, active-data pools are not eligible for processing at the time of installation. Copy storage pools, on the other hand, are processed at installation time even if you have not explicitly specified a copy storage pool or pools to be managed.

EXPIRE INVENTORY command enhancements

The EXPIRE INVENTORY command is now enhanced with new functionality.

The additional parameters that you can now use are NODE, DOMAIN, TYPE, DURATION, AND RESOURCE. You can use these parameters to target specific client nodes and domains, and also to determine the type of data to be processed. You can use the RESOURCE parameter to specify the number of parallel processes that you want to run within the single EXPIRE INVENTORY process. You can run up to ten threads at one time, but if you are processing one node, only one thread is utilized.

No-query restore changes

The no-query restore (NQR) function and the internal algorithms responsible for NQR were changed to take advantage of DB2 capabilities and to improve performance.

The NQR function has been rewritten to resolve a performance problem encountered when restoring a small number of objects for a client file system with a large number of backup objects spread across a large number of Tivoli Storage Manager server storage pool volumes. NQR performance is now comparable to that of the classic restore under these conditions. NQR now performs a volume determination phase that must be completed before any objects are restored from DISK, FILE, or tape storage volumes.

Server database

Tivoli Storage Manager version 6.1 provides a new server database. Advantages include automatic statistics collection and database reorganization, full-function SQL queries, and elimination of the need for offline audits of the database.

Upgrading to V6.1 requires that data in a current Tivoli Storage Manager server database be extracted and then inserted into the new database structure. Tivoli Storage Manager provides utilities to perform the process.

Support for NetApp SnapMirror to Tape feature

AIX

HP-UX

Linux

Solaris

Windows

With Tivoli Storage Manager you can create SnapMirror to Tape images of file systems on NetApp file servers.

SnapMirror to Tape provides an alternative method for backing up very large NetApp file systems. Because this backup method has limitations, use this method when copying very large NetApp file systems to secondary storage for disaster recovery purposes.

Reporting and monitoring feature

The reporting and monitoring feature uses a combination of the Tivoli Common Reporting tool, IBM Tivoli Monitoring, and the IBM Tivoli Data Warehouse to offer you reports and real time monitoring information about Tivoli Storage Manager servers and client activity.

HP-UX

Installing the Tivoli Storage Manager reporting and monitoring feature directly on a Tivoli Storage Manager HP-UX server is not supported. You can monitor and report on HP-UX Tivoli Storage Manager servers by creating a monitoring agent instance for these servers on an AIX, Linux®, or Windows IBM Tivoli Monitoring server.

Solaris

Installing the Tivoli Storage Manager reporting and monitoring feature directly on a Tivoli Storage Manager Sun Solaris server is not supported. You can monitor and report on Sun Solaris Tivoli Storage Manager servers by creating a monitoring agent instance for these servers on an AIX, Linux, or Windows IBM Tivoli Monitoring server.

ODBC driver support

Tivoli Storage Manager Version 6.1 uses the DB2® open database connectivity (ODBC) driver to query the database and display the results.

The Tivoli Storage Manager ODBC driver is no longer supported with the server.

Backup sets and client node enhancements

The Administration Center now displays the backup sets, client nodes, and client node groups from one portlet.

You can view all of the client nodes, view them by server, or search for a node from the three available client node tabs. The All Client Nodes tab lists all of the nodes and has a Filter feature to help in your search. The filter works differently than the other table filters in the Administration Center, in that here you do not have to press the Enter key to get results. The search is initiated when you enter a text character in the filter field. As you add characters, the results are filtered even more.

When you select a client node, a summary panel is displayed with the current operation status, server actions, and client node actions. You can also access the Server Actions by right-clicking on the selected row.

The Search tab lets you refine your search parameters to include the server name, the client node name, policy domain name, and other fields that are available.

In the Client Node Groups section, you can find a client node group from the All Client Node Groups tab or from the By Server tab. You can use the filter and the right-click menu on these pages also.

Backup sets are found in the Backup Set Collections section. Search a server by selecting it and clicking **Update Table**.

Chapter 1. Resolving Tivoli Storage Manager client problems

If you are experiencing problems with a Tivoli Storage Manager client, there are several ways to resolve them.

Resolving problems with the client application can involve connecting to the server, changing policy settings, reproducing the error, or several other possible options.

Examining error messages

One way to resolve problems is to examine the error messages that are generated during operation.

The QUIET processing option for the Tivoli Storage Manager client suppresses all messages. Restart the client with the QUIET option turned off to allow all messages to be issued, which will provide a more complete understanding of the problem.

Check for any ANSnnnnx messages issued to the console, dsmsched.log, or dsmmerror.log. Additional information for ANSnnnnx messages is available in either the Tivoli Storage Manager Messages or from the client HELP facility.

Examining the server activity log messages

Check for server activity log using QUERY ACTLOG for messages issued for this Tivoli Storage Manager client session.

The messages from the server activity log might provide additional information about the symptoms for the problem or might provide information about the actual cause of the problem that the client encountered.

Identifying when and where the problem can occur

Problems with Tivoli Storage Manager client processing often occur only when you are performing specific operations, at certain times, or only on certain client computers.

To further isolate when and where a problem occurs, determine the following answers:

- Does this problem occur for a single client, some clients, or all clients for a given server?
- Does this problem occur for all clients running on a specific operating system?
- Does this problem occur for specific files, for files that are in a specific directory, for files on a specific drive, or for all files?
- Does this problem occur for clients on a specific network, subnet, or all parts of the network?
- Does this problem occur only for the command-line client, the GUI client, or the Web client?
- Does the Tivoli Storage Manager always fail when processing the same file or directory, or is it different from run to run?

Reproducing the problem

If the problem can be reproduced, try to minimize the circumstances under which it can occur.

You can help Tivoli Storage Manager support by minimizing the complexity of the environment in which you want to recreate the problem. The following options can be used to minimize the complexity of the environment:

- Use a minimal options file consisting of only TCPSERVERADDRESS, TCPPORT, and NODENAME.
- If the problem occurs for a file during incremental backup, try to reproduce the problem with a selective backup of just that file.
- If the problem occurs during a scheduled event, try to reproduce the problem by manually running the command.

Collecting documentation to resolve problems with the client application

The Tivoli Storage Manager client creates valuable information in a number of different sources. If any of the information in the documentation relates to your problem, provide it to support.

Tivoli Storage Manager client problems and configuration information might be found in one or more of the following documents:

- Error log. The client error log file is `dsmerror.log`.
- Scheduler log. The error log for the client scheduler is `dsmsched.log`.
- Web client log. The error log for the Web client is `dsmwebcl.log`.
- Options files. The client might use a combination of files for its configuration. These files are `dsm.opt`, `dsm.sys` for UNIX systems, and the include-exclude file.
- Trace data. If tracing was active, the file containing the trace data could be provided to support.
- Application dump. If the Tivoli Storage Manager client stops running, many platforms will generate an application dump. The operating system provides the application dump.
- Memory dump. If the Tivoli Storage Manager client stops, a memory dump can be generated that can then be used to help with diagnosis. The type of system determines how the memory dump occurs, and the operating system provides the memory dump.

The `DSMC QUERY SYSTEMINFO` command is available and will collect most of this information in the `dsminfo.txt` file. The following items can help you to determine Tivoli Storage Manager problems:

- A list of all the software installed on the client system. The client might experience problems due to interactions with other software on the computer or because of the maintenance levels of software that the client uses.
- Client option sets defined on the server that apply to this client node. Issue the `QUERY CLOPTSET` command to search for the client option sets.
- Server options. There are a number of server options that are used to manage the interaction between the client and server. An example of one such server option is `TXNGROUPMAX`.

- Information about this node as it is defined to the server. To collect this information, issue the `QUERY NODE nodeName F=D` command using an administrative client connected to the server.
- Schedule definitions for the schedules that apply to this node. These can be queried from the server using the `QUERY SCHEDULE` command.
- The policy information configured for this node on the IBM Tivoli Storage Manager server. This information can be queried from the server using the `QUERY DOMAIN`, `QUERY POLICYSET`, `QUERY MANAGEMENTCLASS`, and `QUERY COPYGROUP` commands.

Determining why the `dsmc/dsmadm/dsmj/...` will not start

Tivoli Storage Manager uses `dsmc/dsmadm/dsmj` in its startup procedures. The `dsmc/dsmadm/dsmj/...` occasionally will not start, keeping you from using Tivoli Storage Manager.

Processing stops and the following message is displayed if the `dsmc/dsmadm/dsmj/...` will not start:

```
ANS1398E Initialization functions cannot open one of the
Tivoli Storage Manager logs or a related file: /dsmerror.log. errno = 13,
The file access permissions do not allow the specified action.
```

Note: The `dsmerror.log` file is used only as an example file in the message.

Client applications will not run without a log to which you can write and the system will deny “write” access to the log file named in the message. If the log does not exist, it will be created with default permissions. The following rules apply:

- The name and the directory specified by the `ERRORLOGNAME` option are used.
- If the option is absent, the name `dsmerror.log` in the directory specified in the **DSM_LOG** environment variable, if present, is used. Otherwise, the name `dsmerror.log` in the current working directory is used.

The following issues are applicable if the default permissions are used:

- A log created by the root user might not be written to by any other user
- The root user must set the proper permissions or access control lists (ACLs) to allow free use of the client application by all users who need to use it

If the log is successfully created, an error-free session will leave a zero-length (empty) log file.

The Tivoli Storage Manager client does not try to create logs in the root directory. Message ANS1398E is displayed when the method in the first rule, above, directs the log file to be created in the root directory.

If a log file exists and can be located, Tivoli Storage Manager uses the method from the first rule. It can also be in the root directory if you so choose. Furthermore, whatever permissions you give that log file will be preserved by Tivoli Storage Manager code.

Create your log file in advance of first use, ensuring that all eligible users have write access to it. Define the `ERRORLOGNAME` option or the **DSM_DIR** environment variable to designate your predefined log file.

Attention: A system log error indicates that you cannot write to the dsmerror.log file. Certain background Tivoli Storage Manager applications might not start due to errors writing to dsmerror.log. When these errors occur, a number of errors are recorded in the Windows system event log ('system log' on other platforms).

For example:

C:\Program Files\Tivoli\Tsm\baclient>net start "TSM Sched"
The server scheduling service is starting.
The server scheduling service could not be started.
A service specific error occurred: 12.

Additional setup steps are required for non-root users in order for them to be able to run Tivoli Storage Manager applications or Tivoli Storage Manager for Data Protection applications. You will receive the ANS1398E error if you attempt to run Tivoli Storage Manager applications using an error log which has already been generated by root, that is left with default permissions. For data protection clients, you might only receive a Tivoli Storage Manager API error. Here is one method for setting up dsmerror.log for use by non-root users:

- 1. Set ERRORLOGNAME in dsm.sys. For example, errorLogName /var/mgs/tsm/dsmerror.log
- 2. Generate dsmerror.log. dsmc q sess
- 3. Modify the permissions on dsmerror.log to allow writing by all users. chmod 666 /var/mgs/tsm/dsmerror.log

Resolving problems with client option sets

With client option sets, administrators can specify additional options that might not be included in the client's option file. The client uses these options during a backup, archive, restore, or retrieve process.

An administrator for the Tivoli Storage Manager can create a set of client options to be used by a client node on Tivoli Storage Manager. The client options are defined on the Tivoli Storage Manager server. The client options specified in the client option set are used in conjunction with the client options file.

The order in which the options are processed can be controlled. Multiple options can be defined and assigned a sequence number, with these options then processed from low to high sequence. The following example displays the INCLEXCL options:

| Option | Sequence number | Override | Option Value |
|----------|-----------------|----------|-------------------------|
| ----- | ----- | ----- | ----- |
| INCLEXCL | 0 | No | exclude 'sys:\...*' |
| INCLEXCL | 1 | No | include 'sys:\system*' |
| INCLEXCL | 2 | No | include 'sys:\tmp*' |

This sequence results in the exclusion of all files on the Novell NetWare SYS while the files in the SYS:\SYSTEM* and SYS:\TMP* paths are backed up.

Using client option sets

There are several situations where you can use client option sets.

Tip: Trace settings for the client option sets are specified in the Tivoli Storage Manager option file for all clients.

The following scenarios describe how you can take advantage of the client option set.

In this scenario you have multiple NetWare servers and want to control the following options for backup:

- Want SYS: volume to be backed up.
- Want the Novell NetWare server which has the root level NDS to be backed up.
- Want all Tivoli Storage Manager NetWare clients to use standard display on client commands with "scrollines and scrollprompt." Using the scrollines and scrollprompt controls the display so that things do not scroll off of the screen.
- Want to exclude all license objects from NDS backup. License objects cannot be backed up or restored by Tivoli Storage Manager. The license must be reinstalled through Novell NetWare.

Remember: Domain and INCLEXCL options cannot use the force parameter. As a result, the client can override the client option set through the Tivoli Storage Manager option file.

Tivoli Storage Manager server command:

```
Define cloptset netware description="NetWare Server Option Sets"
Define clientopt netware domain sys:
Define clientopt netware domain nds:
Define clientopt netware scrollprompt yes
Define clientopt netware scrollline 20
Define clientopt netware inclexcl " exclude 'NDS:*License ID*' "
Update node mock cloptset=netware
```

In this scenario you have a critical environment and restoring is a high priority.

You want to use collocatebyfilespec so that all filespec data is stored on as few tapes as possible, which will enhance restore processing because fewer tape mounts are needed.

You do not want the client to be able to override this option. Tivoli Storage Manager server command:

```
Define cloptset crit_rest description="Critical Restore Option Sets"
Define clientopt crit_rest collocatebyfilespec yes force=yes
Update node dale cloptset=crit_rest
```

In this scenario you have workstations on a slow network with limited space on the Tivoli Storage Manager server for data. Use the compression option to limit the amount of data sent and stored.

Tivoli Storage Manager server command:

```
Define cloptset space_rest description="Space Restriction Option Sets"
Define clientopt space_rest compressalways no force=yes
Define clientopt space_rest compression yes force=yes
Update node mark cloptset=space_rest
```

In this scenario you use a database which cannot be stopped. Because the files are open, the server cannot back them up. You want to exclude all files and

subdirectories from Tivoli Storage Manager backups and add the files and subdirectories to the existing "space_rest" client option set. Use the EXCLUDE DIR command and specify the directory path to be excluded. Use the following Tivoli Storage Manager server command:

```
Define clientopt space_rest inclexcl "exclude.dir c:\notes\data"
```

In this scenario you have a fast network and want to make the best possible use of Tivoli Storage Manager client resources to complete backups. Set RESOURCEUTILIZATION to the maximum amount. Use the following Tivoli Storage Manager server command:

```
Define cloptset unix_srv description="UNIX Server Option Sets"  
Define clientopt unix_srv resourceutilization 10 force=yes
```

Resolving client authentication problems

There are three common errors that can occur in relation to your password or authentication method: authentication failure, login failure due to the NetWare target service agent, or login failure due to the NetWare file server.

Resolving password authentication problems

A client authentication error generally occurs when the password expires. It can also occur, however, if either the server or the client is renamed, or if the Tivoli Storage Manager administrative user identification password expires.

If you receive the ANS1025E error message during an interactive session, the probable cause is an incorrect password. You can change the password using either of the following two methods:

- The administrator can reset the node's password by issuing the UPDATE NODE command.
- You can issue a DSMC QUERY SESSION command and, when prompted, enter the new password.

If you receive the ANS1025E error message during a noninteractive session, such as central scheduling, ensure that the client option is PASSWORDACCESS GENERATE. This option causes the client to store the password locally. The password is encrypted and stored either in the registry for Windows clients or in a file named TSM.PWD for Macintosh, UNIX, and NetWare clients. You should not edit the registry or the TSM.PWD file. Instead, see the following actions:

- Ensure that PASSWORDACCESS GENERATE is set in the option file.
- Issue a DSMC QUERY SESSION command. This command will force-set the locally stored password.
- If the previous actions do not resolve the problem, update the node's password by issuing the UPDATE NODE administrative command.
- Reissue the DSMC QUERY SESSION command, providing the new password.

To see the password expiration setting for a particular node, issue the QUERY NODE F=D administrative command. Look for the *Password Expiration Period* field.

Important: If this field is blank, the default password expiration period of 90 days is in effect.

1. To change the password expiration period for a particular node, issue the administrative UPDATE NODE command with the option PASSEXP=*n*, where *n* is the number of days. A value of 0 will disable the password expiration.

If a Windows client node is unable to connect to the server after having been renamed, verify that the node name was changed in both the client options file and Windows registry. When the client scheduler runs as a foreground process using the DSMC SCHED command, Tivoli Storage Manager uses the nodename in the client options file to contact the server. However, when the scheduler runs as a Windows service, Tivoli Storage Manager uses the node name in the Windows registry instead.

2. Issue the DSMCUTIL UPDATE SCHEDULE command to achieve the following results:
 - With the *node* parameter, address how to change the nodename used with the Tivoli Storage Manager scheduler service on Windows
 - With the *validate:yes* parameter, contact the Tivoli Storage Manager server to authenticate (and store the updated password)

For more information, see the “Changing the processing options used by the scheduler service” section of the Windows Backup-Archive Clients Installation and User’s Guide.

Resolving NetWare login problems

The ANS1874E and ANS2025E messages indicate an authentication problem between the Tivoli Storage Manager NetWare client and the NetWare server. These messages usually occur when a login is denied to a NetWare target service agent or when a login failed to NetWare file server.

The most probable cause of this error is either not ensuring that the proper target service agent (TSA) is loaded, or not using the Novell distinguished name.

The password for the NetWare TSA is encrypted and stored in the same file that stores the Tivoli Storage Manager password. The process of storing the password in this file is not related to the client option PASSWORDACCESS GENERATE. If you do not want the password stored locally, enter the NWPWFILE NO option in the dsm.opt file.

Verify the following items:

- LOAD TSA for the target service agent file system (TSAFS), depending on the NetWare Operating System version.
- For NDS backups, LOAD TSANDS.
- Use the Novell typeful name. For example, instead of *Admin*, use *.CN=Admin.O=IBM*.
- Ensure that NWPWFILE YES (the default setting) is in the dsm.opt options file.
- Issue the DSMC QUERY TSA command to check to see if the Tivoli Storage Manager can connect to the file system TSA.
- Issue the DSMC QUERY TSA NDS command to check to see if the server can connect to the NDS TSA.

Tip: You can issue the DSMC QUERY TSA command to store the password in the local password file and also to test to see if the stored password is valid.

Check for the following items when experiencing NetWare login failures:

1. Determine if the NetWare userid was turned off.
2. Determine if the NetWare userid or password is not valid or expired.
3. Determine if the NetWare userid has inadequate security access.
4. Determine if the NetWare userid has insufficient rights to files and directories.

5. Determine if the NetWare userid that is specified has a login restriction based on time-of-day.
6. Determine if the NetWare userid that is specified has a Network address restriction.
7. Determine if the NetWare userid that is specified has a login restriction based on the number of concurrent connections.
8. Determine if NetWare is not allowing logins (DISABLE LOGIN was issued at the console).
9. Determine if the temporary files in "SYS:\SYSTEM\TSA" are corrupt, which can prevent logging in. Shut down all Tivoli Storage Manager processes and SMS modules and then either move or delete these temporary files. The following Novell TID reviews this issue: error: FFFDFFD7 when the tape software tries to login in order to backup nds
10. Determine if the storage management data requester (SMDR) configuration is corrupt. Reset the SMDR by issuing the following command: 'LOAD SMDR /NEW' at the NetWare console.
11. Determine if the message is displayed intermittently during a multiple session backup or restore. If the message is displayed, the probable cause is that there are not enough available Novell licenses. Each Tivoli Storage Manager session requires at least one licensed connection to the file server. Either add more NetWare licenses or reduce the RESOURCEUTILIZATION setting. The NetWare utility, Nwadm32, can be used to determine the current number of licenses.
12. Determine if the SYS volume has free space. A lack of free space can cause the authentication failure.

If the previously listed items have no adverse effect on the login, contact Novell for additional support to resolve this issue.

Resolving client scheduling problems

The Tivoli Storage Manager administrator can schedule the Tivoli Storage Manager to perform tasks automatically.

If you are experiencing problems with your client scheduler, the following diagnostic steps are available to help determine the cause of the problem:

- Changes to the Tivoli Storage Manager client options are not recognized by the client scheduler until the scheduler is restarted. Stop and restart the client scheduler.
- Use the SHOW PENDING diagnostic tool to display schedules, nodes, and when they should next run.
- View the dsm.sys stanza for the node and the MANAGEDSERVICES, PRESCHEDCMD, and POSTSCHEDCMD option values from the client options file for information when a node misses a scheduled event.

Determining the status of a scheduled event

The server maintains a record of all scheduled events, which is useful when managing Tivoli Storage Manager schedules on numerous client computers.

Perform the following steps to view the event records on a server:

1. Issue the QUERY EVENT command.
2. Issue the following query to view all of the event results for the previous day:
`query event * * begin=today-1 begint=00:00:00 endd=today-1 endt=23:59:59`
3. Issue the following query to limit the query results to exception cases:
`query event * * begin=today-1 begint=00:00:00 endd=today-1 endt=23:59:59
exceptiononly=yes`

The query results include a status field that gives a summary of the result for a specific event. By using the format=detailed option you can also see the result of an event that is the overall return code passed back by the Tivoli Storage Manager client. See Table 5 for the status and meaning of the event status codes that might exist for a scheduled event that has already taken place.

Table 5. Scheduled event status

| Event Status Codes | Explanation |
|--------------------|---|
| Completed | The scheduled client event ran to completion without a critical failure. There is a possibility that the event completed with some errors or warnings. Query the event with detailed format to inspect the event result for more information. The result can either be 0, 4, or 8. |
| Missed | The schedule start window has elapsed without action from the Tivoli Storage Manager client. Common explanations for this result include the schedule service not running on the client, or a previously scheduled event not completing for the same or a different schedule. |
| Started | Typically, this indicates that a scheduled event has begun processing. However, if an event showing a status of Started is followed by one or more Missed events, it is possible that the client scheduler encountered a stoppage while processing that event. One common cause for a stopped client schedule is the occurrence of a user interaction prompt such as a prompt for an encryption key that is not responded to. |
| Failed | The client event ran to completion; however, a critical failure occurred. |

Checking for errors in the server activity log

If a scheduled event is missed but other consecutive scheduled events for that node show a result of Completed, check for errors in the server activity log and the client schedule log for more information.

When checking the server activity log, narrow the query results down to the time frame surrounding the scheduled event. Begin the event log query at a time shortly before the start window of the scheduled event in question. For example, investigate the following suspect event:

Scheduled Start Actual Start Schedule Name Node Name Status

08/21/2003 08:27:33 HOURLY NODEA Missed

Afterwards you could issue one of the following queries:

```
query actlog begin=08/21/2003 begint=08:25:00
query actlog begin=08/21/2003 begint=08:25:00 originator=client node=nodea
```

The Tivoli Storage Manager client keeps a detailed log of all scheduled activities. Check the client's local schedule log if queries of the server's activity log cannot explain a failed scheduled event.

You must have access to the client computer in order to inspect the schedule log. The schedule log file is typically stored in the same directory as the `dsmerror.log` in a file named `dsmsched.log`. The location of the log file can be specified using client options, so you might need to refer to the options file to see if the `SCHEDLOGNAME` option was used to relocate the log file. On Windows, the schedule log can also be relocated by an option setting which is part of the schedule service definition. You can issue the `DSMCUTIL QUERY` command to check if this option has been set. When you locate the schedule log, search through the file to find the time period corresponding with the start date and time of the scheduled event in question. The following list displays what you might search:

- If you are investigating a missed event, check the details of the previous event, including the time at which the previous event completed.
- If you are investigating a failed event, look for error messages that explain the failure (such as the server session limit being exceeded).
- When an explanation is still not clear, the last place to check is the client's error log file (usually named `dsmerror.log`).

Starting and stopping the client service

To resolve client scheduling problems, you can opt for starting and stopping the client service.

Tip: When you manage a large number of clients running scheduler processes, you also might want to be able to start and stop the client service from a remote computer. The Tivoli Storage Manager client for Windows provides a utility to assist with remote management of the scheduler service. For other platforms, standard operating system utilities are required.

To remotely manage the Windows client scheduler service using `dsmcutil` with the `/computer:` option, you must have administrative rights in the domain of the target computer. To determine whether the scheduler service is running on a remote computer, check the "Current Status" field from a query similar to the following query:

```
dsmcutil query /name:"TSM Client Scheduler" /computer:ntserv1.ibm.com
```

Issue the following queries to restart a scheduler service that is missing schedules:

```
dsmcutil stop /name:"TSM Client Scheduler" /computer:ntserv1.ibm.com
dsmcutil start /name:"TSM Client Scheduler" /computer:ntserv1.ibm.com
```

Consequently, if you use the CAD to manage the scheduler, you might have to restart the CAD service or stop the scheduler service and restart the CAD service with the following queries:

```
dsmcutil query /name:"TSM Client Scheduler" /computer:ntserv1.ibm.com
dsmcutil query /name:"TSM Client Acceptor" /computer:ntserv1.ibm.com
dsmcutil stop /name:"TSM Client Scheduler" /computer:ntserv1.ibm.com
dsmcutil stop /name:"TSM Client Acceptor" /computer:ntserv1.ibm.com
dsmcutil start /name:"TSM Client Scheduler" /computer:ntserv1.ibm.com
dsmcutil start /name:"TSM Client Acceptor" /computer:ntserv1.ibm.com
```

For UNIX, you can write a shell script to search for and stop running Tivoli Storage Manager schedulers or client acceptor processes, and then restart the processes. Software products such as Symark's Power Broker allow Tivoli Storage Manager administrators limited access to UNIX servers for the purpose of managing the scheduler processes, and copying off the schedule log file.

The following shell script is an example of how to recycle the UNIX Tivoli Storage Manager scheduler process:

```
#!/bin/ksh
# Use the following script to kill the currently running instance
# of the TSM scheduler, and restart the scheduler in nohup mode.
#
# This script will not work properly if more than one scheduler
# process is running.
# If necessary, the following variables can be customized to allow an
# alternate options file to be used.
# export DSM_DIR=
# export DSM_CONFIG=
# export PATH=$PATH:$DSM_DIR
# Extract the PID for the running TSM Scheduler
PID=$(ps -ef | grep "dsmc sched" | grep -v "grep" | awk {'print $2'});
print "Original TSM scheduler process using PID=$PID"
# Kill the scheduler
kill -9 $PID
# Restart the scheduler with nohup, redirecting all output to NULL
# Output will still be logged in the dsmsched.log
nohup dsmc sched 2>&1 > /dev/null &
# Extract the PID for the running TSM Scheduler
PID=$(ps -ef | grep "dsmc sched" | grep -v "grep" | awk {'print $2'});
print "New TSM scheduler process using PID=$PID"
```

Resolving errors when including or excluding client files during backup processing

The include-exclude processing option impacts which files are sent to the server for a backup or archive operation. If you implicitly or explicitly indicate that a file should be included or excluded during backup processing and it was not processed correctly, there are several possible causes.

Identifying files that are included or excluded by the server client option set

The Tivoli Storage Manager administrator can include or exclude files on behalf of the client. Include or exclude statements that come from the server will override include and exclude statements entered in the local client option file.

Contact the Tivoli Storage Manager server administrator to correct the problem.

You can issue the Backup-Archive client DSMC QUERY INCLEXCL command to identify files that are included or excluded by the server client options set. The output from this command shows "Operating System" as the source file for files that have been automatically excluded from backup processing. In our example, the users indicate that they want all files that end with a ".o" extension to be included in the local options file, but the server sends the client an option to exclude all files that end with a ".o" extension. The server-provided option prevails.

```

tsm> q incl excl
*** FILE INCLUDE/EXCLUDE ***
Mode Function Pattern (match from top down) Source File
-----
Excl All /.../*.o Server
Incl All /.../*.o dsm.sys

```

Options that are passed to the Tivoli Storage Manager client from the Tivoli Storage Manager server are provided in groups, meaning that if the INCLUDE and EXCLUDE options are supported on the Tivoli Storage Manager server, that all INCLUDE options would be sent in a group and all EXCLUDE options would be sent in a group. You could not intermix these options to get desired results of including some files from excluded directories. Using the INCLEXCL option allows you to intermix and order the INCLUDE and EXCLUDE options.

Excluding files automatically from backup processing

Two reasons for the backup application to not back up some files might be that there are files that were identified by the operating system as not necessary for backup, or that there are files that the Tivoli Storage Manager uses for internal processing.

If these files must be included in the backup processing, Tivoli Storage Manager can include them by putting *INCLUDE* statements in the client options set on the server.

Important: Because these files were explicitly identified as files not being backed up, including them in the server client options set is not recommended.

Issue the Backup-Archive client's DSMC QUERY INCLEXCL command to identify these files. The output from this command shows "Operating System" as the source file for files that were automatically excluded from backup processing.

```

tsm> q incl excl
*** FILE INCLUDE/EXCLUDE ***
Mode Function Pattern (match from top down) Source File
-----
Excl All C:\WINDOWS\Registration\*.clb Operating System
Excl All C:\WINDOWS\netlogon.chg Operating System

```

See Table 6 for the files that are automatically excluded.

Table 6. Files automatically excluded during backup processing

| Platform | Files Excluded |
|-----------|--|
| Windows | <ul style="list-style-type: none"> Files enumerated in the HKLM\SYSTEM\CurrentControlSet\Control\BackupRestore\FilesNotToBackup registry key The client staging directory C:\ADSM.SYS RSM database files (these files are processed in the system object or system state backup) IIS metafiles (these files are processed in the system object or system state backup) Registry files (these files are processed in the system object or system state backup) Client trace file System files <p>Windows system files are silently excluded from the system drive backup processing and cannot be included.</p> <p>To process these Windows system files, you must issue a DSMC BACKUP SYSTEMOBJECT command (Windows 2000 and Windows XP) or a DSMC BACKUP SYSTEMSTATE command (Windows 2003 and Windows Vista).</p> <p>The Windows system files are excluded from the system drive backup processing because they are usually sent during the system object or system state backups. System files are boot files, catalog files, performance counters, and files protected by the Windows system file protection (sfp). These files will not be processed during backup of the system drive but are excluded from the system drive processing internally instead of relying on explicit exclude statements due to the sheer number of exclude statements that would be needed to represent all of these files. Backup performance can be adversely affected.</p> <p>You can issue the Backup-Archive client DSMC QUERY SYSTEMINFO command to identify the Windows system files. The output of this command is written to the dsminfo.txt file.</p> <p>(partial contents of the dsminfo.txt file)</p> <pre>===== SFP c:\windows\system32\ahui.exe (protected) c:\windows\system32\apphelp.dll (protected) c:\windows\apppatch\apphelp.sdb (protected) c:\windows\system32\asycfilt.dll (protected)</pre> |
| UNIX | Client trace file |
| NetWare | Client trace file |
| Macintosh | <ul style="list-style-type: none"> Volatile, temporary, and device files used by the operating system Client trace file |

Excluding files with the EXCLUDE.DIR statement

EXCLUDE.DIR statements exclude all directories and files under the parent directory.

If you want to include all files based on a file pattern, regardless of their location within a directory structure, do not use the EXCLUDE.DIR statements.

For example, consider this set of UNIX include-exclude statements:

```
exclude.dir /usr
include /.../*.o
```

The INCLUDE statement in this example indicates that all files with a “.o” extension should be included, but the preceding EXCLUDE.DIR statement will exclude all files in the /usr directory, even if they have a “.o” extension. This fact would be true, regardless of the order of the two statements.

If you want to back up all the files ending with “.o” use the following syntax:

```
exclude /usr/.../*
include /.../*.o
```

When using wildcards in include-exclude, use “*” if you want all the files rather than “*.*.*,” which means to include-exclude all files containing at least one dot (.) character, while * means to include-exclude all files. If you use “*.*”, files containing no dot characters (such as C:\MYDIR\MYFILE) will not be filtered.

If you want to perform a selective backup of a single file from the command-line client, it will not be affected by the EXCLUDE.DIR option.

If you issue a selective backup from the command-line client of a single file, the file is processed, even if there is an EXCLUDE.DIR statement which excludes one of the parent directories.

For example, consider the following UNIX include-exclude statement which is used in subsequent command-line actions:

```
exclude.dir /home/spike
```

The following selective backup will always result in the file being processed:

```
dsmc selective /home/spike/my.file
```

If you issue a selective backup using a wildcard, no files are processed because the directory is excluded:

```
dsmc selective "/home/spike/my.*"
```

Important: A subsequent incremental backup of the /home file system will inactivate the file “/home/spike/my.file.”

EXCLUDE.DIR statements should not be terminated with a directory delimiter.

The following examples show the incorrect EXCLUDE.DIR statements, due to a terminating directory delimiter:

```
exclude.dir /usr/ (UNIX)
exclude.dir c:\directory\ (Windows)
exclude.dir SYS:\PUBLIC\ (NetWare)
exclude.dir Panther\User: (Macintosh)
```


The following examples show the correct coding of EXCLUDE.DIR:

```
exclude.dir /usr (UNIX)
exclude.dir c:\directory (Windows)
exclude.dir SYS:\PUBLIC (NetWare)
exclude.dir Panther:User (Macintosh)
```

Determining if compression, encryption, and subfile backup statements include or exclude

Include and exclude statements for compression (INCLUDE.COMPRESS), encryption (INCLUDE.ENCRYPT), and subfile backup (INCLUDE.SUBFILE) do not imply that the file will be included for backup processing.

You can use the INCLUDE and EXCLUDE statements in combination with the COMPRESS, ENCRYPT, and SUBFILE statements to produce your desired results. Consider the following UNIX example:

```
exclude /usr/file.o
include.compress /usr/*.o
```

This statement indicates that the /usr/file.o file is excluded from backup processing. The INCLUDE.COMPRESS statement indicates that “if a file is a candidate for backup processing and matches the pattern /usr/*.o; then compress the file.” The INCLUDE.COMPRESS statement should not be interpreted as “backup all files that match the pattern /usr/*.o and compress them.” If you want to back up the /usr/file.o file in this example, you must remove the exclude statement.

Using delimiters to include or exclude files

A platform-specific INCLUDE or EXCLUDE statement contains syntax for “everything” and “all files under a specific directory.”

If the volume delimiters or directory delimiters are not correct, it might cause *INCLUDE* and *EXCLUDE* statements to malfunction.

If you want to use an *INCLUDE* statement for “all files under a specific directory,” ensure that the slashes and volume delimiters are correct. If you want to exclude all of the files under a directory called “home,” or simply all files, see the following examples:

Using the backwards slash “\” and the volume delimiter “:” (Windows)

```
*include everything in the c:\home directory
include c:\home\...\*
*include everything
include *:\...\*
```

Using the forward slash “/” (UNIX and Macintosh OS X)

```
*include everything in the /home directory
include /home/.../*
*include everything
include /.../*
```

Using either slash (NetWare) but the volume name is required with the volume delimiter “:”

```
*include everything in the SYS:\HOME directory
include sys:\home\...\* or
include sys:/home/.../*
*include everything
include *:\...\* or
include */.../*
```

Resolving errors due to the incorrectly coded include or exclude list

Due to the complexity or number of INCLUDE or EXCLUDE statements, you might experience the unintentional inclusion or exclusion of a file.

Configure the client with the INCLEXCL trace flag to help determine why a file was included or excluded.

For example, when you believe that the c:\home\file.txt file should be included in the backup processing. The trace shows that there is an EXCLUDE statement that excludes this file:

```
polbind.cpp (1026): File 'C:\home\file.txt' explicitly excluded by pattern  
'Excl All c:\home\*.txt'
```

Using the backup-archive client DSMC QUERY INCLEXCL command shows that this statement is in the Tivoli Storage Manager server client options set:

```
tsm> q inclexcl  
*** FILE INCLUDE/EXCLUDE ***  
Mode Function Pattern (match from top down) Source File  
-----  
Excl All c:\home\*.txt Server
```

Resolving image backup errors

Errors that might occur with image backup processes are a Linux image backup failure, a Linux Snapshot image backup failure, or errors occurring during AIX JFS2 Snapshot-based backup-archive and image backup.

Resolving Linux image backup errors

Linux

You can resolve Linux image backup errors by performing specific steps, depending on the type of error that occurs.

The following error was generated during image backup:

```

paris:#dsmc b image /dev/system/lv01
Backup Image Function Invoked.
ANS1228E Sending of object '/dev/system/lv01' failed
ANS1584E Error loading system library 'libdevmapper.so'
required for image operations for LVM2 volumes.
ANS1813E Image Backup processing of '/dev/system/lv01'
finished with failures.
Total number of objects inspected: 1
Total number of objects backed up: 0
Total number of objects updated: 0
Total number of objects rebound: 0
Total number of objects deleted: 0
Total number of objects expired: 0
Total number of objects failed: 1
Total number of bytes transferred: 0 B
Data transfer time: 0.00 sec
Network data transfer rate: 0.00 KB/sec
Aggregate data transfer rate: 0.00 KB/sec
Objects compressed by: 0%
Elapsed processing time: 00:00:29
paris# cat dsmerror.log
11/15/2006 13:07:53 ANS1228E Sending of object
'/dev/system/lv01' failed
11/15/2006 13:07:56 ANS1584E Error loading system
library 'libdevmapper.so' required for
image operations for LVM2 volumes.
11/15/2006 13:07:56 ANS1813E Image Backup processing
of '/dev/system/lv01' finished
with failures.

```

For this error, ensure that the system has the correct version of the library device mapper installed. Perform the following steps to determine the installed version:

1. Issue the # DMSETUP VERSION command. The output will display similar to the following output:

```

Library version: 1.00.09-ioct1 (2004-03-31)
Driver version: 4.4.0

```

or

Issue the following command to determine the version using the rpm:

```
dumas:/develop/rem/peterman # rpm -q -a |grep device-mapper
```

The output will display similar to the following output:

```
device-mapper-1.00.09-17.5
```

The library version must be Version 1.01 or later. If you have a lower version, please upgrade the device mapper rpm file at the following Web site:
<http://www.novell.com>.

2. Verify the installation after the upgrade.

```

dumas:/develop/rem/peterman # rpm -Uvh device-mapper-1.01.01-1.6.i586.rpm
Preparing... ##### [100%]
1:device-mapper ##### [100%]
dumas:/develop/rem/peterman # rpm -q -a |grep device-mapper
device-mapper-1.01.01-1.6

```

You can also check the /lib directory to see the correct versions installed. A system with the right levels will have the following information:

```

# ls -l /lib/libdev*
lrwxrwxrwx 1 root root 20 Jul 5 11:42 /lib/libdevmapper.so
->libdevmapper.so.1.01
-rwxr-xr-x 1 root root 24490 May 23 2005 /lib/libdevmapper.so.1.00
-rwxr-xr-x 1 root root 28216 May 23 2005 /lib/libdevmapper.so.1.01

```

Resolving image backup failures when using Linux Snapshot

Linux

To resolve a failed Linux Snapshot image backup, validate that the system is set up to create a Snapshot.

Try to create a Snapshot from a shell command prompt by issuing the following command:

```
/sbin/lvcreate -L 16384K -n <snapname eg. tsm snap>-s  
<volume devname eg /dev/system/lv01>
```

If this command fails with error “Snapshot: Required device-mapper target(s) not detected in your kernel,” the **:dm_snapshot** kernel module is not loaded. This command could also fail for other reasons as well, which might result in similar Tivoli Storage Manager behavior.

The following example shows the output generated when an image backup fails with error message ANS1258E, “The image snapshot operation failed.”

```
dsmerror.log :  
05/31/2006 15:14:36 ANS1259E The image snapshot operation failed.  
Diagnostic text: tsmStartSnapshot.  
05/31/2006 15:14:38 ANS1259E The image snapshot operation failed.  
Diagnostic text: tsmTerminateSnapshot.  
05/31/2006 15:14:38 ANS1228E Sending of object '/fs1' failed  
05/31/2006 15:14:38 ANS1258E The image snapshot operation failed.
```

Perform the following steps to load the modules:

1. Verify that the module is not loaded. See the following example:

```
suzie:/home2/rat # lsmod |grep dm_  
dm_mod 112104 6
```

2. Load the module. See the following example:

```
suzie:/home2/rat # modprobe dm_snapshot
```

3. Verify that the previous step is successful. See the following example:

```
suzie:/home2/rat # lsmod |grep dm_  
dm_snapshot 44024 0  
dm_mod 112104 6 dm_snapshot  
suzie:/home2/rat #
```

4. Create a Snapshot from the shell prompt. See the following example:

```
suzie:/etc # /sbin/lvcreate -L 16384K -n tsm snap -s /dev/system/lv01  
Logical volume "tsm snap" created
```

5. Remove the Snapshot that was created in the previous step. See the following example:

```
suzie:/etc # lvremove /dev/system/tsm snap  
Do you really want to remove active logical volume "tsm snap"? [y/n]: y  
Logical volume "tsm snap" successfully removed  
suzie:/etc #
```

If you followed all the steps, you now might be able to run Snapshot image backups.

Restriction: If the lvcreate command fails with error Insufficient free extents (0) in volume group..., there is not enough space in the volume group for a Snapshot volume.

Resolving errors during AIX JFS2 snapshot-based backup-archive and image backup

AIX

During Tivoli Storage Manager termination, the Tivoli Storage Manager client deletes the AIX enhanced journaled file system (JFS2) snapshot that is created during the backup process. However, there are situations in which AIX might fail the snapshot delete request made by Tivoli Storage Manager.

The following situations illustrate where a snapshot delete request might fail:

- The Control-c keystroke is issued during a Tivoli Storage Manager snapshot backup process. The JFS2 snapshot unmount request might fail with a “Device Busy” error, due to the Tivoli Storage Manager process being in the middle of accessing the snapshot.
- Two Tivoli Storage Manager snapshot backup requests are invoked concurrently for the same file system. For example, if the `dsmc backup image /fs1 backup` request is submitted from one console, and at the same time a `dsmc backup image /fs1 backup` request is issued from another console. If the process from the first console creates the first snapshot for /fs1 and the second process from the second console creates the second snapshot for /fs1, and if the second process finishes first and tries to delete the snapshot, AIX fails the delete request.
- Two Tivoli Storage Manager snapshot backup requests are invoked concurrently for two virtual mount points whose source file system is the same. For example, issuing `dsmc incr /fs1/level1/dir1` from one console and `dsmc incr /fs1/level2/level3/dir3` from a second console, concurrently.

AIX expects snapshot delete requests to be issued in a certain order with the oldest snapshot deletion requested first, and the next oldest snapshot deletion requested next, and so on. If Tivoli Storage Manager cannot honor the sequence due to concurrent processes creating snapshots for the same file system, AIX fails the delete requests. In the previous examples, Tivoli Storage Manager logs a warning message asking the user to delete the snapshots manually.

Issue the following commands, in order, to perform a manual snapshot deletion:

1. `SNAPSHOT -Q -C ' ' <SRCFS>`
2. `DF -K`
3. `UNMOUNT -F /TSM*`
4. `RMDIR /TSM*`
5. `SNAPSHOT -D /DEV/TSM*` If the snapshot delete process fails with “Device Busy” or some other error message, issue the `- UNMOUNT -F <SRCFS>` command to unmount the source file system. Retry snapshot delete.
6. `LS -L /DEV/TSM*` If any /DEV/TSM* logical volumes remain, issue the `- RMLV -F TSM*` command.
7. If you have an unmounted source file system, issue the `- MOUNT <SRCFS>` command to mount it.

If any snapshots are not deleted during a previous Tivoli Storage Manager process, Tivoli Storage Manager tries to delete the snapshots during its next invocation because as older snapshots remain, AIX fails deletion requests for newer snapshots for a given file system. The following cases show where Tivoli Storage Manager does not try to delete older snapshots:

- If the snapshot was not created by Tivoli Storage Manager. Tivoli Storage Manager names its snapshots with a “tsm” prefix to distinguish them from other snapshots created for the same file system. If the snapshot was not created by Tivoli Storage Manager, Tivoli Storage Manager produces an error message that asks the user to delete the older snapshot and retry the operation.
- If the snapshot is created by Tivoli Storage Manager but is still mounted, the snapshot is being used by some other Tivoli Storage Manager process.
- If the snapshot is created by Tivoli Storage Manager, is not mounted, but is newly created, the snapshot might have just been created by some other Tivoli Storage Manager process.

In all such cases, you might have to perform a manual deletion. If any unused older snapshots are existing, subsequent Tivoli Storage Manager backups fail to delete snapshots.

Important: There are AIX defect fixes related to JFS2 snapshots in AIX 5.3.0.70 or later and AIX 6.1 or later. If the fixes are not applied, an AIX system shutdown can occur or Tivoli Storage Manager might stop during snapshot deletion and snapshot query processes. It might also cause data corruption during used block image backup. Therefore, Tivoli Storage Manager will not perform snapshot monitoring, will not perform the snapshot deletion feature described above, and will not perform used block image backup unless AIX is at the AIX 5.3.0.70 or later and AIX 6.1 or later levels. In order to exploit these features, ensure that your operating system level is at AIX 5.3.0.70 or later and AIX 6.1 or later.

API problem determination

There are several methods you can use to determine the source of problems with the application programming interface (API).

Support solutions for the Tivoli Storage Manager API

A number of resources are available to learn about or to diagnose the Tivoli Storage Manager application programming interface (API). The IBM Support Solutions database contains a knowledge base of articles and information on issues related to backup and restore problems.

API instrumentation will only be activated if the testflag INSTRUMENT: API is set in the configuration file and the dsmSetUp and dsmCleanUp calls are used in the application.

Related information

 Product Support

Gathering API information before calling IBM support

By collecting all the necessary information about your environment, you can significantly help to determine the problem.

Gather as much of the following information as possible before contacting IBM Support:

- On what operating system is the problem being experienced?
- What is the exact level of the operating system, including all service packs and hot fixes that were applied?
- What is the exact level of the Tivoli Storage Manager application program interface (API)?

- What is the exact level of the Tivoli Storage Manager server?
- What is the Tivoli Storage Manager server platform and operating system level?
- What is the exact level of the Tivoli Storage Manager storage agent (if LAN-free environment)?
- What is the Tivoli Storage Manager storage agent platform and operating system level (if LAN-free environment)?
- List all applications running on the system.
- List the steps required to recreate the problem (if the problem can be recreated).
- If you cannot recreate the problem, list the steps that caused the problem.

Gathering API files before calling IBM support

A number of log files and other data might be created by the Tivoli Storage Manager application programming interface (API).

Gather as many of the following files as possible before contacting IBM Support:

- Tivoli Storage Manager API options file.

The following two options files are used on UNIX and OS/400® operating systems:

dsm.opt

The client options file

dsm.sys

The system options file

For Windows, find the dsm.opt default options file or the file referenced by the **DSMI_CONFIG** environment variable. For UNIX, the default options file is dsm.sys and is found in the directory referenced by the **DSMI_DIR** environment variable.

On other operating systems, the client options file (dsm.opt) contains all of the options. The following definitions are environment variables that describe the location of the option files and other API components:

DSMI_CONFIG

The fully-qualified name for the client options file.

DSMI_DIR

This variable points to the API installation directory and is also used to find the dsm.sys file (on UNIX). Wherever the DSMI_DIR is set, ensure that a dsm.sys file exists in this same directory.

DSMI_LOG

Points to the path for the dserror.log file.

Tip: If this variable points to a directory for which the user does not have write permission, dsmSetup and dsmInitEx will fail with return code DSM_RC_ACCESS_DENIED (106).

If the ERRORLOGNAME option is set in the options file (dsm.sys/dsm.opt), its value will be used as the error log name instead of the default value dserror.log.

- Tivoli Storage Manager API error log file. The default API error log is dserror.log.
- Any trace files created for the API (the recommended trace flags are api, api_detail, or verbdetail).

- Output from any failed command or operation, which might be either the console output redirected to a file or an actual screen image of the failure.
- The output from the Tivoli Storage Manager server QUERY SYSTEM command.
- Tivoli Storage Manager server activity log. The Tivoli Storage Manager administrator can view this log for you if you do not have a Tivoli Storage Manager administrator user ID and password.
- If the API client is configured for LAN-free data movement, collect the options file for the Tivoli Storage Manager storage agent. The default name for this options file is dsmsta.opt.
- A short program or sections of the application source code invoking the Tivoli Storage Manager API function calls that are suspected to cause the problem.

Verifying that the API uses the correct option file:

When you gather application program interface (API) files, you must verify that the API uses the correct option file or server stanza in dsm.sys.

Perform the following steps to verify that the API uses the correct option file or server stanza:

1. Insert an erroneous option or value in the client option file or server stanza in dsm.sys. For example, if it is uncertain whether the API uses the srvr1.cmpron server, insert 'ERRORNEOUS_OPTION 12345' line into the srvr1.cmpron server stanza of the dsm.sys file. See the following example:

```
...
SERVERNAME srvr1.cmproff
COMPRESSION NO
TCPSERVERADDRESS computer.company.com

SERVERNAME srvr1.cmpron
COMPRESSION YES
ERRORNEOUS_OPTION 12345
TCPSERVERADDRESS computer.company.com

SERVERNAME srvr1.pwdf1
PASSWORDACCESS GENERATE
PASSWORDDIR .
TCPSERVERADDRESS computer.company.com
...
```

2. Verify that the API detects this error. You can use the sample API program dapism for this purpose.

```
# dapism
...
Enter selection ==>0
Node name:node1
Owner name:
Password:
API Config file:
Session options:
User Name:
User pswd:
Are the above responses correct (y/n/q)?
Doing signon for node node1, owner, with password
*** Init failed: ANS0220E (RC400) An invalid option was found during option parsing.
```

The wrong options file was updated if no error is reported.

3. Check the environment variable values that were previously mentioned or repeat steps 1 on page 22 and step 2 on page 22 with a different options file/server stanza.
4. Remove the option inserted in step 1 on page 22.

Determining if data is sent to the IBM Tivoli Storage Manager storage agent rather than the server

You need to know if your data is being sent to the Tivoli Storage Manager storage agent, rather than a server because you will not be able to recover the data if it is sent to the storage agent.

Perform the following steps to verify that the data is being sent to the Tivoli Storage Manager storage agent, rather than the server:

1. Add the following trace options to the client options file prior to backing up or archiving objects:

- TRACEFILE <trace file name>
- TRACEFLAGS api api_detail verbdetail

2. Examine the trace file after the operation and locate a statement that looks similar to the following statement:

```
dsmSendObj ENTRY:... objNameP: '<the file name>'
```

The statement above is followed by the trace statement:

```
tsmEndSendObjEx: Total bytes sent * *, encryptType is *** encryptAlg is
*** compress is *, totalCompress is * * totalLFBytesSent * *
```

The trace statement indicates whether the object totalLFBytesSent was sent to the Tivoli Storage Manager storage agent. If totalLFBytesSent is 0 0, the data was sent directly to the Tivoli Storage Manager server.

Alternatively, your application itself can determine whether the data was sent through a LAN-free path by using the dsmEndSendObjEx function call and the dsmEndSendObjExOut_t data structure.

```
/*-----+
| Type definition for dsmEndSendObjExOut_t
+-----*/
typedef      struct      dsmEndSendObjExOut_t
{
    dsUInt16_t    stVersion;      /* structure version */
    dsStruct64_t   totalBytesSent; /* total bytes read from app */
    dsmBool_t      objCompressed; /* was object compressed */
    dsStruct64_t   totalCompressSize; /* total size after compress */
    dsStruct64_t   totalLFBytesSent; /* total bytes sent LAN Free */
    dsUInt8_t      encryptionType; /* type of encryption used */
} dsmEndSendObjExOut_t;
totalLFBytesSent - The total LAN-free bytes that were sent.
```

For example:

```
...
rc = dsmEndSendObjEx(&endSendObjExIn, &endSendObjExOut);
if (rc)
{
    printf("*** dsmEndSendObjEx failed: ");
    rcApiOut(dsmHandle, rc);
}
else
{
    dI64toCh(&endSendObjExOut.totalLFBytesSent,t,10);
    format_number(t,t2);
    printf("LAN-free bytes sent: %s\n", t2);
}
...
```

See *API Function Calls in Using the Application Programming Interface* for more details.

Running applications that use the API as a non-root user

If you are a non-root user trying to run an application on UNIX that uses the application programming interface (API), you must perform specific steps.

1. Set the **DSMI_CONFIG** environment variable. Verify that the non-root user has “read” permission for the client options file specified by **DSMI_CONFIG**. Otherwise, `dsmInit/dsmInitEx` will fail with return code **DSM_RC_NO_OPT_FILE** (406). For example, the following options file is not readable by a non-root user, therefore the file’s permissions need to be updated:

```
$ ls -l $DSMI_CONFIG
-rwx----- 1 root sys 86 Oct 7 13:07 /testfsapi/callmt_nr/dsm.opt
$ su root
Password:
# chmod a+r /testfsapi/callmt_nr/dsm.opt
# exit
$ ls -l $DSMI_CONFIG
-rwxr--r-- 1 root sys 86 Oct 7 13:07 /testfsapi/callmt_nr/dsm.opt
```

2. Set the **DSMI_DIR** environment variable to the API installation directory. Verify that the non-root user has “read” permission for the system options file specified by **\$DSMI_DIR/dsm.sys**.

```
$ export DSMI_DIR=/opt/tivoli/tsm/client/api/bin64
$ ls -l $DSMI_DIR/dsm.sys
-rw-r--r-- 1 root sys 4712 Oct 19 18:07 /opt/tivoli/tsm/client/api/bin64/dsm.sys
```

3. Set the **DSMI_LOG** environment variable. Verify that the non-root user has “write” permission for this directory. For example, the following **DSMI_LOG** directory is owned by a non-root user:

```
$ ls -ld $DSMI_LOG
drwxr-xr-x 2 apitest users 96 Oct 19 17:56 /testfsapi/callmt_nr/logs
```

If **PASSWORDACCESS GENERATE** is set in system options file **dsm.sys**, perform steps 4 and 5, otherwise go to step 6.

4. Check the ownership and permissions of the Trusted Communication Agent (TCA). This information is in the directory indicated by the **DSMI_DIR** environment variable. For example, the following TCA has the correct ownership and permissions:

```
$ ls -l $DSMI_DIR/dsmtca
-rwsr-xr-x 1 root bin 5021160 Oct 14 09:48 /opt/tivoli/tsm/client/api/bin64/dsmtca
```

Wrong permissions or ownership will result in a **DSM_RC_AUTH_FAILURE** (137) returned from `dsmInit`. Additionally, it is imperative that you use the same version of the API library and `dsmtca`. Mixed versions will result in errors.

```
Error : calling program and dsmtca are not compatible
calling program build date : Mon Oct 18 21:15:59 2004 Mon Oct 18 21:15:59 2004
TCA build date : Wed Oct 13 16:48:03 2004 Wed Oct 13 16:48:03 2004
*** Init failed: ANS0282E (RC168) Password file is not available.
```

5. The root user must generate the **TSM.PWD** password file using either the IBM Tivoli Storage Manager backup-archive client or the `dapism` sample API application. Location of the password file is determined by the **PASSWORDDIR**

option in the `dsm.sys` system options file. In the following example, the sample API application generates the `TSM.PWD` password file for a node whose password is *oddesy*.

```
# dapismp
*****
* Welcome to the sample application for the Tivoli Storage Manager API. *
* API Library Version = 5.4.0.0 *
*****
Choose one of the following actions to test:
0. Signon
1. Backup
2. Restore
3. Archive
4. Retrieve
5. Queries
6. Change Password
7. Utilities : Deletes, Updates, Logevent, SetAccess, RetentionEvent
8. Set preferences, envSetUp
9. Exit to system
10. Restore/Retrieve Without Offset Prompt
11. Extended Signon
Enter selection ==>0
Node name:
Owner name:
Password:oddesy
API Config file:
Session options:
User Name:
User pswd:
Are the above responses correct (y/n/q)?
Doing signon for node, owner, with password oddesy
Handle on return = 1
Choose one of the following actions to test:
0. Signon
1. Backup
2. Restore
3. Archive
4. Retrieve
5. Queries
6. Change Password
7. Utilities : Deletes, Updates, Logevent, SetAccess, RetentionEvent
8. Set preferences, envSetUp
9. Exit to system
10. Restore/Retrieve Without Offset Prompt
11. Extended Signon
Enter selection ==>9
# ls -l TSM.PWD
-rw----- 1 root sys 121 Oct 19 18:28 TSM.PWD
Function call dsmInit returns DSM_RC_NO_PASS_FILE (168), if the password file is not
present in the directory specified by the PASSWORDDIR option.
```

6. If tracing is enabled, verify that the non-root user has “write” permission for the file indicated by issuing the `TRACEFILE` option.

JBB problem determination

Journal Based Backup (JBB) is appropriate for backing up files systems with small or moderate amounts of change activity between backup cycles.

Related information

 [JBB FAQ](#)

Determining if a backup will be journal-based

Before implementing a backup, you need to determine if it is going to be journal-based.

Perform the following steps to ensure that the backup is journal-based:

1. Configure the journal daemon to journal the file system being backed up. The journal daemon journalizes a file system after you list the file system in the `tsmjbbd.ini` configuration file. See the following configuration information:

```
[JournaledFileSystemSettings]
;
; List of journalized file systems
JournaledFileSystems=c:
```

2. Perform a full incremental backup on the corresponding file system while the file system is actively being journalized. This full incremental backup must set the “Last Backup Completed” date on the Tivoli Storage Manager server file space in order for the journal to be set to valid. You can view the “Last Backup Completed” date by issuing the `QUERY FILESPACE` server command. After the journal is set to the valid state, subsequent backups by the same node to the same Tivoli Storage Manager server will be journal-based. If a backup uses a different node or a different server, the backup will be non-journal-based but the journal will remain valid for the original node and server, and backups to the original node and server will be journal-based. The following message is an example of what is written to the Windows Application Event Log when a journal is initially set to valid:

```
Journal set to valid for fs 'H:' and will be used for backup by
node GSHLAGER3 to server GSHLAGER2_SERVER1.
```

3. Ensure that the Tivoli Storage Manager node and server that the backup is using matches the node and server for which the journal is valid.
4. Use the Journal Database Viewing utility to determine the current state of a journal. If a valid journal is restarted, backups will be non-journal based until the journal is re-validated. The following message is written to the Windows Application Eventlog when a journal is restarted:

```
Journal database 'c:\tsmjjournal\tsmH_.jdb' for fs 'H:' has been
deleted and reset to the invalid state.
```

Restarting a valid journal

You might want to restart a valid journal for better performance.

The reasons for restarting a valid journal are displayed in the following list:

- Error conditions in the journal daemon
 - buffer overflow errors caused by excessive change activity on the journal file system being monitored for changes
 - journal database access errors (disk full errors, etc.)
- Request by a backup client
- Clients will issue a journal restart request when it is determined that a journal file system lacks integrity for one of the following reasons:
 - The server filespace no longer exists
 - The server filespace was deleted after the last backup
 - The node policy set was updated after the last backup
 - The Last Backup Completed or Last Backup Started dates are not valid (not set)

Running the Journal Daemon in the foreground

You can improve the diagnostic capabilities and your ability to test by running the Journal Daemon in the foreground, rather than as a Windows service.

The Journal Daemon might be started from a Windows command prompt as follows: `tsmjbbd.exe i`

Using the Journal Database Viewing utility

The Journal Database Viewing utility can provide you with valuable information.

The Journal Database Viewing utility provides the following information:

- The current state of the journal
- The file system tracked by the journal
- The journal activation timestamp
- The journal validation timestamp
- The maximum supported journal size
- The node and server for which the journal is valid
- The number of entries currently in the journal

Note: You must have Version 5.4 of the utility (`dbviewb.exe`) in order to view the 5.4 journal databases, which can be found at the IBM software ftp site: <ftp://ftp.software.ibm.com/storage/tivoli-storage-management>.

This utility also allows searching, inserting, or deleting specific entries in a journal database.

The syntax of this utility is:

```
dbviewb <fully qualified journal database basefile name>
dbviewb <fully qualified journal database basefile name> <i>

D:\tsm540c\debug\bin\winnt_unicode>dbviewb c:\tsmjjournal\tsmh__.jdb
IBM Tivoli Storage Manager
Journal Database Viewing Utility
Version 5, Release 4, Level 0.0
Last Update: Nov 28 2006
Querying Journal DB ...
Journal Database Information:
Database File c:\tsmjjournal\tsmh__.jdb
Database File Disk Size 81 KB (83754 Bytes)
Journal File System H:
Journal Activation Date Tue Nov 28 11:49:05 2006
Journal Validation Date Wed Nov 29 16:41:11 2006
Maximum Journal Size 8191 PB (9223372036854775807 Bytes)
Journal Type Change Journal
Journal State Valid
Valid for Server GSHLAGER2_SERVER1
Valid for Node GSHLAGER3
Number of DB Entries 22
D:\tsm540c\debug\bin\winnt_unicode>

D:\tsm540c\debug\bin\winnt_unicode>dbviewb c:\tsmjjournal\tsmh__.jdb i
IBM Tivoli Storage Manager
Journal Database Viewing Utility
Version 5, Release 4, Level 0.0
Last Update: Nov 28 2006
Querying Journal DB ...
Journal Database Information:
Database File c:\tsmjjournal\tsmh__.jdb
Database File Disk Size 81 KB (83754 Bytes)
```

```

Journal File System H:
Journal Activation Date Tue Nov 28 11:49:05 2006
Journal Validation Date Wed Nov 29 16:41:11 2006
Maximum Journal Size 8191 PB (9223372036854775807 Bytes)
Journal Type Change Journal
Journal State Valid
Valid for Server GSHLAGER2_SERVER1
Valid for Node GSHLAGER3
Number of DB Entries 22
Enter request on a single line, in the following format:
Req-Type [Entry-key]
Req-type might be one of the following:
Del Delete a row from the database. The fully-qualified case sensitive
file name is required.
Find Find the entry whose key is the argument.
List Print all the entries to stdout. No arguments are required.
Quit
Please enter your request: find H:\dbview.example\Dir3Depth1\F2.txt
Located Journal Database Record:
-----
Object Name : H:\dbview.example\Dir3Depth1\F2.txt
Action : Modify
Object Type : File
Inserted : Fri Dec 01 10:15:28 2006
Object Time : Fri Dec 01 14:15:28 2006
Hit Count : -2110169276
-----
Please enter your request: quit

```

Using open file support and the logical volume snapshot agent

There are several methods in determining problems with the open file support (OFS) and logical volume snapshot agent (LVSA).

Examining the Windows system event log

Windows

In the Tivoli Storage Manager, critical information is written for problem determination to the Windows system event log.

Examining the event log is the first step in isolating potential problems with the logical volume snapshot agent (LVSA) in the context of online image or open file backup.

Obtaining debug print output

Many problems require that you obtain trace data from the `tsmlvsa.sys` driver to supplement what is obtainable from a client service trace.

You can obtain the logical volume snapshot agent (LVSA) debug print output by using the DebugView tool.

Perform the following steps to install the DebugView tool:

1. Download the latest version of the DebugView tool. Make sure you use the version that is labeled "you plan on using DebugView on WinNT/2K/XP."
2. Install the DebugView tool. The installation is a simple extraction of the files from the `dbgvnt.zip` file.
3. Place the following text line in the `dsm.opt` file:

```
TRACEFLAG SERVICE
TRACEFILE trace.txt
```

Ensure that you direct the trace file to a location with many GB of free space.

4. Run the `dbgview.exe` executable file prior to running the Tivoli Storage Manager client.
5. Configure `dbgview.exe` to log the output to a file through the **File** → **Log to File** option.
6. Perform the failing operation.

Configuring the system for a full dump

When a system bug check occurs, you must obtain a full memory dump to assist in the diagnosis of possible logical volume snapshot agent (LVSA) problems.

The failing system must be configured to take a full memory dump. The following steps show you the proper configuration:

1. Open the control panel.
2. Open the system icon.
3. Select the advanced tab.
4. Select the startup and recovery button.
5. Ensure that the following check boxes are selected in the “System Failure” section:
 - Write an event to the system log
 - Send an administrative alert
6. Ensure that the “Automatically reboot” check box is not selected.
7. In the “write debugging information” section, select “Complete Memory Dump.”

Important: Make a note of where the file will be written (%SystemRoot%\MEMORY.DMP). Ensure that the “Overwrite any existing file” check box is selected. Windows will ask you to restart so that the new setting can take effect.

8. Restart. If you did not select the “Overwrite any existing file” check box, after the restart rename the previous dump file (if any) to a new name.

When a bug check occurs, note the contents of the bug check screen (commonly referred to as the Blue Screen Of Death or BSOD). Collect the `memory.dmp` file upon reboot for examination.

Forcing a memory dump for a system stoppage when suspecting a logical volume snapshot agent problem

If you have ensured proper configuration and a memory dump is not taken, a memory dump might need to be forced when the system stops.

There are two methods you might employ:

1. If you have the opportunity to restart and recreate the stoppage, see Microsoft Knowledge Base article 244138 “Windows feature allows a Memory.dmp file to be generated with the keyboard.” This method requires a registry change and reboot to enable an on-demand memory dump when the right CTRL key is held and SCROLL LOCK key is pressed twice. This method might also be required if the BANG! tool is unable to cause a bug check and memory dump.
2. If the system is stopped and you cannot afford a reboot and recreate:

- a. Download and install BANG! from the Windows Driver Developers Web site. Follow instructions provided in the BANG! package/website.
- b. Run BANG! and press the “Crash Now” button. The system should get a blue screen and generate a full memory dump.

Note: IBM does not support the BANG! utility. Any questions or problems regarding the BANG! utility should be reported to the Windows Driver Developers Web site.

Best practices for open file support

The Tivoli Storage Manager Client open file support (OFS) technotes outline current limitations and known problems and to list steps that might help to diagnose problems in the setup and use of OFS

Related information

 <http://www-1.ibm.com/support/docview.wss?uid=swg21248971>

Using Windows Volume Shadow Copy Services

The Tivoli Storage Manager Windows client uses the Volume Shadow Copy Services (VSS) of Windows 2003 and Windows Vista to perform system state and system services backup. VSS can also be used as a snapshot provider for open file support (OFS) and online image operations.

Defining VSS transient errors

The Tivoli Storage Manager client considers several Volume Shadow Copy Services (VSS) errors to be transient. Transient errors are network errors or drives that are temporarily misbehaving that might require backup recovery.

When one of these errors occurs, the client will, by default, retry the VSS backup process three times at 30-second intervals. The number of retries and retry intervals can be configured using two test flags. The Tivoli Storage Manager client considers the following VSS errors to be transient:

VSS_E_MAXIMUM_NUMBER_OF_VOLUMES_REACHED
VSS_E_SNAPSHOT_SET_IN_PROGRES
VSS_E_MAXIMUM_NUMBER_OF_SNAPSHOTS_REACHED
VSS_E_PROVIDER_VETO VSS_E_UNEXPECTED
VSS_E_FLUSH_WRITES_TIMEOUT
VSS_E_HOLD_WRITES_TIMEOUT
VSS_E_WRITERERROR_TIMEOUT
VSS_E_WRITERERROR_RETRYABLE
VSS_E_WRITERERROR_OUTOFRESOURCES
VSS_E_WRITER_NOT_RESPONDING
VSS_E_VOLUME_IN_USE
VSS_E_PROVIDER_IN_USE
VSS_E_UNEXPECTED_PROVIDER_ERROR
VSS_E_UNEXPECTED_WRITER_ERROR

Defining Windows VSS test flags

The Tivoli Storage Manager client uses two different test flags to configure the number of Volume Shadow Copy Services (VSS) retries and how long between retries.

The following test flags are used to set the retry and retry interval of the Tivoli Storage Manager:

SETVSSMAXRETRY

Specifies the number of times the VSS backup process is retried if a transient error occurs. The default value is to retry three times.

SETVSSDELAY

Specifies the number of seconds to wait between retries of the VSS backup process, should a transient error occur. The default value is 60 seconds.

Option file example:

```
retry 10 times at 300 second intervals
TESTFLAG SETVSSMAXRETRY:10
TESTFLAG SETVSSDELAY:300
```

Windows 2003 VSS hot fixes

Microsoft issued several hot fixes for Volume Shadow Copy Services (VSS).

IBM technote 1242128 lists the known hot fixes, but is not guaranteed to be current. You need to contact Microsoft for the most current VSS hot fixes.

Related information

 [technote 1242128](#)

VSS tuning

Microsoft issued several tuning fixes for Volume Shadow Copy Services (VSS).

Controlling the VSS diff Area Size

After you apply these fixes, one of the following events occurs:

- “The shadow copy of volume C: took too long to install”
- “The shadow copy of volume C: was aborted because the diff area file could not grow in time.”

Reduce the I/O load on this system to avoid this problem. If these events still occur, you can use the following registry key to control the size of the diff area used by VSS:

```
HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\VolSnap\
MinDiffAreaFileSize : REG_DWORD: <size in MB> (the default size is 300, but can
be increased to 3000).
```

Event Log Maximum Size

Microsoft indicates that if the event logs are sufficiently large, the copy operation can take longer than the timeout for systems with high I/O load or high memory load. The log size is best when below 64 MB.

Gathering VSS diagnostic information for Microsoft assistance

Microsoft Support can assist you with diagnostic information for Volume Shadow Copy Services (VSS) failures.

If the VSS failure is outside of the scope of Tivoli Storage Manager, gather the following information for Microsoft support:

- Windows application event log
- Windows system event log
- VSS trace

Examine the application and system event logs focusing on the error events created by the VolSnap and VSS sources at the time of failure. You might want to extract the germane events from the log to isolate the problem and have a more productive interaction with MS support.

Performing a VSS trace

You can troubleshoot your Volume Shadow Copy Services (VSS) errors by conducting a VSS trace.

Perform the following steps to complete a VSS trace:

1. Create a tracing.reg file using the contents shown and change the TraceFile entry to point to a volume that is not going to have a shadow copy created. Note the double-backslash delimiter usage; you must enter “\\” as the delimiter for each backslash in the path you want to specify.
2. Double-click the file from within Windows Explorer to install tracing.reg.
3. Reproduce the problem.
4. Turn off tracing by deleting the “HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\VSS\Debug\Tracing” key.

The following contents are displayed in the tracefile.reg registry file:

```
Windows Registry Editor Version 5.00
[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\VSS\Debug\Tracing]
"TraceFile"="c:\\trace.txt"
"TraceLevel"=dword:ffffffff
"TraceEnterExit"=dword:00000001
"TraceToFile"=dword:00000001
"TraceToDebugger"=dword:00000000
"TraceFileLineInfo"=dword:00000001
"TraceForceFlush"=dword:00000000
```

Performing VSS API calls with the vsreq.exe sample program

The Volume Shadow Copy Services (VSS) Software Developer’s Kit (SDK) contains the vsreq (VSS requester) sample program which performs a sequence of VSS API calls similar to the calls that are performed by the Tivoli Storage Manager backup-archive client.

You can compile and run vsreq.exe on the failing system to determine if vsreq and Tivoli Storage Manager encounter the same problem. If vsreq can reproduce the same problem as Tivoli Storage Manager, then the output of vsreq can be supplied to MS support to help in diagnosing the VSS problem.

In some cases, Microsoft provides an I/O subsystem analysis tool (“yapt”) to gather I/O performance data for analysis. vshadow is a tool that is also available as an alternative to vsreq.exe.

Comparing Tivoli Storage Manager and Ntbackup.exe interaction with VSS

Using the Ntbackup.exe executable file does not fully utilize Volume Shadow Copy Services (VSS) and cannot always be considered as a benchmark for Tivoli Storage Manager interaction with VSS.

The known difference between Ntbackup.exe and Tivoli Storage Manager in the context of VSS is that Ntbackup.exe does not use VSS to back up the Active Directory (NTDS). Although Ntbackup.exe uses VSS to take a snapshot, it still uses the legacy NTDS backup API to read data from the disk. Tivoli Storage Manager uses the VSS interface to read NTDS data from the disk. If there is a problem with the VSS writer responsible for NTDS, it does not evidence itself with Ntbackup.exe.

Issue the VSSADMIN LIST command to query the VSS writer state to ensure that VSS is in a stable or ready state.

Show commands for the backup-archive client

SHOW commands are unsupported diagnostic commands that are used to display information about in-memory control structures and other runtime attributes. The SHOW commands are used by development and service only as diagnostic tools. Several SHOW commands exist for the backup-archive client.

Depending upon the information that a SHOW command displays, there might be instances where the information is changing or cases where it might cause the application (client, server, or storage agent) to stop running. The SHOW commands should only be used when development or service suggests it. The SHOW commands in table Table 7 are not all of the available SHOW commands.

Table 7. SHOW commands for the backup-archive client

| SHOW Command | Description | Information |
|--------------|---|---|
| CACHE | Displays information about the subfile cache. | For Microsoft Windows clients that have configured to use subfile backup, this is useful for displaying information about the configured subfile cache. |
| CLUSTER | Displays information about the disk mappings in a Microsoft Cluster. | Useful for displaying information about the disk mapping (configuration) in a Microsoft Cluster environment. |
| DOMAIN | Displays information about the configured domains to use for incremental backup processing. | Useful for displaying and summarizing the DOMAIN, DOMAIN.IMAGE and DOMAIN.NAS client options. |
| OPTIONS | Displays the client options. | Useful to determine the settings of client options. |

Table 7. *SHOW* commands for the backup-archive client (continued)

| SHOW Command | Description | Information |
|----------------|---|--|
| OPTTABLE | Displays information about options that are administered by the server versus those that are managed by the client option file. | The client might receive its option settings from either the client option file or from the server. To receive the option from the server, a client option set must be defined with the <code>DEFINECLOPTSET</code> command. This command helps you to determine whether the client is using an option configured from the option file or an option configured from a client option set defined on the server. |
| PLUGINS | Displays information about installed plug-ins for this client. | The client uses plug-ins to provide additional capabilities, such as image backup. This <code>SHOW</code> command displays the plug-ins that are installed for this client as well as attributes of the various plug-ins, such as their version, type, and location. |
| SESSION | Displays the capabilities that this client is able to have for this connection to the server. | The client and server report and negotiate the capabilities that each has when a session is started by a client to a server. This <code>SHOW</code> command reports the capabilities available by this server and client. |
| SYSTEMOBJECT | For Windows 2000 and XP clients, displays the <code>SYSTEM OBJECT</code> data that is available on this client. | It is helpful in determining which <code>SYSTEM OBJECT</code> files are installed on this Windows client and those that could be backed up. |
| SYSTEMSERVICES | For Windows 2003 clients, displays the <code>SYSTEM SERVICES</code> data that is available on this client. | It is helpful in determining which <code>SYSTEM SERVICES</code> files are installed on this Windows client and those that could be backed up. Note: <code>SYSTEMSERVICES</code> is valid for Tivoli Storage Manager Version 5.4. |
| SYSTEMSTATE | For Windows 2003 and Windows Vista clients, displays the <code>SYSTEM STATE</code> data that is available on this client. | It is helpful in determining which <code>SYSTEM STATE</code> files are installed on this Windows system and those that could be backed up. |
| TRACEFLAGS | Displays information about trace classes and aggregate trace classes for this client. | It is helpful in determining which trace classes and aggregate trace classes could be used for this client. |
| VERSION | Displays the version and build date for this client. | It is helpful in determining which client is running and when it was built. |

Chapter 2. Resolving server problems

When working with the IBM Tivoli Storage Manager, you might experience problems specific to the Tivoli Storage Manager server. The Tivoli Storage Manager server diagnostic tips that you can perform vary from simple actions such as restarting your server, to more involved procedures.

The following list contains some actions that you can perform to help diagnose server problems:

- Check the server activity log
- Recreate the problem
- Check error logs related to reading or writing to a device
- Change the server options
- Stop and start scheduling services
- Query the database or storage pool
- Trace the UNICODE trace class

Checking the server activity log

Check the server activity log 30 minutes before and 30 minutes after the time of the error for other messages.

To review the messages in the server activity log, issue the QUERY ACTLOG command (see the Tivoli Storage Manager Administrator's Reference for more details).

Often, other messages can offer additional information about the cause of the problem and how to resolve it.

Recreating the problem

Recreate the problem to isolate its cause to a specific sequence of events, if the problem can be easily or consistently recreated.

Many problems occur as a result of a combination of events. For example, expiration running along with nightly scheduled backups for twenty clients. In some cases, by changing the timing or order of implementation of events might prevent the problem from reoccurring. For example, one way to change the timing would be to run expiration at a time when the nightly scheduled backups for twenty clients was not running.

Checking system error log files for device errors

If the problem is an error created by reading or writing data from a device, many systems and devices record information in a system error log.

If a device or volume that is being used by the Tivoli Storage Manager is reporting some sort of error to the system error log, it is likely a device issue. The error messages recorded in the system error log might provide enough information to resolve the problem.

Some examples of system error logs are shown in the following list:

- errpt for AIX
- Event Log for Windows
- System Log for z/OS®

Reverting server options or settings

If there were more configuration changes to the server, try reverting the settings back to their original values and retry the failing operation.

If the operation succeeds, try to make one change at a time and retry the operation until the attribute change that caused the failure is identified.

Changes to options in the server options file, or configuration changes to the server using SET or UPDATE commands might cause failures for operations that had previously succeeded. Changes on the server to device classes, storage pools, and policies might also cause failures to operations that had previously succeeded.

Restarting the scheduling service

Scheduled client operations are influenced by the schedule definitions on the server as well as the scheduling service (dsmsched) that runs on the client computer itself.

Restart the scheduling service on the client if a schedule changes on the server.

Important: If the scheduling service is managed by the client acceptor, stop and restart only the client acceptor.

Resolving server space issues

The Tivoli Storage Manager server's primary function is to store data. If it runs out of space in the database or storage pools, operations might fail.

To determine if the database is out of space, issue the QUERY DB command. If the percent utilized (Used Space) is at or near 100%, define more space. Typically, if the database is running out of space, this situation is indicated by other server messages being issued.

To determine if a storage pool is out of space, issue the QUERY STGPOOL command. If the percent utilized is at or near 100%, make more storage space available. Typically, if operations fail because a storage pool is out of space, this situation is indicated by other server messages being issued. To add more space to a DISK storage pool, allocate one or more new storage pools and define them to

the server using `DEFINE VOLUME`. You can configure Tivoli Storage Manager to automatically allocate storage pool `DISK` and `FILE` space by using the `DEFINE SPACETRIGGER` command.

To add more space to a sequential media storage pool, evaluate the tape library and determine if more scratch tapes can be added. If so, add the additional scratch volumes to the library and update the **MAXSCR** parameter for the storage pool by issuing the `UPDATE STGPOOL` command.

Changing the copy frequency

Tivoli Storage Manager server policy demands that an incremental copy frequency be a non-zero value.

The copy frequency attribute of the current *copygroup* management class for the file that is specified dictates the minimum number of days that must elapse between successive incremental backups. If you are trying to perform an incremental backup on a file and this number is set higher than 0 days, then the file will not be sent to the Tivoli Storage Manager server, even if it has changed.

A number of steps can be taken to correct this problem:

- Contact the Tivoli Storage Manager server administrator to change the copy frequency attribute.
- Issue a selective backup of the file. For example, `DSMC SELECTIVE C:\FILE.TXT`

You can issue the following administrative client command, `QUERY COPYGROUP`, to determine the setting of the copy frequency parameter:

```
tsm: WINBETA>q copygroup standard active f=d
Policy Domain Name: STANDARD
...
Copy Frequency: 1
...
```

Tracing to detect a code page conversion failure

The Tivoli Storage Manager server uses operating system functions to convert between Unicode and the server code page. If the system is not set up correctly, the conversion fails. This problem is most likely to occur when you are using the Administration Center to access the server.

Perform the following steps to attain more information on the failure:

1. Begin tracing the `UNICODE` trace class.
2. Repeat the action that caused the error message to occur.
3. Check the server `README` file for any platform-specific requirements for language installation.
4. Ensure that the locales indicated by the problem code pages are installed and any requirements listed in the `README` file are installed.

Resolving server stoppages

If you know the source of your server stoppage, you can resolve several problems.

The server might stop for one of the following reasons:

- A processing error causes memory to be overwritten or some other event triggers the system trap handler to terminate the server process.
- The server processing has validation algorithms throughout the application that check various conditions prior to continuing running. As part of this validation checking, there are cases where if the validation check fails, the server will actually terminate itself instead of allowing processing to continue. These catastrophic validations are referred to as an assert. If the server terminates due to an assert, the following message is issued:

ANR7837S Internal error XXXNNN detected.

where XXXNNN is an identifier assigned to the assertion failure.

Other server messages that are indicative of a stoppage are ANR7836S and ANR7838S.

Whether the server stopped as a result of an assert or the system trap handler, the `tsmddiag` utility can collect the following information and package it for submission for IBM service so the situation can be diagnosed:

- Server error file (`dsmserv.err`)
- System image (core file)
- Libraries and other files
- System logs
- Activity log

Package all the data (files) collected and contact IBM service to report this problem.

For all files from z/OS, make sure to use `xmit` to create a fixed-blocked file because it will be moved by `ftp` to an open systems computer, which will cause the loss of DCB attributes for the file. For the open systems platforms, package the files in a zip or tar file.

Related reference

Appendix C, "Installing and running the `tsmddiag` utility," on page 221

The purpose of the Tivoli Storage Manager Diagnostic utility (`tsmddiag`) is to ease and speed up the process for gathering data that is considered valuable to assist in diagnosing a problem caused by a server component.

Capturing the server error file (`dsmserv.err`)

When the server stops, it appends information to the `dsmserv.err` file which is located in the same directory as the server.

For Linux and AIX, the trap handler is disabled to prevent the function traceback from printing on the console and in `dsmserv.err`. This change is required in order to ensure that we will get a more complete core file. As part of disabling the trap handler, a new script, `getcoreinfo`, is in the Linux packages. The `getcoreinfo` script gets the function traceback for the failing thread and registers values and function traceback for all other threads. The amount of information available in the core for other threads is still incomplete on some Linux platforms/distributions. See the `getcoreinfo` script (in the server bin directory) for more details.

For the Windows platform, if the server is running as a service, then the file is named `dsmsvc.err`.

For the z/OS platform, there is no separate error file. The information will be in the JES job log and in the system log. For z/OS they are generally written by WTO with `route=11`.

For HP-UX, it is possible to use the following script to get basic thread information from the core on the customer system without sending it to IBM.

Perform the following steps to capture the server error file:

1. Make sure that the GNU debugger (gdb) is installed on the customer system.
2. Copy the `gt` shell script to the server bin directory (where the server executable `[.exe]` file and core file are located).
3. Make sure the script is an executable file (`chmod a+x gt`).
4. Invoke the script with the paths/names of the executable file (default is `./dsmserv`) and the core (default is `./dsmcore`). The output will be in file `dsm_gdb.info` (which should be sent to IBM).

Capturing the system image (core file)

Typically, a core file or other system image of the memory is in use by the Tivoli Storage Manager at the time of the failure. In each case, this file should be renamed to prevent it from being overwritten by a later stoppage. For example a file should be renamed to `"core.Aug29"` instead of just `"core."`

Purpose

The type and name of the core file varies depending upon the platform:

- For UNIX systems, such as AIX, HP-UX, Sun Solaris, and Linux, there is typically a file created called `core`. Be sure there is enough space in the server directory to accommodate a dump operation. It is common to have a dump file as large as 2 GB for the 32-bit Tivoli Storage Manager server. Additionally, make sure the `ulimit` for core files is set to unlimited to prevent the dump file from being truncated.
- For Windows systems, the dump is performed automatically through a system API call. If the server is running as a service, the dump file is called `dsmsvc.dmp`. Otherwise, the dump is called `dsmserv.dmp`.
- For a z/OS server, a dump should have been created based upon what was specified in the `SYSMDUMP DD` statement for the JCL used to start the server. A `SYSMDUMP` should be used instead of a `SYSABEND` or `SYSUDUMP` dump, because a `SYSMDUMP` contains more useful debugging information. Ensure that the dump options for `SYSMDUMP` include `RGN`, `LSQA`, `TRT`, `CSA`, `SUM`, `SWA`, and `NUC` on systems where a Tivoli Storage Manager address space will run. To display the current options, issue the z/OS command `DISPLAY DUMP,OPTIONS`. You can issue the `CHNGDUMP` command to alter the `SYSMDUMP` options. Note that issuing this command will only change the parameters until the next IPL is performed.

If the system was not configured to capture a core file or the system did not have sufficient space to create a complete core file, it might be of limited use in determining the cause of the problem.

Capturing library files

For the UNIX platforms, core files are specific to the application, libraries, and other system resources in use by the application on the system where it was running.

To accurately read the core file on our system, we need all of the following files which are located in the directory where the server is installed:

- dsmserve
- dsmlicense
- ndmpsi
- dsmcored
- dsmaio
- centera

The library files that are needed vary between all the platforms:

- For AIX systems, collect the following files:
 - /usr/ccs/lib/libpthreads.a
 - /usr/ccs/lib/libc.a
 - Collect any other loaded libraries such as message exits. To see what libraries are loaded, invoke dbx by issuing the DBX DSMSEV CORE_FILE command. Then, from the dbx prompt, issue the MAP command to show all of the libraries that are loaded and needed for core analysis.
- For HP-UX, issue the CHATR DSMSEV command and send in all the dynamic shared libraries. For example:
 - /usr/lib/libpthread.1
 - /usr/lib/libm.2
 - /usr/lib/libstd.2
 - /usr/lib/libstream.2
 - /usr/lib/libCsup.2
 - /usr/lib/libcl.2
 - /usr/lib/libc.2
 - /usr/lib/libdld.2
- For Linux, issue the LDD DSMSEV command and send in all the dynamic shared libraries. For example:
 - libm.so.6 =>/lib64/libm.so.6
 - libnsl.so.1 =>/lib64/libnsl.so.1
 - libpthread.so.0 =>/lib64/libpthread.so.0
 - libdl.so.2 =>/lib64/libdl.so.2
 - libc.so.6 =>/lib64/libc.so.6
 - /lib64/ld64.so.1 =>/lib64/ld64.so.1
- For Solaris, issue the following commands to collect the needed libraries:
 - sh
 - cd /usr
 - (find . -name "ld.so" -print ; \
 - find . -name "ld.so.?" -print ; \
 - find . -name "libm.so.?" -print ; \
 - find . -name "libsocket.so.?" -print ; \

```

- find . -name "libnsl.so.?" -print ; \
- find . -name "libthread.so.?" -print ; \
- find . -name "libthread_db.so.?" -print ; \
- find . -name "libdl.so.?" -print ; \
- find . -name "libw.so.?" -print ; \
- find . -name "libgen.so.?" -print ; \
- find . -name "libCrun.so.?" -print ; \
- find . -name "libc.so.?" -print ; \
- find . -name "libmp.so.?" -print ; \
- find . -name "libc_psr.so.?" -print ; \
- find . -name "librtld_db.so.?" -print) > runliblist
- tar cfh runliblist.tar -I runliblist

```

Capturing system log files

You can retrieve system log files to help resolve problems with server stoppages.

Retrieve the following log files to give to IBM service:

- For the AIX platform redirect the output from the command `errpt -a` into a file: `errpt -a >errpt.txt`.
- For the HP-UX platform, copy the `/var/adm/syslog/syslog.log` file.
- For the Linux platform, copy the `/var/log/messages` file.
- For the Solaris platform, copy the `/var/adm/messages` file.
- For the Windows platform, save a copy of the Event Logs, as seen from the Event Viewer.
- For the z/OS platform, gather a copy of the System Log.

Capturing the activity log

Activity log files can be retrieved to help resolve problems with server stoppages.

Collect the activity log at least two hours prior to the stoppage and 30 minutes after the stoppage using the `QUERY ACTLOG` command. See the Tivoli Storage Manager Administrator's Reference for more details.

Resolving database errors

Server errors might be caused by database irregularities. Some more common issues are running out of space and errors caused by insert, update, or delete operations.

Resolving a missing or incorrect database ID file problem

If you restore a database to a different server after a disaster and the database ID file (`dsmserv.dbid`) is not restored, the server will not be able to find the file after the restore operation and will not start.

This is just one scenario where a lost or incorrect `dbid` file can affect starting the Tivoli Storage Manager server after a database restore operation.

Tivoli Storage Manager version 6.1.0 requires that you drop the database before you restore it.

When a database is restored, the database ID file must stay in synch with the database. With Tivoli Storage Manager version 6.1.0, if you format the database before you restore it, the database ID file changes. This change causes a mismatch of the date and time in the database and keeps the server from starting.

If you find that your database ID file is causing errors during a restore operation, you might have to use the -S (skip DB ID check) parameter. The dsmserv.dbid file must be absent from your server when you use the -S parameter. The following situations describe where the -S parameter is useful:

- When you run the server with a different instance owner ID at logon.
- If you reformat the server after backing it up, you will have mismatched the date and time that is stored in the new dsmserv.dbid file and those that are kept in the database. Use the -S parameter when you start the server after restoring.
- When the dsmserv.dbid file gets damaged or lost.

After the initial use of the -S parameter in a restore scenario, the server creates a dsmserv.dbid file in the instance directory.

Resolving DB2 problems

IBM Tivoli Storage Manager version 6.1.2 is installed with the IBM DB2 database application. You can find the most information for DB2 on the DB2 Information Center and within the DB2 documentation.

To retrieve the list of supported configuration options, issue the following command:


```
db2osconf -h:
```

The following options are shown:

```
-c          # Client only ---> remove
-f          # Compare to current
-h          # Help screen
-l          # List current
-m<mem in GB> # Specify memory in GB
-n<num CPUs> # Specify number of CPUs
-p<perf level> # Msg Q performance level (0-3)
-s<scale factor> # Scale factor (1-3)
-t<threads> # Number of threads
```

Note: HP-UX and Sun Solaris users must run the db2osconf utility after installing and configuring Tivoli Storage Manager to ensure that the system kernel parameters are set properly.

Related information

 <http://publib.boulder.ibm.com/infocenter/db2luw/v9r5/index.jsp>

Resolving problems with the BACKUP DB and the RESTORE DB commands

The IBM Tivoli Storage Manager server BACKUP DB and RESTORE DB commands request the IBM DB2 database application to back up the Tivoli Storage Manager database to the server. Backup data is then sent to the Tivoli Storage Manager server through the Tivoli Storage Manager client application programming interface (API).

When a BACKUP DB or RESTORE DB command fails with a messages indicating the DB2 SQLCODE or the SQLERRMC with return codes, get a description of the DB2 SQLCODE by completing the following procedures:

1. **Windows** On Windows, click **Start** → **All Programs** → **IBM DB2** and click **Command Line Tools** → **Command Line Processor** to open a DB2 command-line interface. For all other supported platforms, log on to the DB2 instance ID and open a shell window, then issue the command DB2.
2. Enter the SQLCODE. For example, if the DB2 SQLCODE is -2033, issue the following command:
? sql2033

You can use the details of the error condition to debug the problem with the BACKUP DB or RESTORE DB command. If the SQLERRMC code is also displayed, it is explained in the SQLCODE description that you are provided. You can find more information about the API return codes through the following files:

- **Windows** tsm\api\include\dsmrc.h (Windows)
- **AIX** **HP-UX** **Linux** **Solaris** tsm/client/api/bin64/sample/dsmrc.h (for all other platforms)

Resolving incorrect environment variables for BACKUP DB and RESTORE DB:

Many of the BACKUP DB or RESTORE DB problems are as a result of incorrectly set DSMI_CONFIG or DSMI_DIR,DSMI_LOG environment variables.

The environment variables are used by the Tivoli Storage Manager client API to locate API codes and the options files. The DB2 instance must be running in a shell with correctly set environmental variables.

HP-UX For UNIX, the DSMI_* variables are set in the instance's userprofile file. For example: /home/tsminst1/sqlllib/userprofile

Windows On Windows, the DSMI_* variables are set in the file that the DB2 instance registry variable, DB2_VENDOR_INI, points to. For example, this file might be /home/tsminst1/tsmdbmgr.env. You can verify this by issuing the db2set -i tsminst1 DB2_VENDOR_INI command, where tsminst1 is the DB2 instance.

The DSMI_* variables are initially set up automatically by the Tivoli Storage Manager instance configuration wizard. They can be set up manually, though, as described in the *Installation Guide*.

The following procedure is an example process for debugging DSMI environment variable errors on a UNIX platform where the SQL error code (SQLERRMC) of 409 was displayed when using the dsmapipw command:

1. Open the /home/tsminst1/sqlllib/userprofile file and examine the statements. If you make any changes to this file, stop and restart the DB2 instance so that the changes are recognized. The userprofile file might have statements similar to the following example text:

```
export DSMI_CONFIG=/home/tsminst1/tsminst1/tsmdbmgr.opt
export DSMI_DIR=/usr/tivoli/tsm/client/api/bin64/dsm.sys
export DSMI_LOG=/home/tsminst1/tsminst1
```

The file in the first line of the example (/home/tsminst1/tsminst1/tsmdbmgr.opt) might have something similar to the following text:

```
SERVERNAME TSMDBMGR_TSMINST1
```

The file in the second line of the example (/usr/tivoli/tsm/client/api/bin64/dsm.sys) might have something similar to the following text:

```
SERVERNAME TSMBMGR_TSMINST1
commethod tcpip
tcpserveraddr localhost
errorlogname /home/tsminst1/tsminst1/tsmdbmgr.log
```

2. Verify that the SERVERNAME entry in the tsmbmgr.opt file matches the SERVERNAME entry in the dsm.sys file.
3. Run the DSMAPIPW command. You must be logged on using the root user ID.
4. If you can run the DSMAPIPW command, remove the /home/tsminst1/tsminst1/tsmdbmgr.log file while still using the root user ID to eliminate permission problems between the root user and tsminst1.

Common BACKUP DB and RESTORE DB errors:

Common errors derived from BACKUP DB or RESTORE DB commands might include SQL return or error codes.

The following errors are some of the more common errors that are displayed when issuing the BACKUP DB or RESTORE DB commands:

ANR2968E - Database backup terminated

DB2 SQLCODE -2033 SQLERRMC 406

SQL error message code 406 requires that the following issues are resolved:

- The DSML_CONFIG environment variable points to a valid Tivoli Storage Manager options file.
- The instance owner has read access to the dsm.opt file.
- The DSML_CONFIG environment variable is set in the db2profile.

DB2 SQLCODE: -2033, DB2 SQLERRMC: 106

SQL error message code 106 might mean that there is a permissions problem with the log file that the Tivoli Storage Manager client API writes. On UNIX, this happens because the DSMAPIPW command is using the root user ID but the DB2 instance is using a different ID. To resolve the problem, find the log file with the permissions problem and delete it (using the root user).

DB2 SQLCODE: -2033, DB2 SQLERRMC: 168

Make sure that DSML_DIR environment variable is pointing to the client API executable directory that contains dsmtca (trusted communication agent). Make sure that the TSM.PWD file exists in the Tivoli Storage Manager server instance directory. (It should be pointed to by the passworddir option in file tsmbmgr.opt).

ANR2971E - Database backup/restore/rollforward terminated

DB2 SQLCODE - 2071 error.

The library could not be loaded because it (or a library required by it) does not exist or does not have a valid format. This sometimes means that a 32-bit library is being loaded in a 64-bit instance, or vice versa. This typically indicates that the DSML_DIR environment variable is pointing to the wrong Tivoli Storage Manager client API executable files. More information about the error is available by opening a DB2 command-line processor window and issuing the following command: db2 => ? sql2071

Make sure that if any changes were made to tsmbmgr.opt, dsm.sys, or sqllib/userprofile files, that the DB2 instance is recycled so that it picks up the new values. To recycle the DB2 instance, you must stop and restart the Tivoli Storage Manager server. Also, make sure that the EXPORT command precedes DSML_*= entries in the file sqllib/userprofile.

Sometimes DB2 runs under a different shell than Telnet, so while the DSMAPIPW command works from a Telnet shell, the DB2 instance does not.

DB2 contacts the server with nodeid \$\$_TSMDBMGR_\$\$, but get error message that node is "locked"

The dsm.sys file must specify tcpserveraddress localhost in the SERVERNAME TSMDBMGR_TSMINST1 stanza. Do not specify the dotted IP address of the computer, for example 127.0.0.1.

Troubleshooting error message ANR2971E using the SQL code:

The message ANR2971E is one error message that might be displayed when you attempt a restore or backup database operation and the process stops. Use the SQL code attached to the error to help you resolve this problem faster.

Restoring a database might be the last option for you. If you are restoring a database because the server stopped during normal operation, review the db2diag.log file *before* running a restore or backup operation. This preventative step can help you avoid having an error during a backup or backup operation.

The following message can be issued when you are restoring or backing up data: :
ANR2971E Database backup/restore/rollforward terminated - DB2 sqlcode -2581 error

This following scenario does not pertain to the DSMI environment variables. In the following scenario, the DSMSEV RESTORE DB process failed with a DB2 SQL 2581 code.

Complete the following steps to resolve an ANR2971E error message with a SQL error code:

1. Issue the following command from the DB2 command-line interface:
? SQL2581

An explanation is generated about the SQL code.

```
SQL2581N  Restore is unable to extract log files or restore a log
          directory from the backup image to the specified path. Reason code
          "<rc>"
```

2. Review the db2diag.log file where you can find status and error messages. A portion of the db2diag.log file is displayed in the following example:

```
2009-02-10-09.49.00.660000-300 E8120712F500      LEVEL: Info
PID       : 4608                TID  : 3956        PROC : db2syscs.exe
INSTANCE: SERVER1              NODE : 000          DB   : TSMDB1
APPHDL    : 0-7                APPID: *LOCAL.SERVER1.090210144859
AUTHID    : B1JRP01
EDUID     : 3956                EDUNAME: db2agent (TSMDB1)
FUNCTION: DB2 UDB, database utilities, sqludPrintStartingMsg, probe:1292
DATA #1 : <preformatted>
Starting a full database restore.
Agent EDU ID: 3956
```

```
2009-02-10-09.50.21.051000-300 E8123213F483      LEVEL: Severe
PID       : 4608                TID  : 5080        PROC : db2syscs.exe
INSTANCE: SERVER1              NODE : 000
EDUID     : 5080                EDUNAME: db2bm.3956.1 (TSMDB1)
FUNCTION: DB2 UDB, database utilities, sqluWriteLogFile, probe:1498
MESSAGE : ZRC=0x850F000C=-2062614516=SQLO_DISK "Disk full."
          DIA8312C Disk was full.
```



```

DATA #1 : String, 46 bytes
F:\tivoli\tsm\Beta\sarch\RstDbLog\S0000262.LOG

2009-02-10-09.50.21.051000-300 E8124165F912      LEVEL: Severe
PID      : 4608                      TID   : 5080      PROC  : db2syscs.exe
INSTANCE: SERVER1                   NODE  : 000
EDUID    : 5080                      EDUNAME: db2bm.3956.1 (TSMDB1)
FUNCTION: DB2 UDB, database utilities, sqluWriteLogFile, probe:1500
MESSAGE  : SQL2581N  Restore is unable to extract log files or restore a log
           directory from the backup image to the specified path. Reason code "".
DATA #1 : SQLCA, PD_DB2_TYPE_SQLCA, 136 bytes
sqlcaid : SQLCA      sqlcabc: 136      sqlcode: -2581      sqlerrml: 1
sqlerrmc: 4
sqlerrp : sqluWrit
sqlerrd : (1) 0x00000000      (2) 0x00000000      (3) 0x00000000
           (4) 0x00000000      (5) 0x00000000      (6) 0x00000000
sqlwarn : (1)      (2)      (3)      (4)      (5)      (6)
           (7)      (8)      (9)      (10)     (11)
sqlstate:

```

From the preceding example we can see that during the restore attempt there was not enough disk space to place the needed log files from the backup operation.

3. Add disk space and rerun the operation.

Resolving a stopped uninstallation process

A stoppage during an IBM Tivoli Storage Manager uninstallation process might be caused by an expired DB2 password.

If the DB2 administrator's userid password is expired, the uninstallation process cannot complete. You must log in using the DB2 administrator's ID and reset the password, then uninstall Tivoli Storage Manager.

Resolving a stoppage or loop

A stoppage is a situation where the server does not start or complete a function and is not using any microprocessor power.

A stoppage might be just one session or process that is not processing, or it could be the entire Tivoli Storage Manager server not responding. A loop is a situation where no progress is being made, but the server is using a high amount of microprocessor power. A loop can affect just one session or process, or it could affect the entire Tivoli Storage Manager server.

You might collect documentation to resolve this type of problem, depending on whether the server is able to respond to commands. It is helpful to schedule the SHOW command list to run intermittently so that you can then see the behavior that precedes the stoppage situation.

- For a stoppage or a loop where the server can respond to commands, issue the following commands to help determine the cause of the stoppage:
 - QUERY SESSION f=d
 - QUERY PROCESS
 - SHOW RESQ
 - SHOW THREADS
 - SHOW DEADLOCK
 - SHOW TXNT
 - SHOW DBTXNT

- SHOW LOCKS
- SHOW LIBR
- SHOW MP
- SHOW SESS
- SHOW ASQ
- SHOW ASVOL
- SHOW DBV
- SHOW SSS
- SHOW CSV (do this only if the problem appears to be related to scheduling)
- In addition to the output from the listed commands, or in the case of a server that cannot respond to commands, collect a dump. The way that you collect a dump depends on the operating system.
 - For UNIX -type operating systems, issue the KILL -11 command on the dsmserv process to create a core file. The process ID to perform the kill is obtained by issuing the PS command.
 - For the Windows operating system, refer to the Microsoft Knowledge Base item 241245 at microsoft.com for instructions on installing and using the userdump.exe program to obtain a dump.
 - For the z/OS platform, issue the operating system DUMP command. The SDUMP options should specify RGN, LSQA, TRT, CSA, SWA, and NUC.

Related reference

“Resolving server stoppages” on page 38

If you know the source of your server stoppage, you can resolve several problems.

Issuing a process to resolve server problems

A server process is a task that is performed on the server. You can assign the task to perform a specific operation, such as migrating data from a storage pool to the next storage pool in the hierarchy. Issue the server processes to resolve problems that you are having with your server.

A process has the following general characteristics:

Process name

The name of the process as it appears in the process related messages.

Means of initiation

Server processes can be initiated in several ways. Typically, they are either an automated process on the server that might or might not be influenced by a server options or other setting, or they are started by a command.

Can run in foreground?

Many server processes can be run in the FOREGROUND or synchronously. Processes that run in the FOREGROUND can be initiated by a command using the WAIT=YES parameter. Commands that start server processes that do not allow the WAIT=YES parameter or those specified with WAIT=NO are run in the BACKGROUND or asynchronously.

Can run as multiple processes

Some server processes can initiate multiple processes simultaneously to accomplish the task.

Description

A description of what this task does.

See table Table 8 for the descriptions of the server processes.

Table 8. Tivoli Storage Manager server processes

| Process | Description | Information | Runs in the foreground or as a multiple process |
|--------------------|---|---|---|
| AUDIT VOLUME | Audit the contents of a volume to validate that the data can still be read and that the server database definitions describing the data are correct. | The audit is initiated by issuing the AUDIT VOLUME command. | |
| BACKUP DB | Back up the server database (FULL or INCREMENTAL). | The backup is initiated by issuing the BACKUP DB command. | The BACKUP DB can run as a synchronous process by specifying WAIT=YES. |
| BACKUP STGPOOL | Backup a primary server storage pool to a copy storage pool for the purpose of making duplicate copies of the data and potentially taking duplicate copies to an off-site location. | The backup is initiated by issuing the BACKUP STGPOOL command. | The BACKUP STGPOOL can run as a synchronous process by specifying WAIT=YES. BACKUP STGPOOL might be run using multiple concurrent processes. This is controlled by the MAXPROCESS parameter specified on the BACKUP STGPOOL command. |
| CHECKIN LIBVOLUME | Check a tape volume into a tape library. | The check-in is initiated by issuing the CHECKIN LIBVOLUME command. | |
| CHECKOUT LIBVOLUME | Check a tape volume out from a tape library. | The check-out is initiated by issuing the CHECKOUT LIBVOLUME command. | |

Table 8. Tivoli Storage Manager server processes (continued)

| Process | Description | Information | Runs in the foreground or as a multiple process |
|--------------------|---|---|---|
| EXPIRATION | Expire (delete) client backup and archive files from the server, based on the policies defined to manage those files. | You can run expiration automatically by specifying <code>EXPINTERVAL=<i>n</i></code> in the server options file, where <i>n</i> is any number other than zero. Expiration can also be initiated by issuing the <code>EXPIRE INVENTORY</code> command. Please note that it is not possible to have more than one expiration process running at a time, although you may have more than one thread running at one time. | The EXPIRATION command can run as a synchronous process by specifying <code>WAIT=YES</code> . |
| IMPORT | Import data from sequential media volumes or directly from another server using TCP/IP communication connections between the servers. | Import processing can be started by any of the following commands: <code>IMPORT ADMIN</code> , <code>IMPORT NODE</code> , <code>IMPORT POLICY</code> , and <code>IMPORT SERVER</code> . | |
| LABEL LIBVOLUME | Label one or more library volumes in a library. | Labeling is initiated by issuing the <code>LABEL LIBVOLUME</code> command. | |

Table 8. Tivoli Storage Manager server processes (continued)

| Process | Description | Information | Runs in the foreground or as a multiple process |
|--------------|--|--|--|
| MIGRATION | Migrate data from one storage pool to the next in the storage hierarchy. | Migration starts and stops, based on the HighMig and LowMig thresholds defined for the storage pool. Whenever UPDATE STGPOOL is issued, these values are reexamined and, if appropriate, MIGRATION is started. Otherwise, the server monitors the percentage utilization for non-migrated data in a storage pool, and as needed, it starts migration processing for that storage pool when the HighMig threshold is exceeded. You can also issue the MIGRATE STGPOOL command to manually start migration processing. | Migration might be configured to run multiple concurrent processes. This is controlled by the MIGPROCESS attribute of the storage pool and might be updated by issuing the UPDATE STGPOOL command. |
| MOVE DATA | Move data from one volume to other volumes in the same storage pool or to a different storage pool. | The move is initiated by issuing the MOVE DATA command. | The MOVE DATA command can run as a synchronous process by specifying WAIT=YES. |
| MOVE DRMEDIA | Manage the disaster recovery media by moving on site volumes off site, or by bringing off-site volumes back on site. Disaster recovery media is the database backup and storage pool backup volumes necessary to protect and recover the server. | The move is initiated by issuing the MOVE DRMEDIA command. | The MOVE DRMEDIA command can run as a synchronous process by specifying WAIT=YES. |
| MOVE MEDIA | Move volumes from a tape library to the overflow location to prevent a library from becoming full. | The move is initiated by issuing the MOVE MEDIA command. | |

Table 8. Tivoli Storage Manager server processes (continued)

| Process | Description | Information | Runs in the foreground or as a multiple process |
|-----------------|---|---|---|
| MOVE NODEDATA | Move all the data for the node or nodes specified to other volumes in the same storage pool or to a different storage pool. | The move is initiated by issuing the MOVE NODEDATA command. | The MOVE NODEDATA command can run as a synchronous process by specifying WAIT=YES. |
| PREPARE | Create a recovery plan file. | The recovery plan file is initiated by issuing the PREPARE command. | The PREPARE command can run as a synchronous process by specifying WAIT=YES. |
| RECLAMATION | Reclaim space from tape volumes by moving active data to other volumes and returning the volume back to empty and private, or else back to scratch. | The server monitors the RECLAMATION THRESHOLD defined for a storage pool. It starts a reclamation process for that storage pool to reclaim any eligible volumes if it determines that one or more eligible volumes exist. | |
| RESTORE STGPOOL | Restore all files for a given storage pool from a copy storage pool. | The restore is initiated by issuing the RESTORE STGPOOL command. | The RESTORE STGPOOL can run as a synchronous process by specifying WAIT=YES. RESTORE STGPOOL might be run using multiple concurrent processes. This is controlled by the MAXPROCESS parameter specified on the RESTORE STGPOOL command. |
| RESTORE VOLUME | Restore all files for a given volume from a copy storage pool. | The restore is initiated by issuing the RESTORE VOLUME command. | The RESTORE VOLUME command can run as a synchronous process by specifying WAIT=YES. RESTORE VOLUME might be run using multiple concurrent processes. This is controlled by the MAXPROCESS parameter specified on the RESTORE VOLUME command. |

Reading the process messages to determine the state of your server operations

Server processes, whether run in the foreground or background, will always issue a “process started” message and a “process ended” message in addition to the general process messages. You can use these messages to determine the status of your server operation.

Resolving the “process started” message

The server might run tasks as processes. Processes are assigned an identification message and report that they have started.

The reported start is issued in the following message:

ANR0984I Process *process_id* for *process_name* started in the *process_state* at *time*

The following list defines the variables from this message:

process_id

Numeric process identifier.

process_name

The name of the process.

process_state

BACKGROUND or FOREGROUND. If the process is running in the foreground, the command was issued with the **WAIT=YES** parameter. Foreground processing causes the administrative session that issued the command to wait until the processing completes. A process running in the background returns immediately to the administrative session that issued the command, indicating that a process was started while the process still runs. Processes running in the background might be monitored with the QUERY PROCESS command.

time The time that the process was started.

Resolving the “process ended” message

The “process ended” message that is issued varies, depending on whether or not the process needs to report information about no items or bytes processed, items and bytes processed, items processed, or just bytes processed.

Process ended

When a process completes and it does not have bytes or number of files to report, the following message is issued:

ANR0985I Process *process_id* for *process_name* running in the *process_state* completed with the *completion_state* at *time*

The following list defines the variables from this message:

process_id

Numeric process identifier.

process_name

The name of the process.

process_state

BACKGROUND or FOREGROUND. If the process is running in the foreground, the command was issued with the **WAIT=YES** parameter.

Foreground processing causes the administrative session that issued the command to wait until the processing completes. A process running in the background returns immediately to the administrative session that issued the command, indicating that a process was started while the process still runs. Processes running in the background might be monitored with the QUERY PROCESS command.

completion_state

SUCCESS or FAILURE

time The time that the process was started.

Process ended with items and bytes

When a process completes and has bytes and items processed to report, the following message is issued:

ANR0986I Process *process_id* for *process_name* running in the *process_state* processed *number_of_items* items for a total of *bytes_processed* bytes with a completion state *completion_state* at *time*

The following list defines the variables from this message:

process_id

Numeric process identifier.

process_name

The name of the process.

process_state

BACKGROUND or FOREGROUND. If the process is running in the foreground, the command was issued with the WAIT=YES parameter. foreground processing causes the administrative session that issued the command to wait until the processing completes. A process running in the background returns immediately to the administrative session that issued the command, indicating that a process was started while the process still runs. Processes running in the background might be monitored with the QUERY PROCESS command.

number_of_items

The number of items processed.

bytes_processed

The number of bytes processed.

completion_state

SUCCESS or FAILURE

time The time that the process was started.

Process ended with items

When a process completes and has items processed to report, the following message is issued:

ANR0987I Process *process_id* for *process_name* running in the *process_state* processed *number_of_items* items with a completion state *completion_state* at *time*

The following list defines the variables from this message:

process_id

Numeric process identifier.

process_name

The name of the process.

process_state

BACKGROUND or FOREGROUND. If the process is running in the foreground, the command was issued with the WAIT=YES parameter. Foreground processing causes the administrative session that issued the command to wait until the processing completes. A process running in the background returns immediately to the administrative session that issued the command, indicating that a process was started while the process still runs. Processes running in the background might be monitored with the QUERY PROCESS command.

completion_state

SUCCESS or FAILURE

time The time that the process was started.

Process ended with bytes

When a process completes and has bytes processed to report, the following message is issued:

ANR0988I Process *process_id* for *process_name* running in the *process_state* processed *bytes_processed* bytes with a completion state *completion_state* at *time*

The following list defines the variables from this message:

process_id

Numeric process identifier.

process_name

The name of the process.

process_state

BACKGROUND or FOREGROUND. If the process is running in the foreground, the command was issued with the WAIT=YES parameter. Foreground processing causes the administrative session that issued the command to wait until the processing completes. A process running in the background returns immediately to the administrative session that issued the command, indicating that a process was started while the process still runs. Processes running in the background might be monitored with the QUERY PROCESS command.

bytes_processed

The number of bytes processed.

completion_state

SUCCESS or FAILURE

time The time that the process was started.

Analyzing the process symptoms to resolve problems

The process symptoms sometimes can indicate where your errors occur.

The following process symptoms might be encountered:

- Insufficient space in a target copy storage pool
- Damaged file found on volume
- Files are not expired after reducing the number of versions that need to be kept
- Migration does not run for sequential media storage pool
- Migration only uses one process
- Process running slow

Analyzing the ANR1221E error message

The ANR1221E message appears in the form ANR1221E COMMAND: Process *processID* terminated - insufficient space in target copy storage pool.

Perform the following steps to resolve error message ANR1221E:

1. Issue the QUERY STGPOOL *stgpoolName* F=D command.
2. Issue the following SQL select statement from an administrative client to this server: "select *stgpool_name*,*devclass_name*,count(*) as 'VOLUMES' from volumes group by *stgpool_name*,*devclass_name*."
3. Compare the number of volumes reported by the select statement to the maximum scratch volumes allowed (as reported by the QUERY STGPOOL command). If the number of volumes reported by the select is equal to or exceeds the "Maximum Scratch Volumes Allowed," update the storage pool and allow more scratch volumes by issuing the UPDATE STGPOOL *stgpoolName* MAXSCR=*nn* command, where *stgpoolName* is the name of the storage pool to update and *nn* is the increased number of scratch volumes to make available to this copy storage pool.

Important: The tape library should have this additional number of scratch volumes available, or you need to add scratch volumes to the library prior to issuing this command and retrying the BACKUP STGPOOL operation.

Analyzing the ANR2317W error message

The ANR2317W error appears in the form "ANR2317W Audit Volume found damaged file on volume *volumeName*: Node *nodeName*, Type *fileType*, File space *fileSpaceName*, fsId *fileSpaceID*, File name *fileName* is number *version* of *totalVersions* versions."

Perform the following steps to resolve error message ANR2317W:

1. Issue the QUERY VOLUME *volumeName* F=D command.
2. Issue the following SQL select statement from an administrative client to this server: "select* from VOLHISTORY where VOLUME_NAME='volume_name' AND TYPE='STGNEW.'" The results of the QUERY VOLUME command indicate when this volume was last written. The information from the SELECT operation reports when this volume was added to the storage pool. Often, AUDIT VOLUME might report files as damaged because, at the time that the data was written, the hardware was malfunctioning and did not write the data correctly, even though it reported to the Tivoli Storage Manager server that the operation

was successful. As a result of this device malfunction, many files on many different volumes might be affected. Perform the following steps to resolve this issue:

- a. Evaluate the system error logs or other information about this drive to determine if it still reports an error. If errors are still reported, they must first be resolved. To resolve a hardware issue, work with the hardware vendor to correct the problem.
- b. If this storage pool is a copy of a storage pool volume, simply delete this volume using the `DELETE VOLUME volumeName DISCARDDATA=YES` command. The next time a storage pool backup is run for the primary storage pool or storage pools where this damaged data resides, it will be backed up again to this copy storage pool and no further action is necessary.
 - If this storage pool is a primary storage pool volume and the data was written directly to this volume when the client stored the data, then it is likely that there are no undamaged copies of the data on the server. If possible, back up the files again from the client.
 - If this storage pool is a primary storage pool volume but the data was put on this volume by `MIGRATION`, `MOVE DATA`, or `MOVE NODEDATA`, there might be an undamaged copy of the file on the server. If the primary storage pool that contained this file was backed up to a copy storage pool prior to the `MIGRATION`, `MOVE DATA`, or `MOVE NODEDATA` then an undamaged file might exist. If an undamaged file exists, issue the `UPDATE VOLUME volumeName ACCESS=DESTROYED` command and then issue `RESTORE VOLUME volumeName` command to recover the damaged files for this volume from the copy storage pool.

Files are not expired after reducing versions

You might encounter an error after you update the server policies to reduce the number of versions of a file to retain.

Issue the `QUERY COPYGROUP domainName policySetName copyGroupName F=D` command. If either the “Versions Data Exists” or “Versions Data Deleted” parameters were changed for a `TYPE=BACKUP` copy group, it might affect expiration.

If the “Versions Data Exists” or “Versions Data Deleted” values for a `TYPE=BACKUP` copy group were reduced, the server expiration process might not immediately recognize this fact and expires these files. The server only applies the “Versions Data Exists” and “Versions Data Deleted” values to files at the time they are backed up to the server. When a file is backed up, the server will count the number of versions of that file and if that exceeds the number of versions that should be kept, the server will mark the oldest versions that exceed this value to be expired.

Process symptoms indicate migration errors

You might be faced with process symptoms that point to migration as the cause for errors.

Migration does not run for sequential media storage pool

If migration does not run for sequential media storage pools, issue the QUERY STGPOOL *stgpoolName* F=D command.

Migration from sequential media storage pools calculates the “Pct. Util” as the number of volumes in use for the storage pool, relative to the total number of volumes that can be used for that storage pool. Similarly, it calculates the “Pct. Migr” as the number of volumes with data, that can be migrated, in use for the storage pool, relative to the total number of volumes that can be used for that storage pool. Because it might be considering unused scratch volumes in this calculation, there might not appear to be sufficient data, that can be migrated in the storage pool to require migration processing.

Migration uses only one process

Issue the QUERY STGPOOL *stgpoolName* F=D and QUERY OCCUPANCY * * STGPOOL= *stgpoolName* command.

The following reasons show why only one migration process is running:

- The Migration Processes setting for the storage pool is set to one or is not defined (blank). If true, issue the UPDATE STGPOOL *stgpoolName* MIGPROCESS=*n* command, where *n* is the number of processes to use for migrating from this pool. Note that this value must be less than or equal to the number of drives (mount limit) for the NEXT storage pool where migration is storing data.
- If the QUERY OCCUPANCY command only reports a single client node and file space in this storage pool, migration can only run a single process even if the Migration Processes setting for the storage pool is greater than one. Migration processing is partitioning data, based on client node and file space. In order for migration to run with multiple processes, data for more than one client node needs to be available in that storage pool.

Resolving storage pool issues

Storage pools are integral to a successful server operation. The Tivoli Storage Manager database contains information in storage pools about registered client nodes, policies, schedules, and the client data. This information must be available and valid in order for the Tivoli Storage Manager to function correctly.

Storage pool errors can be related to the following issues:

- Failed transactions
- A storage pool experiencing a high volume usage after increasing MAXSCRATCH value
- A storage pool having “Collocate?=Yes” but volumes still containing data for many nodes
- Unable to store data in an active data pool by using simultaneous write or by issuing the COPY ACTIVATEDATA command

“ANR0522W Transaction failed...” message received

The ANR0522W message is displayed when the server is unable to allocate space in the storage pool that is identified to store data for the specified client. There are a number of possible causes for running out of space in a storage pool.

Perform the following procedures to resolve the space allocation error:

1. Issue `QUERY VOLUME volname F=D` for the volumes in the referenced storage pool. For any volumes reported with access different from Read/Write, check that volume. A volume might be marked Read/Only or Unavailable because of a device error. If the device error was resolved, issue the `UPDATE VOLUME volname ACCESS=READWRITE` command to allow the server to select and try to write data to that volume.
2. Issue `QUERY VOLUME volname` for the volumes in the referenced storage pool. Volumes that report “pending” for the volume status are volumes that are empty but waiting to be reused again by the server. The wait time is controlled by the `REUSEDELAY` setting for the storage pool and displayed as “Delay Period for Volume Reuse” on the `QUERY STGPOOL` command. Evaluate the `REUSEDELAY` setting for this storage pool and, if appropriate (based upon your data management criteria), lower this value by issuing the `UPDATE STGPOOL stgpoolname REUSEDELAY=nn` command, where *stgpoolname* is the name of the storage pool and *nn* is the new reuse delay setting. The key to getting the data collocated is to have sufficient space in the target storage pool for the collocation processing to select an appropriate volume. Having sufficient space in the target storage pool is significantly influenced by the number of scratch volumes in a storage pool.

Storage pool experiences high volume usage after increasing MAXSCRATCH value

For collocated sequential storage pools, increasing the `MAXSCRATCH` value might cause the server to use more volumes.

The server uses more storage pool volumes in this case because of the collocation processing. Collocation will group user data for a client node onto the same tape. During a client backup or archive operation, if no tapes currently have data for this client node, the server selects a scratch volume to store the data. Then, for other client nodes storing data, it makes the same decision when selecting a volume and again selects a scratch volume. The reason that scratch volumes are not selected prior to changing the `MAXSCRATCH` setting is that if there is no scratch volume available and no preferred volume already assigned for this client node, the volume selection processing on the server ignores the collocation request and stores the data on an available volume.

Storage pool has “Collocate?=Yes” but volumes still contain data for many

The two possible reasons for this message are that data was stored on volumes in this storage pool prior to setting “Collocate=Yes” or the storage pool ran out of scratch tapes and stored data on the best possible volume, even though it ignored the request to collocate.

If data for multiple nodes ends up on the same volume for a storage pool with “Collocate=Yes,” this situation can be corrected by one of the following actions:

- Issue the `MOVE DATA` command for the volume or volumes affected. If scratch volumes are available or volumes with sufficient space are assigned to this client

- node for collocating their data, the process reads the data from the specified volume and moves it to a different volume or volumes in the same storage pool.
- Allow migration to move all the data from that storage pool by setting the HIGHMIG and LOWMIG thresholds to accomplish this outcome. By allowing migration to migrate all data to the NEXT storage pool, the collocation requirements are honored, provided that the NEXT storage pool is set to “Collocate=Yes,” it has sufficient scratch volumes, and it is assigned volumes to satisfy the collocation requirements.
- Issue MOVE NODEDATA for the client nodes whose data resides in that storage pool. If scratch volumes are available or volumes with sufficient space are assigned to this client node for collocating their data, the MOVE NODEDATA process reads the data from the volumes that this node has data on and move it to a different volume or volumes in the same storage pool.

The key to getting the data collocated is to have sufficient space in the target storage pool for the collocation processing to select an appropriate volume. Selecting an appropriate volume is significantly influenced by the number of scratch volumes in a storage pool. Another alternative is to explicitly define more volumes to the storage pool by issuing the DEFINE VOLUME command. Again, the key is to have candidate empty volumes for collocation to use rather than using a volume that already has data on it for a different node.

Resolving active data pool, storage issues

You might experience difficulty in storing data in an active data pool by using simultaneous write or by issuing the COPY ACTIVEDATA command.

Before data can be stored in an active data pool, you must establish a policy to allow the data into the pool. The node that owns the data must be assigned to a domain whose active data pool is listed in the domain ACTIVEDESTINATION field. Issue the following command to determine if the node is assigned to a domain that authorizes storing into the active data pool: `QUERY NODE node_name F=D`

The Policy Domain Name field lists the domain to which the node is assigned. Issue the following command to determine if the active data pool is listed in the domain ACTIVEDESTINATION field: `QUERY DOMAIN domain_name F=D`

If the active data pool is not listed, issue the following command to add the active data pool to the list: `UPDATE DOMAIN domain_name ACTIVEDESTINATION=active-data_pool_name`

Note: After you issue the `UPDATE DOMAIN domain_name ACTIVEDESTINATION=active-data_pool_name` command, all nodes assigned to the domain are authorized to store data in the active data pool. If having the nodes assigned to the domain authorized to store data is not acceptable, you must create a new domain for those nodes whose data you want stored in the active data pool and assign those nodes to the newly created domain. See the Tivoli Storage Manager Administrator’s Guide to learn how to establish a new policy domain.

Chapter 3. Resolving communication problems

The need for connectivity in Tivoli Storage Manager means that any communication error can render your application useless. Communication errors might be attributed to TCP/IP configuration, client and server connections, and other causes.

Resolving errors created when connecting to the server

Problems that are generated while you are connecting to the server might be related to your communication options.

To correct the error, perform any or all of the following options:

- Review the changes in the client communication options in the client option file (if they exist) and try to revert back to the previous values. Retry the connection.
- If the server communication settings were changed, either update the client communication options to reflect the changed server values or revert the server back to its original values.
- If any network settings were changed, such as the TCP/IP address for the client or server (or a firewall), work with the network administrator to update the client, server, or both for these network changes.

Resolving failed connections by clients or administrators

The two main cases for connection failures are general failure, where no connections at all are allowed, or an isolated failure where some connections are allowed but others fail. If no connections at all are possible, it might be necessary to run the server in the foreground so that a server console is available, and additional diagnostic steps can be taken.

Check the settings to verify the proper configuration for communicating with the server:

- Ensure that the server is able to bind to a port when it is started. If it is unable to bind to a port, then it is likely that some other application is using that port. The server can not bind (use) a given TCP/IP port if another application is already bound to that port. If the server is configured for TCP/IP communications and successfully binds to a port on startup for client sessions, the following message is issued:

`ANR8200I TCP/IP driver ready for connection with clients on port 1500.`

If the server is configured for HTTP communications for administrative session and successfully binds to a port on startup, the following message is issued:

`ANR8280I HTTP driver ready for connection with clients on port 1501.`

If a given communication method is configured in the server options file, but a successful bind message is not issued during server startup, then there is a problem initializing for that communication method.

- Verify that the code TCPPORT setting in the server options file is correct. If the code setting is inadvertently changed, the clients fail to connect. That is because the clients are trying to connect to a different TCP/IP port than the one the server is listening on.

- If multiple servers are using the same TCP/IP address, ensure that the TCPSPORT and TCPADMINPORT for each server are unique. For example, there are two servers at the same TCP/IP address. The first server has a TCPSPORT of 1500 and a TCPADMINPORT of 1500. The second server has a TCPSPORT of 1501 and a TCPADMINPORT of 1500. The first server to grab port 1500 locks out the other server from port 1500 and clients can no longer access the first server. Administrative clients always connect to the second server. A better choice of ports for each server would be 1500 and 1501 for TCPSPORT; 1510 and 1511 for TCPADMINPORT.
- Check that the server is enabled for sessions. Issue the QUERY STATUS command and verify that “Availability: Enabled” is set. If the result states “Availability: Disabled,” issue the ENABLE SESSIONS command.
- If specific clients are unable to connect to the server, check the communication settings for those clients. For TCP/IP, check the TCPSERVERADDRESS and TCPSERVERPORT options in the client options file.
- If only a specific node is rejected by the server, verify that the node is not locked on the server. Issue the QUERY NODE *nodeName* command, where *nodeName* is the name of the node to check. If the result states “Locked?: Yes,” then evaluate why this node is locked. Nodes can only be locked by using the LOCK NODE administrative command. If it is appropriate to unlock this node, issue the UNLOCK NODE *nodeName* command, where *nodeName* is the name of the node to unlock.
- If the computer that the server is running on is having memory or resource allocation problems, it might not be possible to start new connections to the server. The memory or resource allocation problem might be cleared up temporarily if you either halt and restart the server, or if you halt and restart the computer itself. This action is a temporary solution, and diagnosis should be continued for either the operating system or the Tivoli Storage Manager server because the memory and resource allocation problem might indicate an error in either.

Determining SSL errors

Secure sockets layer (SSL) errors might be attributed to an incorrect environment setup, a bad server certificate, connection problems, or other causes.

The common SSL errors are shown in the following list:

Unable to run gsk7capiCmd.exe

In most cases this Windows error is generated by an incorrect environment setup. Please refer to your *Users Guide* and set up the PATH variable as directed, before running the gsk7capiCmd utility.

ANS1595E Bad server certificate

This error is reported when the server certificate is not known to the client. The “bad server certificate” error can occur under the following conditions:

- The certificate was never imported
- The certificate file (cert.arm) was corrupted before being imported
- The command to import the certificate was entered incorrectly
- The DSM_DIR variable points to wrong directory, which contains an incorrect client key database (dsmcert.kdb)

Repeat all of the steps necessary for importing the server certificate and check the DSM_DIR variable. Refer to the client error log for more

information about the failure. The client error log might also contain information about specific GSKit failure.

ANS1592E Failed to initialize SSL protocol

This general error occurs on the client and indicates that the SSL connection could not be established. See the client error log for more information on the failure. One of the most common situations that lead to this error message is when the server does not accept SSL sessions on the port to which the client is trying to connect. Determine if the client points to the correct server port (TCPPort), which in most cases is a different port than the default 1500.

ANR8583E and GSKit return code 406

This error might indicate that a non-SSL enabled client is trying to contact an SSL port. When a client contacts a Tivoli Storage Manager server at a port defined by SSLTCPPORT or SSLTCPADMINPORT, the server establishes a session and initiates an SSL “handshake.” If the client is not SSL-enabled, it cannot complete the SSL handshake process. The session then appears to stop but will timeout through the server IDLEWAIT option, or end when the server administrator issues the CANCEL SESSION command to manually cancel it. The following example illustrates a session in this state, from the server:

```
TSM:SERVER1>query session
ANR2017I Administrator SERVER_CONSOLE issued command: QUERY SESSION
```

| Sess Number | Comm. Method | Sess State | Wait Time | Bytes Sent | Bytes Recvd | Sess Type | Platform | Client Name |
|----------------|-----------------|---------------|--------------|---------------|----------------|--------------|----------|-------------|
| 1 | SSL | IdleW | 17 S | 0 | 0 | Node | | |

Important: Because the computing environment could cause a valid handshake process to take some time, do not assume that the above output always indicates a non-SSL client.

ANR8583E and GSKit return code 420, and ANR8581E with GSKit return code 406 occur for the same Tivoli Storage Manager client session

When Tivoli Storage Manager server messages ANR8583E with GSKit return code 420 and ANR8581E with GSKit return code 406 occur for the same client session, it is likely that the client has generated an ANS1595E message while attempting to establish a session with the server. If true, follow the guidance in the Tivoli Storage Manager message manual for ANS1595E to eliminate these errors.

Related reference

Appendix D, “IBM Global Security Kit return codes,” on page 225
Version 6.1 of the IBM Tivoli Storage Manager uses the IBM Global Security Kit (GSKit) Version 7.0.4.17 on AIX and Windows for Secure Sockets Layer (SSL) processing between the Tivoli Storage Manager server and the backup-archive client. Some messages issued for SSL processing include GSKit return codes.

SAN device mapping errors

The errors that are most often generated during storage area network (SAN) device mapping can be related to SAN discovery, SAN device malfunction, libraries that are not valid, and other SAN-related issues.

ANR1745I: Unable to discover SAN devices. Function is busy.

This error message appears if there is another active SAN discovery.

The Tivoli Storage Manager server is not able to perform SAN discovery. Retry again after the other SAN discovery is completed.

ANR1786W, ANR1787W or ANR1788W

You might see error messages ANR1786W, ANR1787W, or ANR1788W due to a problem with SAN discovery. The following three messages usually indicate that the HBAAPI library is not working in general:

- ANR1786W HBAAPI not able to get adapter name
- ANR1787W Not able to open adapter *adaperName*
- ANR1788W Not able to get the adapter attributes for *adapterName*

If the result is that the Tivoli Storage Manager server is unable to perform SAN discovery, go to <http://www.ibm.com/software/sysmgmt/products/support/IBMTivoliStorageManager.html> to verify that the host bus adapter (HBA) driver is up-to-date and at a supported level.

ANR1789W Get HBA target mapping failed

Error message ANR1789W is the most common HBAAPI error on the SAN.

“Get HBA target mapping failed” means that the HBA encountered an error while gathering device mapping information by sending various SCSI commands.

Verify that all SAN devices are working properly (e.g. a SAN Data Gateway could be hung and need to be rebooted). If all devices appear functional, verify the firmware of device on the SAN, as well as HBA driver, are at the appropriate levels. If the result is that the Tivoli Storage Manager server is not able to perform SAN discovery, go to <http://www.ibm.com/software/sysmgmt/products/support/IBMTivoliStorageManager.html> to verify that the HBA driver is up-to-date and at a supported level. For IBM tape devices, make sure the latest firmware is installed. Firmware prior to 4772 for IBM 3580 tape devices caused problems with Qlogic HBAAPI.

ANR1790W SAN discovery failed

Error message ANR1790W is a general message indicating that the HBAAPI function failed and we cannot perform SAN discovery.

Verify that all SAN devices are working properly (e.g. a SAN Data Gateway could be hung and need to be rebooted). If all devices appear functional, verify that the firmware of device on the SAN, as well as the HBA driver, are at the appropriate levels.

For IBM tape devices, make sure the latest firmware is installed. Firmware prior to 4772 for IBM 3580 tape devices causes problems with Qlogic HBAAPI.

ANR1791W HBAAPI wrapper library xxxxx failed to load or is missing

The HBAAPI wrapper library is used by the Tivoli Storage Manager server to communicate with the SNIA HBAAPI.

The HBAAPI wrapper libraries are in the same directory as the Tivoli Storage Manager executable file (unless full path is given as shown below). The following list shows the HBA wrapper files shipped with the Tivoli Storage Manager server package (except on AIX and Linux zSeries®). Error message ANR1791W indicates that the HBAAPI wrapper file is either missing or could not be loaded by the Tivoli Storage Manager. Verify that the wrapper file is in the same directory as the Tivoli Storage Manager executable file. The HBAAPI wrapper library files are shown in the following list:

- Windows: hbaapi.dll
- AIX: /usr/lib/libhbaapi.a (provided by AIX with HBAAPI installation)
- 32-bit Linux: libhbaapi32.so
- 64-bit Linux: libhbaapi64.so
- 64-bit Solaris: libhbaapi64.so

The result is that the Tivoli Storage Manager server is not able to perform SAN discovery.

ANR1792W HBAAPI vendor library failed to load or is missing

Error message ANR1792W indicates that the vendor's library file failed to load. Verify the validity of the library files.

UNIX systems (except on Linux zSeries) store their HBAAPI libraries in the location specified by the /etc/hba.conf file, and Windows file are stored in the C:\winnt\system32 directory. The following examples are of vendor library files:

- C:\winnt\system32\qlsdm.dll (QLogic's Windows file)
- /usr/lib/libHBAAPI.a (Emulex's AIX file)
- /usr/lib/libqlsdm.so (Qlogic's Linux file)
- /usr/lib/libemulexhbaapi.so (Emulex's Linux 32-bit file)
- /usr/lib64/libemulexhbaapi.so (Emulex's Linux 64-bit file)
- /usr/lib/libqlsdm.so (Qlogic's Solaris file)
- /opt/JNIsnia/Solaris/Jni/64bit/JniHbaLib.so (JNI's Solaris file)

The result is that the Tivoli Storage Manager server is not able to perform SAN discovery.

ANR1793W Tivoli Storage Manager SAN discovery is not supported on this platform or this version of OS

Error message ANR1793W is only displayed if the Tivoli Storage Manager attempts a SAN device mapping or device discovery operation on an unsupported operating system. The following platforms are not currently supported by SAN device mapping or device discovery:

- HP-UX
- 64-bit Windows 2003

- AIX versions that are not 52L or 53A. Support for SAN device mapping and device discovery on AIX requires either version 52L (fileset level of 5.2.0.50) or 53A (fileset level of 5.3.0.10) or higher.

The result is that the Tivoli Storage Manager server is not able to perform SAN discovery.

ANR1794W Tivoli Storage Manager SAN discovery is disabled by options

Error message ANR1794W indicates that the SAN discovery on the Tivoli Storage Manager server is disabled.

The SAN discovery can be disabled or enabled by issuing the following server commands:

setopt SANDISCOVERY OFF and setopt SANDISCOVERY PASSIVE

These two commands disable the SAN discovery. The Tivoli Storage Manager server is not able to correct the device path automatically if the path was changed. This command only has to be issued once.

The difference between these two commands is that SANDISCOVERY OFF polls the device and marks the inactive path off-line. SANDISCOVERY PASSIVE does not poll the device and does not mark the inactive path off-line.

setopt SANDISCOVERY ON

This command enables the SAN discovery. The above setopt SANDISCOVERY command can be issued as many times as necessary.

Another way to disable/enable SAN discovery is to put the following option in the dsmserv.opt file:

SANDISCOVERY OFF or SANDISCOVERY PASSIVE

These two commands can disable the SAN discovery.

SANDISCOVERY ON

This command enables the SAN discovery.

SANDISCOVERY is defaulted to ON for Windows platform. SANDISCOVERY is defaulted to OFF for all non-Windows platforms.

Go to <http://www.ibm.com/software/sysmgmt/products/support/IBMTivoliStorageManager.html> to verify the platform/HBA vendor/driver level support level prior to setting SANDISCOVERY ON to enable the SAN discovery.

ANR2034E QUERY SAN: No match found using this criteria

Error message ANR2034E is issued when the Tivoli Storage Manager server tries to collect configuration information for the SAN and finds nothing.

The result is that the Tivoli Storage Manager server is unable to perform SAN discovery.

The following list displays a number of possible reasons for not finding information about the SAN:

- The platform or OS level is unsupported.
- This environment is not a SAN environment.

- There may be a problem with the SAN.
- HBAAPI may return the zero value of the number of HBAs on the system.
- HBAAPI may return the zero value of the number of devices on the system.

Perform the following tasks to find the SAN configuration information:

- Check the fibre-channel HBA driver and make sure it is installed and enabled.
- Check the HBA driver level to make sure that it is up-to-date.
- Use the HBA vendor's utility to check for any reported fibre-channel link problems.
- Uninstall and then install the HBA driver. If there is an issue with the HBA configuration, device driver, or compatibility, sometimes uninstalling and re-installing it corrects the problem.
- Check the fibre-channel cable connection to the HBA.
- Check the fibre-channel cable connection from the HBA to the SAN device (switch, data gateway, or other device).
- Check the GBIC.
- On the SAN device (switch, data gateway, or other device) try a different target port. Sometimes the SAN devices may have a specific port failure.
- Halt the Tivoli Storage Manager server, restart the machine, and restart the server. If there were configuration changes in the SAN, sometimes the operating system, device driver, or HBA requires a machine restart before they can communicate with the SAN.
- Recycle the destination port on the SAN device.
- Re-seat the HBA card.
- Replace the HBA.

ANR8226E Error detecting version of HBA-API library

Error message ANR8226E is only displayed for AIX.

The server attempted to determine the level of the `devices.common.IBM.fc.hba-api` fileset and encountered an error. Error message ANR8226E indicates that an error was encountered while trying to detect the HBA-API libraryFileset version on AIX.

The result is that the Tivoli Storage Manager server is not able to perform SAN discovery.

ANR8227E Fileset `devices.common.IBM.fc.hba-api` is not at the required level

Error message ANR8227E is only displayed for AIX.

Due to problems in AIX HBAAPI code, the minimum fileset `devices.common.IBM.fc.hba-api` level needed for successful SAN discovery are shown in the following list:

- AIX52 - Need 5.2.0.50
- AIX53 - Need 5.3.0.10

The server specified that the file set `devices.common.IBM.fc.hba-api` is at a level that is incompatible with Tivoli Storage Manager operations. Install the latest maintenance for this file set if you use SAN devices.

The result is that the Tivoli Storage Manager server is not able to perform SAN discovery.

Related reference

“SAN device mapping hints and tips” on page 204

Storage area network (SAN) device discovery and device mapping are supported on Windows 2000, Windows 2003 (32 bits), AIX, Solaris, and Linux (except Linux zSeries).

SAN devices are missing from the display of QUERY SAN server command

The possible reasons for the QUERY SAN server command not displaying all the devices can be due to configuration or vendor support issues.

Refreshing the SAN configuration

The QUERY SAN server command might not be displaying all the devices because of the storage area network (SAN) configuration.

You might have to refresh the SAN because the configuration was changed (add/remove device) and the system configuration needs to be updated.

Update configuration on AIX:

For IBM devices:

Issue the `cfgmgr` command to configure new devices and view the new configuration. The special file name for IBM tape devices (not the Tivoli Storage Manager devices) is `/dev/rmtX` for tape drives and `/dev/smcX` for medium changers.

Tip: Special file name: `/dev/rmt0`, `/dev/smc0`

For the Tivoli Storage Manager devices:

To update the special files, use **smitty** → **devices** → **Tivoli Storage Manager Devices** → **remove all defined devices**, then **discover devices supported by Tivoli Storage Manager**. The special file name is `/dev/mtX` for tape drives and `/dev/lbX` for medium changers.

Tip: Special file name: `/dev/mt0`, `/dev/lb0`

Note: Alternatively, reinstalling the IBM device driver. Tivoli Storage Manager device driver updates all the current special file name.

Update configuration on Windows:

With the plug and play, the Windows registry is updated and the device name might change without the need to restart the computer or having the device driver's involvement. The Tivoli Storage Manager server detects the change in a special file name and updates the new special file name when it accesses the tape devices (during server initialization or normal operation). The correct device name is updated in the Tivoli Storage Manager database. The special file name is `/dev/mtA.B.C.D` for both Tivoli Storage Manager devices and IBM devices, and `/dev/lbA.B.C.C` for both Tivoli Storage Manager devices and IBM medium changers. The special file name `TapeX` is only for IBM tape drives and `ChangerX` is only for IBM medium changes.

Tip: Special file name: `mt0.1.0.0`, `lb0.0.1.0`, `Tape0`, and `Changer0`.

Update configuration on Linux:

The host bus adapter (HBA) gets the most up-to-date configuration information as a result of the RSCN. Sometimes, the computer must be restarted to be able to pick up the configuration changes.

For IBM devices:

Issue the `lin_taped` command to reconfigure devices. The device information can be retrieved from the `/proc/scsi/IBMTape` file for tape devices and `/proc/scsi/IBMchanger` file for medium changers. The special file name is `/dev/IBMTapeX` for tape devices and `/dev/IBMChangerX` for medium changers.

Tip: Special file name: `/dev/IBMTape0`, `/dev/IBMChanger0`

For the Tivoli Storage Manager devices:

Users can issue `autoconf`, the Tivoli Storage Manager device driver auto configure script. This script resides in the `/opt/tivoli/tsm/devices/bin` directory (or in the same directory as the `tsmscsi` file) to be able to configure devices and get all the current special file names and device information. The device special file name is `/dev/mtX` for tape devices and `/dev/lbX` for medium changers.

Tip: Special file name: `dev/tsmscsi/mt0`, `/dev/tsmscsi/lb0`

Note: Alternatively, reinstalling the IBM device driver. Tivoli Storage Manager device driver updates all the current special file names.

With the Linux pass-thru device driver for the Tivoli Storage Manager devices, the HBA driver and the generic driver must be reloaded to get all the current special file names. You have to run the `autoconf` script so that the Tivoli Storage Manager device driver can create configuration files (`/dev/tsmscsi/lbinfo` and `/dev/tsmscsi/mtinfo`). These files are used by the Tivoli Storage Manager server to create the special file names after each SAN discovery.

32 bits (Linux xSeries®)

Ensure that the HBAAPI wrapper library `libhbaapi32.so` is in the same directory as `dsmserv` or in the `/opt/tivoli/tsm/server/bin` directory.

64 bits (Linux pSeries®)

Ensure that the HBAAPI wrapper library `libhbaapi64.so` is in the same directory as `dsmserv` or in the `/opt/tivoli/tsm/server/bin` directory.

64 bits (Linux zSeries)

Ensure that the pseudo-HBAAPI wrapper library `libhbaapi64.so` is in the same directory as `dsmserv` or in the `/opt/tivoli/tsm/server/bin` directory. The wrapper library, `libhbaapi64.so`, is a link to the `/usr/lib64/libzfcphbaapi.so` file.

Update the configuration on Solaris:

The HBA gets the most up-to-date configuration information as result of the RSCN. Most of the time, the computer must be restarted to pick up the configuration changes. Reinstall the IBM device driver package or the

Tivoli Storage Manager device driver package and run `autoconf`, or issue the `rem_drv` and `add_drv` commands to reconfigure devices and update the special file name:

For IBM devices:

The IBM device driver has already completed configuring the devices after installing the device driver package. The `/opt/IBMtape/tapelist -l` command can show all IBM device information on the system. The special file name is `/dev/rmt/Xst` for tape devices and `/dev/rmt/Xsmc` for medium changers.

Tip: Special file name: `/dev/rmt/0st`, `/dev/rmt/0smc`

For Tivoli Storage Manager devices:

Modify `/usr/kernel/drv/mt.conf` and `/usr/kernel/drv/lb.conf` and ensure that `name="mt" parent="pseudo" instance=16383`; and `name="lb" parent="pseudo" instance=16383`; are not commented out in the `mt.conf` and `lb.conf` files. Ensure that each entry for a device in `/usr/kernel/drv/lb.conf` and `/usr/kernel/drv/mt.conf` is correct. After running `autoconf`, device information can be found in the `mtinfo` and `lbinfo` files in the `/opt/tivoli/tsm/devices/bin` directory or the same directory as the `autoconf` script. The special file name is `/dev/rmt/Xmt` for tape drives and `/dev/rmt/Xlb` for medium changers.

Tip: Special file name: `/dev/rmt/0mt`, `/dev/rmt/0lb`

Important:

Ensure that the two pseudo devices, `/devices/pseudo/mt@16383:tsmmtctl` and `/devices/pseudo/lb@16383:tsmlbctl`, are in the `/devices/pseudo` directory.

Ensure that the pseudo device special files, `/dev/tsmmtctl` and `/dev/tsmlbctl` are linked to their corresponding pseudo devices in `/devices/pseudo/mt@16383:tsmmtctl` and `/devices/pseudo/lb@16383:tsmlbctl`.

Resolving configuration problems that cause SAN device absence

The possible reasons for the `QUERY SAN` server command not displaying all the devices can be due to a configuration problem with the HBA hardware, HBA driver level, or OS level.

Perform the following steps to resolve your configuration issues:

1. Go to <http://www.ibm.com/software/sysmgmt/products/support/IBMTivoliStorageManager.html> to verify the platform/HBA vendor/driver level support level to make sure the HBA driver level and OS level are compatible and supported by IBM Tivoli for SAN discovery.
2. Use the HBA vendor utility to check to see if the device can be seen by the HBA. If the device is not seen by the HBA, the device might not be connected. Check the Fibre Channel or SCSI cable. If the device is seen by the HBA, check the HBA driver version. This driver version might have problems with the HBA API.

Verifying vendor support for any particular device in the SAN

Many devices or combinations of devices might not be supported in a given storage area network (SAN). These limitations arise from the ability of a given vendor to certify their device using Fibre Channel Protocol.

For a given device, verify with the device vendor that it is supported in a SAN environment. Vendor support includes all hardware associated with the SAN, which means verifying that this device is supported with the vendors of the HBAs, hubs, gateways, and switches that make up the SAN environment.

Chapter 4. Resolving Administration Center problems

The Administration Center is a Web-based interface that can be used to centrally configure and manage Tivoli Storage Manager servers. You can resolve Administration Center errors through several methods, such as establishing a connection to a Tivoli Storage Manager server, reinstalling the Integrated Solutions Console, or by reviewing the log files that are generated during an error.

Re-establishing a connection between the Administration Center and a Tivoli Storage Manager server

If you have a problem establishing a connection to a Tivoli Storage Manager server, use the Administration Center to isolate or resolve the problem.

Perform the following steps to establish a connection between the Administration Center and a Tivoli Storage Manager server:

1. Determine if the computer is accessible over the network. Issue the PING command in a command prompt or shell or try connecting using Telnet or FTP. If the computer is not accessible over the network, the computer is down or there is a network communication error. Use the same TCP/IP address entered in the Administration Center.
2. Determine if the Tivoli Storage Manager server is running. If the server is not running, the Administration Center will not be able to establish a connection to it.
3. Try connecting to the Tivoli Storage Manager server by using the administrative client. Use the same connection settings as in the Administration Center (TCP/IP address, TCP/IP port, administrator ID, administrator password). This method is the quickest way to determine if the problem is on the Tivoli Storage Manager server computer or on the computer running the Administration Center. If both the Tivoli Storage Manager server and the Administration Center are running on the same computer, skip this step and go to the directory where the administrative client is installed. Issue DSMADMC with parameters matching those in the connection settings for the Administration Center.

```
dsmadmc -id=<admin id> -pass=<admin password> -tcpport=<TCP/IP port>  
-tcps=<TCP/IP address>
```

4. Determine what port the Tivoli Storage Manager server is using. You can issue the QUERY OPT TCPPORT command on the server to determine the server port. Make sure the port used in the Administration Center is the same port on which the server is running. Go to the directory where the administrative client is installed. Issue DSMADMC with parameters matching those in the connection settings for the Administration Center. This command can also be issued from the server console.

```
dsmadmc -id=<admin id> -pass=<admin password> -tcpport=<TCP/IP port>
```

```
-tcps=<TCP/IP address>
```

```
tsm:SERVER1>QUERY OPT TCPPORT
```

| Server Option | Option Setting |
|---------------|----------------|
| ----- | ----- |
| TCPPort | 1500 |

```
tsm: SERVER1>
```

5. Determine if the computer you are attempting to access is behind a firewall. If the computer running the Tivoli Storage Manager server is behind a firewall, then the computer running the Administration Center must be authenticated to the firewall. Try using the computer running the Administration Center to connect to the computer running the Tivoli Storage Manager server. Use ping, Telnet, or FTP. If these methods do not work, try connecting to another computer under the same firewall as the server computer.
6. Determine if the TCP/IP address for the Tivoli Storage Manager server is entered correctly in the Administration Center. Select **Modify Server Connection** from the drop-down list to view the current connection settings for the Tivoli Storage Manager server connection. Verify that the server connection address is correct.

- a. Issue the PING command in a command prompt or shell. Verify that the computer indicated by the address is accessible.
- b. Issue the QUERY OPT TCPPOPT command in a server console to determine on which port the Tivoli Storage Manager server is running. To determine which port the Tivoli Storage Manager server is using, go to the directory where the administrative client is installed. Issue DSMADMC with parameters matching those in the connection settings for the Administration Center. This command can also be issued from the server console. Verify that the server connection port is correct.

```
dsmadmc -id=<admin id> -pass=<admin password> -tcpport=<TCP/IP port>
-tcps=<TCP/IP address>
```

```
tsm: SERVER1>QUERY OPT TCPPOPT
```

| Server Option | Option Setting |
|---------------|----------------|
| ----- | ----- |
| TCPPort | 1500 |

```
tsm: SERVER1>
```

7. Determine if the administrator ID for the Tivoli Storage Manager server is entered correctly in the Administration Center. Select **Modify Server Connection** from the drop-down list to view the current connection settings for the Tivoli Storage Manager server connection. Verify that the administrative ID is correct.
8. Determine if the administrator password for the Tivoli Storage Manager server is entered correctly in the Administration Center. Select **Modify Server Connection** from the drop-down list to view the current connection settings for the Tivoli Storage Manager server connection. Enter the correct administrative password to connect to the Tivoli Storage Manager server. Retry the operation to see if changing the password resolved the problem.
9. Determine if any messages are issued on the server when you try to connect using the Administration Center. The activity log contains useful information if you happen to experience any trouble connecting to the server. You can see sessions starting and stopping when the Administration Center successfully communicates with the server. If the network is down or the TCP/IP address or port is incorrect, no information shows up in the activity log when you make connection attempts. To check the server activity log, go to the directory where the administrative client is installed. Then issue the DSMADMC command with parameters matching those in the connection settings for the Administration Center. This command can also be issued from the server console.

```
dsmadm -id=<admin id> -pass=<admin password> -tcpport=<TCP/IP port>  
-tcps=<TCP/IP address>
```

```
tsm: SERVER1>QUERY ACTLOG
```

10. Check the server's database file for corruption. The server's database file is located in the Integrated Solutions Console installation directory under `PortalServer\shared\app\dsm\tsmserver.xml`. If this file is corrupted, problems might occur when you try to connect to the servers. You will, however, typically see other error messages indicating that this file is corrupt. Open this file in an editor (preferably an XML editor), and verify that the end tag has a closing end tag.

Resolving Integrated Solutions Console user authority problems

Integrated Solutions Console users can access only the pages for which they are authorized.

You can use the pages on the "Users and Groups" tab of the Integrated Solutions Console to create, delete, and view information for users and groups.

User administration for Tivoli Storage Manager Administration Center is based on the user and group management features of the Integrated Solutions Console. Individual users or groups can be granted role-based authorization to access Administration Center resources.

Roles and groups

User permissions for the Administration Center are managed with roles and groups.

A role represents a set of authorizations for a particular resource. When a user ID is assigned a role for a resource, that user ID is then authorized to perform specific actions on that resource.

You can assign a role to an individual user or to a group. If assigning a role to a group, the role applies to all members of the group. A user ID can have multiple roles, either assigned directly to the user ID or assigned to groups of which that user ID is a member. If a user ID has multiple roles, all of the authorizations associated with all of the roles apply (a role can only grant authorization, not deny it).

The Administration Center defines two user roles. Both of the following roles have access to all of the components of the Administration Center:

- `tsmAdministrator`
- `tsmUser`

When you install the Administration Center, this creates a new user group for the Administration Center called `TSM_AdminCenter`. The group is given the `tsmAdministrator` role. Any new Integrated Solutions Console users are created in the group. These new users will have access to the Administration Center.

For more information about users, roles, and groups, refer to the Integrated Solutions Console online help (access this information by clicking **Help** at the top of any page).

Creating a user with access to the Administration Center

If you are having difficulty with user authority, you might want to create a new user with the proper permissions or look into the permissions of the user.

Perform the following steps to create an Integrated Solutions Console user who has access to the Tivoli Storage Manager Administration Center:

1. In the navigation tree, select **Users and Groups**.
2. Click **Manage Users**.
3. Click **Create**.
4. Click **Group Membership**.
5. Select **Group Name**, then click **Search**.
6. Add **TSM_AdminCenter** to the Current Groups list.
7. Click **Close**.
8. Complete the form and click **Create**.

If an Integrated Solutions Console user does not have access to the Administration Center, verify the following items:

- Ensure that the group to which the user belongs has the tsmAdministrator role. Ideally, the group is TSM_AdminCenter, but that is not a requirement. Perform the following steps to determine the group to which the user belongs:
 1. In the navigation tree, expand **Users and Groups**.
 2. Click **Manage Users**.
 3. Click **Search**.
 4. Click the user in the table.
 5. Click the **Groups** tab.
 6. Determine the group to which the user belongs.
- Perform the following steps to verify the role assigned to the group:
 1. In the navigation tree, expand **Users and Groups**.
 2. Click **Administrative Group Roles**.
 3. Click the group name in the table.
 4. Verify that the group has the tsmAdministrator role.
- Ensure that your user group does exist.

Resolving an Integrated Solutions Console server stoppage

The Integrated Solutions Console is built on top of a WebSphere Application Server. If the WebSphere server were to stop running, the Integrated Solutions Console would no longer be accessible from a browser.

Before restarting the Integrated Solutions Console server, gather information about the stoppage so that the problem can be reported.

WebSphere includes several troubleshooting tools that are designed to help you isolate the source of problems. Many of these tools are designed to generate information that IBM Support can use.

Related reference

“Resolving server access problems” on page 84

You might encounter a problem when you try to access the Integrated Solutions Console and the Tivoli Storage Manager Administration Center from a Web browser.

Running the collector tool to obtain problem-analysis information

The collector tool gathers information about your WebSphere server installation and packages it in a Java™ archive (JAR) file that you can send to the WebSphere Customer Center to assist in determining and analyzing your problem.

Information in the JAR file includes logs, property files, configuration files, operating system and Java data, and the presence and level of each software prerequisite.

There are two ways to run the collector tool. The collector tool can be run to collect summary data or to traverse the system to gather relevant files and command results. The collector tool produces a Java archive (JAR) file of information needed to determine and solve a problem. The collector summary option produces a lightweight collection of version and other information that is useful when first reporting the problem to the WebSphere Customer Center.

There are two phases of using the collector tool. The first phase involves running the collector tool on your WebSphere server and producing a JAR file. The Support team performs the second phase, which involves analyzing the JAR file.

The collector program runs to completion as it creates the JAR file, despite any errors that it might find. Errors might include missing files or commands. The collector tool collects as much data in the JAR file as possible.

Perform the following steps to run the collector tool:

1. Log on to the system as root (or Administrator on Windows).
2. Verify that Java 1.2.2 or higher is available in the path.
3. If there are multiple JDKs on the system, verify that the JDK that the WebSphere server uses is the one in the path for the collector program. The collector program requires Java to run. It also collects data about the Java Development Kit (JDK) in which it runs.
4. Verify that all necessary information is in the path being used by the collector program and that you are not running the program from within the Integrated Solutions Console installation root directory.
 - If this system is a Linux or UNIX-based platform, verify that the path contains the following entries:
 - /bin
 - /sbin
 - /usr/bin
 - /usr/sbin
 - If this system is a Windows platform, include regedit in the path. The collector tool is located in the `<tsm_install_root>\Tivoli\TSM\AC\ISCW61\bin` directory.
5. Create a work directory where you can start the collector program.
6. Make the work directory, the current directory.

The collector program writes its output JAR file to the current directory and also creates and deletes a number of temporary files in the current directory. By creating a work directory to run the collector program, the collector program avoids naming collisions and makes cleanup easier. You cannot run the collector tool in a directory under the Integrated Solutions Console installation directory.

7. Run the collector program by issuing the COLLECTOR command from the command line.

For example: `c:\work>collector`

Issuing the COLLECTOR command with no additional parameters gathers one copy of the node data and data from each server in the node, and stores them in a single JAR output file. To gather data from a specific server in the node, issue the COLLECTOR *servername* command, where *servername* is the name of the problem server. The name of the Integrated Solutions Console server is `tsmServer`.

The collector program creates a log file, `Collector.log`, and an output JAR file in the current directory.

The name of the JAR file is composed of the host name, cell name, node name, and profile name: `host_name-cell_name- node_name-profile_name.jar`.

For example, if you run the collector tool on server `bohm1`, the file name is `bohm1-tsmCell-tsmNode-TsmAC-WASenv.jar`.

The `Collector.log` file is one of the files collected in the `host_name--cell_name- node_name-profile_name.jar` file.

Tip: Contact Support for assistance in deciphering the output of the collector tool.

Diagnosing log-entry problems by using the log analyzer tool (showlog)

The Log Analyzer takes one or more service or activity logs, merges all of the data, and displays the entries.

Based on its symptom database, the tool analyzes and interprets the event or error conditions in the log entries to help you diagnose problems. The Log Analyzer has a special feature, enabling it to download the latest symptom database from the IBM Web site.

About the Service or Activity log

The Websphere server creates the service or activity log file from the activity of the various WebSphere server components. The Log Analyzer is used to view the service or activity log file and can merge service or activity log files into one log file. The service or activity log file (`activity.log`) is a binary file in the following directory: `tsm_install_root\Tivoli\TSM\AC\ISCW61\profiles\TsmAC\logs`, where *tsm_install_root* is the root directory for your installation.

Using the Log Analyzer

You cannot view the service or activity log with a text editor. The Log Analyzer tool lets you view the file.

The Websphere server on which runs does not include the Java administrative console, so there is no graphical interface available for viewing a service or activity log file. The alternate viewing tool, `showlog`, must be used to view the service or activity log file:

1. Change to the directory `tsm_install_root\Tivoli\TSM\AC\ISCW61\bin` where `tsm_install_root` is the root directory for your installation.
2. Run the showlog tool with no parameters to display usage instructions:
 - On Windows systems, run `showlog.bat`
 - On UNIX systems, run `showlog.sh`

To direct the service or activity log (`activity.log`) contents to stdout, issue the `showlog activity.log` command.

To dump the service or activity log to a text file for viewing with a text editor, issue the `showlog activity.log some_text_file_name` command.

Tip: Contact IBM Support for assistance in deciphering the output of the collector tool.

Resolving excessive memory consumption problems with the Integrated Solutions Console server

The Integrated Solutions Console is built on top of a WebSphere application server. If the Websphere server is using a large amount of memory, there are a few actions that can be taken.

To determine if a larger amount of memory is in play, use the operating system tools that provide such information. For example, on Windows, the Task Manager shows memory use.

Log off from Integrated Solutions Console on a regular basis or if you determine that the memory usage of the Websphere Server is high. Logging out at the end of each day should help minimize the memory use. Logging out instead of only closing the browser is recommended. The default value of Session Timeout is 30 minutes. Reduce this value to a lower number to help reduce memory consumption requirements. The value can be changed with the Administration Center support utility.

Related reference

“Administration Center support utility” on page 96

The Administration Center Support Utility is a command-line driven utility designed to assist in performing basic support tasks with the Administration Center.

Referencing installation log files

If you experience errors during installation, these errors are recorded in several log files that are distributed in various locations.

Depending on the operating system, files stored in the OS temporary directory might not be saved after the system is shut down. For the Integrated Solutions Console Version 6.0.1, the installation log files are collected in the `ISCLogs__.jar` file. This file can be found in the `/Tivoli/dsm/logs` directory.

For Linux users, set `SELINUX=disable` or set `SELINUX=permissive` in the `/etc/sysconfig/selinux` file if you receive the following message:

The installer cannot run on your configuration. It will now quit.

The following table describes the files that are created when you install or uninstall Tivoli Storage Manager and recommends which files to check when looking for information that might help you troubleshoot problems:

Table 9. Contents of the log.zip file

| File Name | Description | Location |
|---|--|---|
| <p>The log.txt file contains information about the following Environment Checks:</p> <ul style="list-style-type: none"> • Platform • Version • Architecture • Prerequisites | <p>Contains installation log files.</p> <p>Review this log file when any installation failures occur.</p> | <p>For Windows, this file is located in the InstallAnywhere location that you specified. For AIX, HP-UX, Linux, and Sun Solaris, the file is located in /var/tivoli/tsm.</p> <p>The InstallAnywhere exit codes are in the log.txt file and can also be summoned by command. You can only retrieve the exit codes after the installer is finished installing. The exit codes are for both the Tivoli Storage Manager installer as well as the Tivoli Storage Manager reporting and monitoring installer.</p> <p>To use the command line from a UNIX server, issue the following command:</p> <pre>echo \$?</pre> <p>To use the command line from a Windows server, issue the following command:</p> <pre>echo %ERRORLEVEL%</pre> <p>See Table 10 on page 81 for all of the InstallAnywhere exit codes.</p> |
| DE_Install.log | <p>Contains information about the Deployment Engine (DE) installation.</p> <p>Review this log file if the DE installation fails.</p> | de\root |
| db2setup.log | <p>Contains information about the DB2 installation.</p> <p>Review this log file if the DB2 installation fails</p> | coi\plan\tmp |

Table 9. Contents of the log.zip file (continued)

| File Name | Description | Location |
|--|--|---|
| Administration Center installation log files | <p>Installation log files.</p> <p>Review these log files if the Administration Center installation or uninstallation fails</p> | <ul style="list-style-type: none"> • coi\plan\install\logs • coi\plan\install\MachinePlan_<host_name>\00001_eWAS • coi\plan\install\MachinePlan_<host_name>\00002_ISC • coi\plan\install\MachinePlan_<host_name>\00003_TSM_AdminCenter <p>or</p> <ul style="list-style-type: none"> • <install_root>_uninst\plan\install\MachinePlan_<host_name>\00001_eWAS • <install_root>_uninst\plan\install\MachinePlan_<host_name>\00002_ISC • <install_root>_uninst\plan\install\MachinePlan_<host_name>\00003_TSM_AdminCenter |

Table 10. InstallAnywhere exit codes

| Code | Description |
|------|--|
| 0 | Success: The installation completed successfully without any warnings or errors. |
| 1 | The installation completed successfully, but one or more of the actions from the installation sequence caused a warning or a non-fatal error. |
| -1 | One or more of the actions from the installation sequence caused a fatal error. |
| 1000 | The installation was cancelled by the user. |
| 1001 | The installation includes an invalid command line option. |
| 2000 | Unhandled error. |
| 2001 | The installation failed the authorization check, may indicate an expired version. |
| 2002 | The installation failed a rules check. A rule placed on the installer itself failed. |
| 2003 | An unresolved dependency in silent mode caused the installer to exit. |
| 2004 | The installation failed because not enough disk space was detected during the execution of the Install action. |
| 2005 | The installation failed while trying to install on a Windows 64-bit system, but installation did not include support for Windows 64-bit systems. |
| 2006 | The installation failed because it was launched in a UI mode that is not supported by this installer. |
| 3000 | Unhandled error specific to a launcher. |
| 3001 | The installation failed due to an error specific to the lax.main.class property. |
| 3002 | The installation failed due to an error specific to the lax.main.method property. |
| 3003 | The installation was unable to access the method specified in the lax.main.method property. |

Table 10. InstallAnywhere exit codes (continued)

| Code | Description |
|------|--|
| 3004 | The installation failed due to an exception error caused by the lax.main.method property. |
| 3005 | The installation failed because no value was assigned to the lax.application.name property. |
| 3006 | The installation was unable to access the value assigned to the lax.nl.java.launcher.main.class property. |
| 3007 | The installation failed due to an error specific to the lax.nl.java.launcher.main.class property. |
| 3008 | The installation failed due to an error specific to the lax.nl.java.launcher.main.method property. |
| 3009 | The installation was unable to access the method specified in the lax.nl.launcher.java.main.method property. |
| 4000 | A Java executable could not be found at the directory specified by the java.home system property. |
| 4001 | An incorrect path to the installer jar caused the relaucher to launch incorrectly. |

Configuring the IP address to align with the Administration Center

The Administration Center assumes that the host system uses a static IP address instead of a dynamically-assigned IP address. A static IP address is necessary because the Administration Center server must be listed on the domain name servers, which map the host name to the physical address of the system.

On a system that is not connected to the network, you must configure your system so that the IP loopback port is mapped to the fully-qualified host name. To enable that mapping, perform the following steps:

1. Go to the system where the Administration Center will be installed.
2. Locate the TCP/IP hosts file on your system.

For Windows systems, look in WINNT\system32\drivers\etc.

For AIX, Linux, and Solaris systems, look in path/etc.

3. Use a text editor to open the file named "hosts."
4. At the end of the hosts file, add lines similar to the following lines:

```
127.0.0.1 localhost
127.0.0.1 your.server.name
```

where *your.server.name* is the fully-qualified host name for the Administration Center system.

5. Save the hosts file.

Resolving Administration Center performance tuning issues

You can fine-tune the performance of the Administration Center by sizing the number of Tivoli Storage Manager Administration Center installations.

Sizing the number of Tivoli Storage Manager Administration Center installations

While there are a number of variables that can influence this sizing, most variables can be safely ignored if the Administration Center installation meets the recommended installation minimums and guidelines.

Ensure that your Administration Center installation meets the following guidelines:

- The Administration Center is being installed on a system dedicated to this function and no other applications will be installed on this system that require significant processing or memory resources.
- The Administration Center is being installed on a system that is based on recent hardware (not more than 18 months has elapsed since general availability of the specific hardware models).

If these conditions are met, it is likely that the system has sufficient processing capacity. Uni-processor systems or dual-processor systems are expected to be sufficient to meet the processing needs for a single Administration Center installation. More processors are not expected to be beneficial, as the major resource demand will be for memory.

The Administration Center disk I/O and network I/O requirements are not particularly demanding and there is no need for sustained high I/O throughput. However, application response time suffers if network delays or disk I/O delays occur. A low-latency network provides the best administrator response time. The Integrated Solutions Console and Administration Center should be installed close to the administrators, rather than close to the Tivoli Storage Manager servers, because more of the network traffic during administration activities will occur between the Integrated Solutions Console system and the administrator's browser than between the Integrated Solutions Console system and a Tivoli Storage Manager server.

Optimizing the performance of the Administration Center

The main resource requirement for supporting a significant number of the Tivoli Storage Manager administrators in the Administration Center is memory.

Performance testing shows that the Administration Center process working set memory is determined by using the following equation:

$$M_{\text{WorkingSet}} = 100 + M_{\text{JavaHeapSize}}$$

where:

$M_{\text{WorkingSet}}$ is the Administration Center process working set memory in MB.

$M_{\text{JavaHeapSize}}$ is the Administration Center Java heap size memory in MB.

This working set memory must remain less than 2 GB, which is the maximum supported process virtual storage for many 32-bit operating systems. This size is not likely to be a problem, because the maximum Java heap size allowed is 1536 MB. The required working set memory must be available in random access memory (RAM) or significant response time degradation might occur as the result

of system memory paging. Thus, the process working set memory requirement is effectively determined by the amount of Java heap memory required.

The system memory sizing must include memory for the operating system and any other applications running on the system. Most operating systems require 256 MB, so this much memory should be added to the process working set memory requirement to obtain the system memory requirement.

Related reference

“Administration Center support utility” on page 96

The Administration Center Support Utility is a command-line driven utility designed to assist in performing basic support tasks with the Administration Center.

Resolving server access problems

You might encounter a problem when you try to access the Integrated Solutions Console and the Tivoli Storage Manager Administration Center from a Web browser.

The following examples are of the messages that you could receive:

- The page cannot be displayed.
- The page you are looking for is currently unavailable.
- Error: Cannot find server or DNS Error.
- The connection was refused when attempting to contact host:port.

These types of errors can occur for a number of reasons. The following list shows you the different ways in which you can correct these errors:

- Ensure that the system on which the browser is running is connected to the network and the target system on which Integrated Solutions Console is installed.
- Ensure that the browser settings are correct.
- If you are behind a firewall and Internet security or proxy software is active, try disabling it temporarily. If Integrated Solutions Console is now accessible, the firewall settings should be investigated.
- Ensure that Integrated Solutions Console is installed on the target system.
- Ensure that Integrated Solutions Console is running on the target system. Integrated Solutions Console might have been terminated either.
- Ensure that the Tivoli Storage Manager Administration Center was deployed into Integrated Solutions Console.

Integrated Solutions Console is actually composed of two servers: the console server and the console help server. If the system on which Integrated Solutions Console is installed is shut down, the Integrated Solutions Console server that was started will stop.

If the system is configured to automatically start the server when the system restarts, you should not have to take any action.

To start the server from a command line interface, go to the `tsm_home\AC\ISCW61\profiles\TsmAC\bin` subdirectory of the Tivoli Storage Manager installation directory and use the appropriate command for your operating system:

- Windows - `startServer.bat tsmServer`
- All other supported systems - `startServer.sh tsmServer`

tsm_home is the root directory for your Tivoli Storage Manager installation.

To stop the server from a command line interface, go to the *tsm_home\AC\ISCW61\profiles\TsmAC\bin* subdirectory of the Tivoli Storage Manager installation directory and use the appropriate command for your operating system:

- Windows - stopServer.bat tsmServer (-user iscadmin -password iscpass)
- All other supported systems - stopServer.sh tsmServer (-user iscadmin -password iscpass)

where *iscadmin* is the administrator user ID for Administration Center and *iscpass* is the password for the administrator.

To stop the server you must specify a user ID and the password for that user ID. If you do not specify the user ID and password, you are prompted to enter them.

Resolving Administration Center health monitor problems

A health monitor presents a view of the overall status of multiple servers and their storage devices. From the health monitor, you can link to details for a server, including a summary of the results of client schedules, and a summary of the availability of storage devices.

Conditions are evaluated on a point system, where the points indicate the kind of problems occurring with the server. If the score is between zero and four, the status is Normal. Points of between five and nine cause a Warning, and points ten and above indicate a Critical status. The rules might change over time, as based on customer feedback.

One exception occurs if a server is down. If the server is down, server status cannot be obtained and the status is reported as critical.

The point calculations are performed through the *dsmhealthmon.xml* and *dsmhealthmon_pre61.xml* report files. In addition to calculating the overall condition of the server, these files count the activity log and event numbers displayed on the health monitor details page.

Restriction: If you make changes to the *dsmhealthmon.xml* or *dsmhealthmon_pre61.xml* files, those changes are not supported. Save a copy of these files, before you change them, to ensure that you can restore the original files if the health monitor breaks.

The overall status of a server is calculated by the following rules:

```
overallHealth    = max( databaseScore, storageScore )
storageScore     = libraryTotalScore / libraryCount
libTotalScore    = max( driveScore, pathScore, libraryPathScore )
driveScore       = 10 * ( driveCount - driveOnlineCount ) / driveCount
pathScore        = 10 * pathOfflineCount / pathCount
libraryPathScore = 10 * libraryPathOfflineCount / libraryPathCount
```

Health monitor conditions that can cause an unknown server status

The Administration Center offers the functions of most administrative commands, as well as unique functions such as the health monitor and wizards to help you perform complex tasks.

Review the following symptoms of server status problems:

- The ADMIN_CENTER ID not defined: If the ADMIN_CENTER administrative ID was deleted from the server, the health monitor is unable to obtain status. Resynch the health monitor password.
- The ADMIN_CENTER password for that server does not match the password for the health monitor. Resynch the health monitor password.
- The ADMIN_CENTER ID is locked. The ID must be unlocked or the health monitor is unable to obtain status. Resynch the health monitor password.
- The health monitor worker is no longer running. Tracing is the only way to determine if the worker thread is running. Follow the Administration Center tracing instruction to activate tracing for the HEALTH trace class. Search the `tsmServer/logs/trace.log` file for strings like "Time for a nap" or "Back to work." If you find those messages in the trace file, it indicates that the health monitor is running. You might need to wait some time before seeing those messages, depending on if the health monitor worker is sleeping for the given interval. When you do not see any activity for a period of time longer than the refresh interval, try restarting the Integrated Solutions Console, which restarts the health monitor worker.

Related tasks

"Enabling Administration Center trace" on page 129

Tracing is available for the Tivoli Storage Manager Administration Center.

Resolving health monitor conditions that can cause a warning or critical storage status

The health monitor determines the server storage status by evaluating a set of rules. No single condition can cause the change in status, but rather, the health monitor looks at a variety of items to determine the overall status.

Perform the following steps to determine the overall health of the storage hardware:

1. Determine the percentage of drives that are offline in a given library.
2. Determine the percentage of paths that are offline for each drive in a given library.
3. Find the average of the numbers in the above step, which represents the score for the drive path status.
4. Determine the percentage of library paths that are offline for the given library. The score for the library is the maximum of the three scores. The number should be somewhere in the range from zero and ten.
5. Repeat the above steps for every library on the server.

The overall health of the storage hardware is the average of the sum of all library scores, which is the overall health of the storage hardware on a scale of from zero to ten. A score of four or less represents Normal status. A score greater than four but less than eight represents Warning status. A score greater than seven represents a Critical status.

The library status becomes Critical in the following instances:

- If you take all of the drives in the library offline
- If you take all of the paths for all of the drives in a single library offline
- If you take the only path to the library offline

Depending on the number of libraries on the server, the Critical status for a single library is diluted by other healthy libraries. For example, if the status of one library is Critical and two libraries are Normal, then the storage status is Warning. To view the individual status of the library, use the Storage Devices work item.

Important: If the server is down, the health monitor is unable to obtain status. The status for a down server is reported as critical.

Health monitor conditions that can cause a warning or critical database status

The health monitor determines the server database status by evaluating a set of rules. No single condition can cause the change in status, but rather, the health monitor looks at a variety of items to determine the overall status. If the server is down, however, the health monitor is unable to obtain status. The status for a down server is reported as critical.

If the score is between zero and four, the status is Normal. Points of between five and nine cause a Warning, and points ten and above indicate a Critical status.

The databaseScore is calculated by a summation of the following rules:

For Tivoli Storage Manager Version 6.1 servers

Free space less than 10% on file systems where the database resides - 10 points

Free space less than 20% on file systems where the database resides - 5 points

No database backup in the last 24 hours - 3 points

Buffer pool hit ratio is less than 98% - 3 points

For Tivoli Storage Manager Version 5.5 servers

Do not have a space trigger - 2 points

Extension of database is 0 and maximum utilization is at 90% - 5 points

No space trigger, no extendable space for the DB, and current utilization of DB over 90% - 10 points

Extension space exists and utilization is over 85% but less than 95% - 5 points

Extension space exists and utilization is over 94% - 10 points

No database backup in the last 24 hours - 3 points

Cache hit ratio is less than 98% - 3 points

Log utilization is currently over 80% but less than 90% - 3 points

Log utilization is currently over 89% but less than 95% - 5 points

Log utilization is currently over 94% - 5 points

Log maximum utilization is over 90% - 3 points

Determining when to resynchronize the ADMIN_CENTER administrator ID password

When you configure the health monitor, the password for the ADMIN_CENTER administrator ID is saved in the health monitor configuration. The same password is used to contact all the servers on the list.

As long as the password that is being updated is updated through the Configure Health Monitor action from the Health Monitor Server table, the password is synchronized for all the servers. When the ADMIN_CENTER password gets changed from the command line or the Server Properties notebook, however, the health monitor knows the new password in order to update the configuration file. The following actions occur:

1. The health monitor contacts the server and the server returns a false credential message.
2. After the third try, the ADMIN_CENTER ID is locked.

You cannot unlock the ADMIN_CENTER ID through the command line or the Server Properties notebook because the health monitor does not have a valid password. This action simply unlocks the ID; then after three tries, the ID is locked again.

If you re-configure the health monitor to update the password, this action also does not work because the health monitor attempts to log on using the password it knows about - which is no longer valid on that server.

In either situation, resynchronize the ADMIN_CENTER password on all of the servers to solve the problem. The health monitor will perform the following procedures:

- Update the ADMIN_CENTER password to the current health monitor password for all of the servers
- Create the ADMIN_CENTER ID if it does not exist
- Unlock the ADMIN_CENTER ID if it is locked

Responding to Administration Center task failure messages

The Administration Center provides both informational and error messages when a failure occurs. Most failure messages typically provide information about what went wrong.

The Administration Center messages often explicitly diagnose the problem and include suggestions about how to manage it. The messages can contain information about Administration Center internal errors or server errors. In some cases, errors can be resolved by retrying a failed task. Before retrying the task, close any error messages to ensure that only relevant error messages are displayed if the task fails again.

Some Administration Center failure messages include one or more error messages returned from the server. The server messages are displayed in the language that was enabled for the server, which might not match the language enabled for the Web browser. In such cases, consult the Message Manual for the message number identified for the specific server platform.

To better understand the problem, check the Activity Log for the server chosen when the failure message occurred. To view the activity log, select a server and

select the Server Properties table action. In the properties notebook, click the Activity Log tab. The Activity Log tab is very useful for cases where the failure message does not seem related to the behavior of the task, it does not include server messages at all, or only the last server message is shown when multiple tasks were performed.

In these cases, multiple commands are typically issued to the server. Look carefully in the Activity Log for the activity at the time frame of the failure. Keep in mind that the server and the computer used to access the Administration Center might be running in different time zones. Activity log information is displayed using the server's time.

If errors are encountered during command routing, check the activity log of the source server first. If it does not provide sufficient information to diagnose the problem, check the activity log of the target server. Make sure that the two servers are running, that they are set up correctly to communicate with each other, and that the source server has appropriate authority level for the commands performed on the target server at the time of failure.

If you need to contact IBM Software Support to resolve an Administration Center issue, you can use the tracing features provided by the Administration Center Support Utility to obtain additional information.

Related tasks

"Enabling Administration Center trace" on page 129

Tracing is available for the Tivoli Storage Manager Administration Center.

Related reference

"Responding to messages that return unexpected results"

There are several ways to determine the source of a problem when a task fails on the Administration Center with unexpected results.

"Determining if you have an Administration Center message or a Tivoli Storage Manager server message" on page 91

Messages shown in the Administration Center are typically either Tivoli Storage Manager server messages or messages specific to the Administration Center.

"Administration Center support utility" on page 96

The Administration Center Support Utility is a command-line driven utility designed to assist in performing basic support tasks with the Administration Center.

Responding to messages that return unexpected results

There are several ways to determine the source of a problem when a task fails on the Administration Center with unexpected results.

Related reference

"Responding to Administration Center task failure messages" on page 88

The Administration Center provides both informational and error messages when a failure occurs. Most failure messages typically provide information about what went wrong.

Checking the server activity log

The Administration Center processes its work by issuing the Tivoli Storage Manager query, select, and other commands to the server.

Check the activity log of the server that was selected for the failing task. To view the activity log, select a server and select the Server Properties table action. In the properties notebook, click the Activity Log tab. Ensure that commands related to the task appear in the activity log and are being issued to the correct server. If there is no evidence of activity related to the Administration Center task, there might be a connection problem or the incorrect server might have been selected.

Look for failures related to commands that were issued in the time frame of the failing Administration Center task. These failures could be due to the incorrect formatting of the command or false parameter values. In some cases, a parameter value comes directly from the Administration Center, but in many others it is specified by the user through a text box, radio button, or other input method. Correct the false value if possible, but if a false parameter or incorrectly constructed command cannot be changed by the user, an internal error might be the cause.

Resolving errors caused by starting or stopping a wizard or portlet

Some problems occur because of the manner in which wizards or portlets are started or restarted. Some of the wizards commit objects to the server database as you proceed through the wizard, instead of only when you finish the wizard.

When the wizard defines objects before you click **Finish**, a summary panel listing the committed objects is displayed. The Back button is disabled because you cannot return to the previous wizard panel to undo the committed changes. If the wizard is then canceled, the objects that were created are not deleted. You cannot restart the wizard from the point at which it was canceled.

If you cancel and then restart a wizard, you cannot duplicate the work done earlier. For example, if you use the “Add a Storage Device” wizard to add a tape device, you will encounter several such summary panels that show the objects that are created before the wizard is finished. The first summary panel is for the creation of a device class, a library, and paths from the server to the library. If you cancel this wizard following the first summary panel and restart it, you cannot create another library with the same name because it now already exists.

After an object is created with a wizard, any changes to that object must be made through a properties notebook. In the “Add a Storage Device” example, changes to the device class, library, or storage pools must be made through the device class, library, or storage pool properties notebooks. Typically, you can click an object’s name to open its properties notebook. The properties notebook contains tabbed pages for modifying all of the attributes created by the wizard. Attributes that are set to the default by the wizard can be changed only in these properties notebooks.

Working with multiple portlets

The Administration Center allows you to open multiple work pages and multiple portlets within work pages. Updates to a server made in one portlet do not necessarily propagate to all other open portlets. In particular, the settings in a properties notebook are gathered when the properties notebook is first launched. If server objects in the properties notebook are created in a different portlet while the

properties notebook is active, the newer objects will not be automatically added to the properties notebook. Likewise, a wizard that offers a selection of objects will only list those objects that existed at the start of the wizard. However, in some cases, object lists can be manually refreshed.

Some portlets contain many tabs and list many server objects and their attributes. It can be difficult to ascertain whether changes made in another table, notebook, or wizard affected objects in a particular portlet. Furthermore, commands issued directly to the server through the server console or command line client can also add objects that will not appear in a notebook or wizard started before the commands were issued. In general, it is best to limit the number of portlets running at once, and to not use the command line client or server console while using the Administration Center. If a missing or changed object becomes apparent, cancel and restart the current task.

Resolving problems caused by internal errors

An internal error is an error in the Administration Center itself, which can be more difficult to diagnose.

In most cases an error message is displayed. Another symptom is when an **OK** or **Cancel** button does not close the current panel. Finally, the server activity log might contain commands issued by the Administration Center that are improperly formatted or contain false parameter values.

These errors can only be accurately diagnosed by support personnel. In addition to the server activity log, the Integrated Solutions Console trace log can often provide information relating to the error. If the problem is repeatable, the tracing level of the trace log can be increased. The information in the trace log will likely be useful to support personnel.

Related tasks

“Enabling Administration Center trace” on page 129

Tracing is available for the Tivoli Storage Manager Administration Center.

Determining if you have an Administration Center message or a Tivoli Storage Manager server message

Messages shown in the Administration Center are typically either Tivoli Storage Manager server messages or messages specific to the Administration Center.

Tivoli Storage Manager server messages are displayed in some cases when the Administration Center performed a command on a Tivoli Storage Manager server. In some cases, both types of messages are displayed. To distinguish between Administration Center messages and Tivoli Storage Manager server messages, observe the prefix of the message number. Messages that do not show any message number are Administration Center informational messages specific to the Integrated Solutions Console.

Administration Center messages have the prefix ANRW. Informational and error messages are distinguished by the suffix of the message, I and E, respectively.

For example:

ANRW0022I The operation completed successfully.

ANRW0023E An internal error occurred during validation.

Informational messages, for example ANRW0022I, provide some general information or identify limitations or requirements for the task being performed.

Error messages, for example ANRW0023E, identify that there is a problem completing the requested task. The message can prompt the user to perform additional setup (such as server-to-server-communication), identify that the requested action is false in the current work item or task, or report an internal error. Resolving an internal error, such as ANRW0023E, generally requires assistance from IBM Software Support. You will typically be asked to provide tracing information, as well as information about the sequence of actions performed before the failure occurred.

Messages issued by the Administration Center are displayed in the language selected for the Web browser, or its closest default. Administration Center message numbers are not server dependent, unlike Tivoli Storage Manager server messages. Administration Center messages are generally based on the return code specified when a Tivoli Storage Manager server command was performed. In some cases the server return code that is the basis for the Administration Center message will be shown, along with the server message. In rare cases, the return code and message displayed will be inconsistent. If you use tracing to capture information for a server command implementation problem, the return codes identified with the server messages can help IBM Software Support diagnose the issue.

Some Tivoli Storage Manager server messages are dependent on the server operating system. When the Administration Center displays a Tivoli Storage Manager server message, the message number can be associated with different messages for servers running on different operating systems. A single message number might have different variations for different platforms.

Tivoli Storage Manager messages use different message prefixes, typically ANR or ANE.

The following sample message occurs if a DEFINE LIBRARY command fails on a z/OS server:

```
ANR2022E
```

```
DEFINE LIBRARY: One or more parameters are missing.
```

Generally, the Administration Center provides a link to the help system for each server message that it displays. Click the link to display help for the server message. If the server message does not provide a link to its help, use the command line in the Administration Center or on the server where the failure occurred to obtain further information about the server message. To request help for a specific Tivoli Storage Manager server message number, issue the HELP ANR2022E command, where ANR2022E is an example message number.

As an alternative, use the Messages Manual and identify the message by its message number. If the message is platform specific, locate the message for the server platform of interest.

For z/OS, for example, consider the version of the message showing (S/390®) right after the message number. For the sample server message above, locate message number ANR2022E in the Message Manual.

Related reference

“Responding to Administration Center task failure messages” on page 88

The Administration Center provides both informational and error messages when a failure occurs. Most failure messages typically provide information about what went wrong.

Defining Tivoli Storage Manager messages

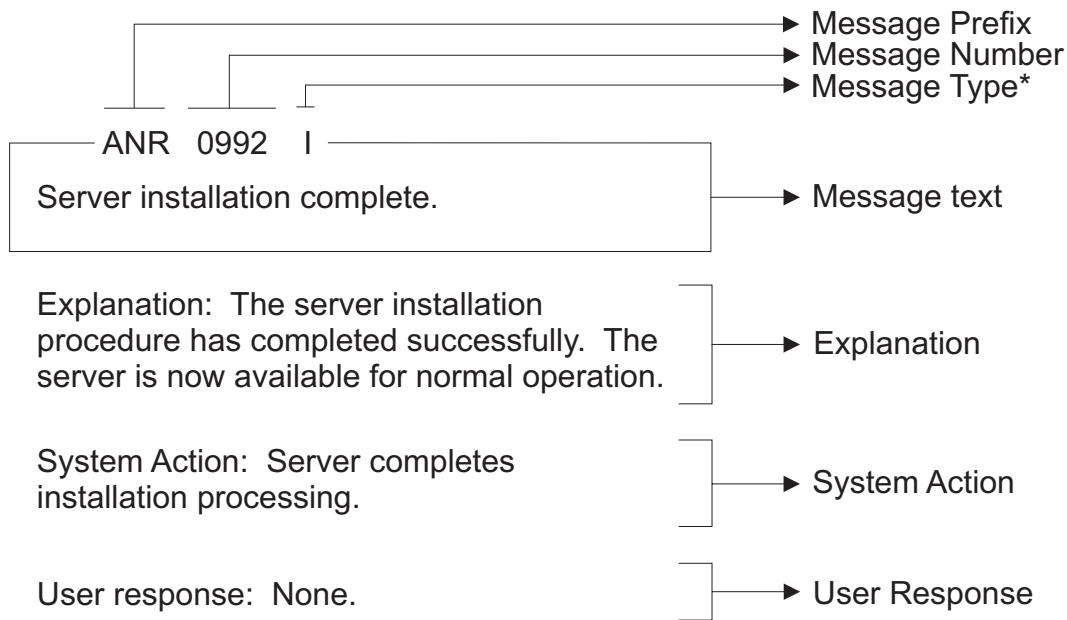
You can determine the kind of Tivoli Storage Manager message being displayed by looking at the message format. The first three characters of each message define what kind of message you are receiving.

The following examples illustrate the format used to describe the Tivoli Storage Manager messages:

- Messages that begin with an **ANE** prefix and are in the 4000-4999 range originate from the backup-archive client. These messages (or events) are sent to the server for distribution to various event-logging receivers.
- The client might send statistics to the server that is providing information about a backup or restore. These statistics are informational messages that might be enabled or disabled to the various event-logging receivers. These messages are not published here.
- Messages that begin with an **ANR** prefix originate from the server or storage agent.
- Messages that begin with an **ANS** prefix are from one of the following clients:
 - Administrative clients
 - Application program interface clients
 - Backup-archive clients
 - Space Manager (HSM) clients
- Messages that begin with an **ACD** prefix are from Data Protection for Lotus Domino®.
- Messages that begin with an **ACN** prefix are from Data Protection for Microsoft Exchange Server.
- Messages that begin with an **ACO** prefix are from Data Protection for Microsoft SQL Server.
- Messages that begin with an **ANU** prefix are from Data Protection for Oracle.
- Messages that begin with a **BKI** prefix are from Data Protection for SAP for DB2 UDB and Data Protection for SAP for Oracle.
- Messages that begin with a **DKP** prefix and are in the 0001-9999 range are from Data Protection for WebSphere Application Server.
- Messages that begin with an **EEO** prefix and are in the 0000-9999 range are from Data Protection for IBM Enterprise Storage Server® (ESS) for Oracle.
- Messages that begin with an **EEP** prefix and are in the 0000-9999 range are from Data Protection for Enterprise Storage Server (ESS) for DB2 UDB.
- Messages that begin with an **IDS** prefix and are in the 1000-1999 range are from Data Protection for Enterprise Storage Server (ESS) for SAP.

Defining the message format

The following example displays the Tivoli Storage Manager message format:



- * I = Information
E = Error
S = Severe Warning
W = Warning
K = Kernel message that originates from the hierarchical storage management (HSM) client

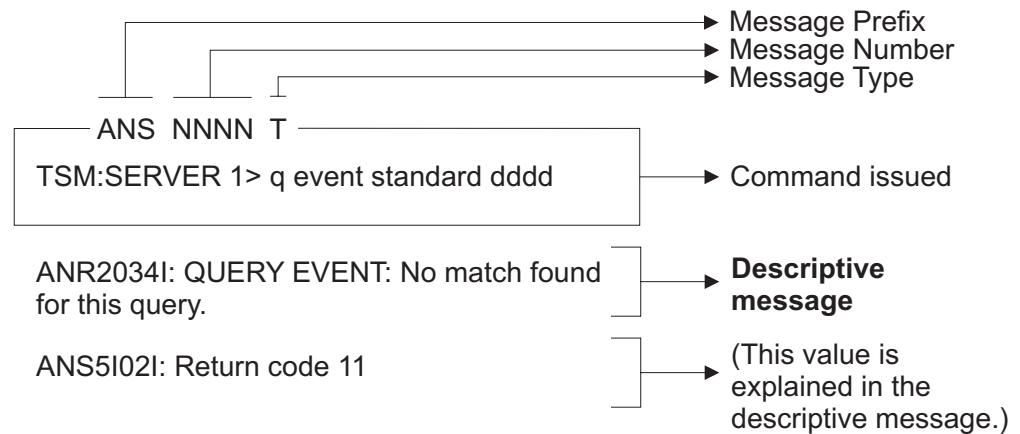
Message variables in the message text appear in *italics*. The server and client messages fall into the following categories:

- Common messages that pertain to all Tivoli Storage Manager server platforms
- Platform-specific messages that pertain to each operating environment for the server and the client
- Messages that pertain to application clients

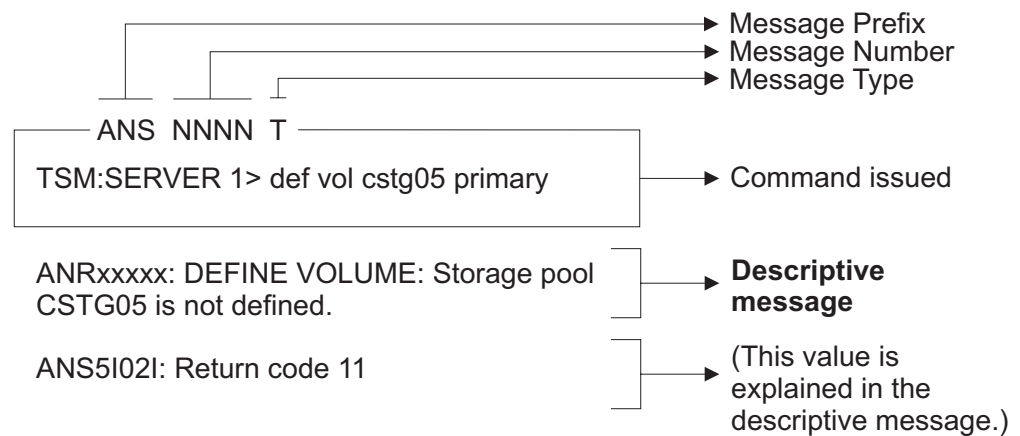
Reading a return code message

Many different commands can generate the same *return code*. The following examples are illustrations of two different commands that are issued that result in the same return code; therefore, you must read the *descriptive message* for the command.

The QUERY EVENT command:



The DEFINE VOLUME command:



Resolving problems with the Tivoli Storage Manager server command definition file

The Administration Center uses command definition files that specify the commands supported for each server operating system.

There is a different command definition file for each server operating system. If this file was corrupted on the Integrated Solutions Console system or on the server system, parts of the interface might not be able to validate creation of new objects and might be unable to correctly construct server commands. Administration Center messages that identify server command syntax errors or validation errors (for text entry or the selection of interface controls) can sometimes be caused by problems with the command definition files.

The Administration Center acquires a command definition file the first time it establishes a connection with a server. The next time the Administration Center contacts a server running on the same operating system, it uses the command file that was previously obtained for that operating system. If the command file is not available in the appropriate location (due to renaming or deletion) then any request following the disappearance of the file triggers another transfer of the command file for that specific operating system.

Do not attempt to update the command definition file. If problems occur that could be related to the command definition file, verify that the appropriate command definition file is available to the Administration Center for the server's operating system. If this file does not exist, verify that the Tivoli Storage Manager server can communicate with the Administration Center API and that it has the platform-specific command file and `dsmcmd.xml` available in the server directory hierarchy.

Though it is not recommended, there is nothing to prevent the command definition file from being modified or deleted on the Integrated Solutions Console system, or the Tivoli Storage Manager server system. Verify that the appropriate platform-specific command file is available to the Administration Center for the platform of the server of interest. If not, verify that the Tivoli Storage Manager server can communicate with the Administration Center API and it has the platform-specific command file and `dsmcmd.xml` available and valid in the server directory hierarchy.

One scenario is, for example, when a failure occurs as a task is being performed on an AIX 5.3.0 server. When a connection is established to that server or a command needs to be generated or verified, the Administration Center looks for the command definition file. The platform-specific command file is copied from the server to the following location in the Tivoli Storage Manager installation directory: `Tivoli\TSM\AC\products\tsm\CmdFileCache\aix_6_1_0_0.xml`.

Other platforms will have similar file name construction and are located in the same directory. Any changes made to the command definition file can corrupt the XML defined objects in the file, which can cause the Administration Center tasks to fail.

If you identify a corrupted command definition file and cannot recover the original command definition file, you can use a connection to another server running the same operating system to obtain a valid command definition file, after renaming the original corrupted file.

If other Administration Center `.xml` or `.xsd` files in the `WEB-INF` directory are corrupted, similar issues can occur. For example, the Administration Center might not be able to construct tables or launch portlets.

Related reference

"Using data storage diagnostic tips" on page 213

If you are experiencing a problem in storing or retrieving data, review the diagnostic tips to try to isolate or resolve the problem.

Administration Center support utility

The Administration Center Support Utility is a command-line driven utility designed to assist in performing basic support tasks with the Administration Center.

This utility is located in the Tivoli Storage Manager installation directory under `Tivoli\TSM\AC\products\tsm\bin`. On Windows, start the tool by issuing `supportUtil.bat`. On UNIX, start the tool by issuing `supportUtil.sh`.

The following example demonstrates what you will see on your Windows system:

```
C:\Program Files\Tivoli\TSM\AC\products\tsm\bin>supportutil
Administration Center Support Utility - Main Menu
=====
```

1. Manage Administration Center tracing
2. Manage the maximum memory size the Administration Center can use
3. Manage the Administration Center session timeout setting
4. Collect trace files, logs and system information to send to support
5. Generate a heap dump of the Java virtual machine
6. Generate a Java core dump of the Java virtual machine
7. View the log file for this utility.
8. Exit.

Related reference

“Trace classes for the Administration Center” on page 130

The Administration Center provides individual and aggregate trace classes.

Aggregate classes are a shortcut for enabling many related trace classes by simply specifying the aggregate trace class name.

Chapter 5. Resolving Data Protection problems

The Data Protection client uses the Tivoli Storage Manager API to communicate with the Tivoli Storage Manager server to provide data management functions.

Troubleshooting IBM Tivoli Storage Manager for Enterprise Resource Planning

Information on how to resolve errors that might occur during IBM Tivoli Storage Manager for Enterprise Resource Planning operations is provided.

Troubleshooting IBM Tivoli Storage Manager for Enterprise Resource Planning common problems

Information on how to resolve errors that might occur during IBM Tivoli Storage Manager for Enterprise Resource Planning operations is provided.

Random problems

If a problem occurs inconsistently, try to determine what the difference is when the problem occurs, if any. Compare the log files of the application in question to find out the differences between successful and unsuccessful operations. Look for one of these patterns when the problem occurs:

- The problem always occurs at the same time. If this is true, view the appropriate log files to determine review if there are any scheduled processes occurring simultaneously such as virus checker, automatic updates, or batch jobs.
- The problem always occurs after another operation is performed or the same operation is performed.
- The problem occurs when another application or process is performed in parallel.

Data Protection for SAP® for Oracle log files:

- brbackup / brrestore log
- sbtio.log

Data Protection for SAP® for DB2 log files:

- tdpdb2.<SID>.<nodename>.log
- db2diag.log

Reproducible (repeatable) problems

When encountering a problem that occurs during an operation that has previously performed successfully, consider these possible causes:

- The IBM Tivoli Storage Manager for Enterprise Resource Planning setup changed.
- One (or more) of the Oracle,DB2, SAP, Tivoli Storage Manager, operating system, network, or hardware components changed.
- Patches or updates to one (or more) of the components were applied.
- Changes originated by the system have occurred such as these:
 - Check if the disks are running full with the UNIX or Linux df command.

- If network performance has decreased, check if additional hosts, additional applications, or defects in software or hardware occurred. Compare operation runs in the Administration Assistant Performance Monitor history view or compare the Data Protection for SAP® for Oracle brbackup / brrestore log files or Data Protection for SAP® for DB2 tdpdb2.<SID>.<nodename>.log file.
- If Tivoli Storage Manager server processing has decreased, check if additional clients or additional operations were added. Information is also available in the Tivoli Storage Manager server activity log.

When none of these possible causes has occurred, view the last modified time stamp of the configuration files for Data Protection for SAP® for Oracle (init<SID>.utl, init<SID>.sap, dsm.sys, dsm.opt, /etc/services, /etc/inittab, ...) or Data Protection for SAP® for DB2 (vendor.env, init<SID>.utl, dsm.sys, dsm.opt, /etc/services, /etc/inittab, ...). This UNIX or Linux command lists all files in the /etc directory which have been modified during the previous five days:

```
find /etc -type f -ctime 5 -print
```

If you are able to identify changes made to the system, roll them back one at a time and try to reproduce the problem. This method frequently reveals which change or set of changes caused the problem.

Internet Protocol version 6 (IPv6) support

Data Protection for SAP® supports both IPv4 and IPv6 for internal communication in that it will run in IPv4, IPv6, and mixed environments on AIX and Linux. However, these products do not exploit new IPv6 functionality. In a mixed environment, the communication depends on the adapter network settings. There is no option to enforce the use of a specific protocol other than by network configuration. Specifically, the ProLE or acsd service will listen for both IPv4 and IPv6 connection requests if the system is configured accordingly. Connection requests to ProLE are made for the addresses returned by the system for the respective port on the local host. Connection requests to other machines such as the Administration Assistant function for Data Protection for SAP® are made for the addresses specified by the user. IPv6 addresses are supported when TCP/IP addresses are specified in a command line or in a profile parameter such as TCP_ADDRESS. However, when the IP address and port are specified in the <IPv4 address>:<service or port> format, then the format needs to be changed to <service or port>@<IP address> if the IP address is specified in the IPv6 notation. In the case of a dotted decimal IPv4 address, the traditional format can still be used.

The specification of IPv6 addresses assumes that Data Protection for SAP® is used in an environment in which IPv6 is supported by all hardware and software components involved and has been adequately tested in this environment.

Understanding the setup

Review these considerations to better understand the installation setup on UNIX or Linux systems:

- Make sure all files are installed as described in the *User's Guide*.
- Make sure an entry similar to this example is defined in the `/etc/inittab` file:

Data Protection for SAP® for Oracle:

```
po64:2:respawn:/usr/tivoli/tsm/tdp_r3/ora64/prole  
-p tdpr3ora64 <Server component hostname> 5126
```

Data Protection for SAP® for DB2:

```
pd64:2:respawn:/usr/tivoli/tsm/tdp_r3/db264/prole  
-p tdpr3db264 <Server component hostname> 5126
```

The `<Server component hostname>` specifies the name or IP address of the host on which the Administration Assistant Server component is running. 5126 is the default port to which the Server component listens. These Server arguments are only needed when using the Administration Assistant. The purpose of this entry is to start a daemon process for ProLE. This process listens on the Data Protection for SAP® for Oracle 64-bit port (tdpr3ora64) for backint and RMAN connections and Data Protection for SAP® for DB2 (tdpr3db264) connections with the shared library and sends performance-related information to the Administration Assistant Server component. The port can have a different name; however, the name must match the name in the `/etc/services` file as shown in this example:

Data Protection for SAP® for Oracle:

```
tdpr3ora64      57323/tcp
```

Data Protection for SAP® for DB2:

```
tdpr3db264     57324/tcp
```

These lines are added to the `/etc/services` file by the installer.

- Make sure the Data Protection for SAP® for Oracle configuration file `init<SID>.utl` is located in the `$ORACLE_HOME/dbs` directory.
- When using the BR*Tools with Data Protection for SAP® for Oracle, modify the `init<SID>.sap` file by setting `backup_dev_type = util_file` and variable `util_par_file` to the fully qualified path and file name of `init<SID>.utl`.

For an overview of the configuration files on a UNIX or Linux system, see the following sections:

- (Data Protection for SAP® for Oracle) Figure 1 on page 102
- (Data Protection for SAP® for DB2) Figure 2 on page 103

Review these considerations to better understand the installation setup on Windows systems:

- Make sure all files are installed as described in the *User's Guide*.
- Verify that service ProLE Service is running and set to automatic startup. If this service is not running, Data Protection for SAP® does not function properly.

- The installer adds lines to the %SYSTEMROOT%\system32\drivers\etc\services file similar to these:

(Data Protection for SAP® for Oracle)

```
tdpr3ora64      57323/tcp
```

(Data Protection for SAP® for DB2)

```
tdpr3db264     57324/tcp
```

The lines tdpr3ora64 and tdpr3db264 are the Data Protection for SAP® 64-bit ports. For Data Protection for SAP® for Oracle, this port name is also needed for the init<SID>.sap file when RMAN is configured.

- Make sure the Data Protection for SAP® configuration file init<SID>.utl is located in the %ORACLE_HOME%\database directory (on Oracle) and in the directory pointed to by the TDP_DIR environment variable (on DB2).
- When using the BR*Tools with Data Protection for SAP® for Oracle, modify the init<SID>.sap file by setting backup_dev_type = util_file and variable util_par_file to the fully qualified path and file name of init<SID>.utl.
- The vendor environment file vendor.env must contain the fully qualified path and file name of the init<SID>.utl file for Data Protection for SAP® for DB2.
- The vendor environment file vendor.env should contain the path of the location where the Data Protection for SAP® for DB2 run logs are written. If this location is not specified, temporary directory of the machine is used.

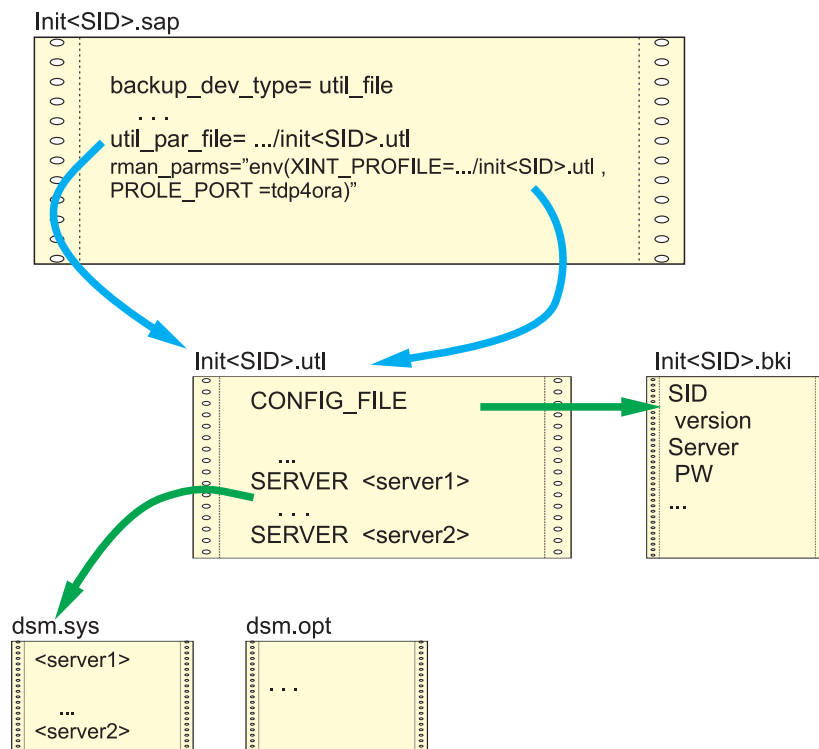


Figure 1. SAP® and Data Protection for SAP® for Oracle configuration files on UNIX or Linux

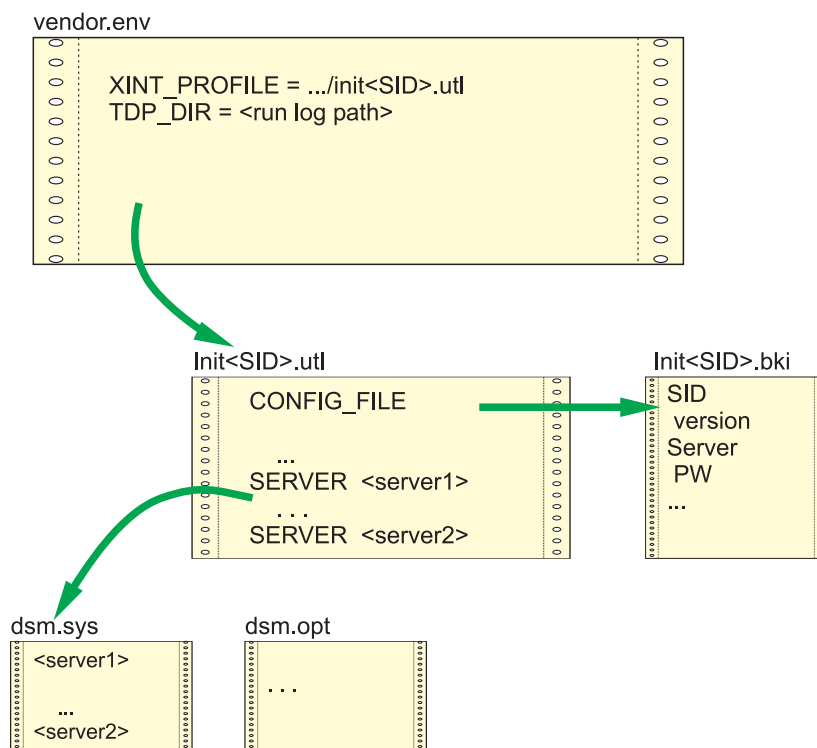


Figure 2. SAP® and Data Protection for SAP® for DB2 configuration files on UNIX or Linux

On UNIX or Linux systems, the names of the Tivoli Storage Manager servers specified in `init<SID>.utl` must match the names in the `dsm.sys` file. If the Tivoli Storage Manager API or Tivoli Storage Manager Backup Archive Client were installed into their default locations, then the `DSMI_*` variables do not need to be set. If the variables are set, however, make sure they specify the correct directories and files. The user ID that runs the backups must have the correct permissions to access all of files and directories specified by these variables. Also verify that write permissions exist for the `init<SID>.bki` file as this is the only file to which Data Protection for SAP® writes persistent information.

On Windows systems, the `dsm.opt` file is used instead of the `dsm.sys` file. However, the content of this file is not relevant to Data Protection for SAP®. The directory that contains the `dsm.opt` file must also contain a `<server>.opt` file for each server specified in the `init<SID>.utl` file. The environment variable `DSMI_CONFIG` must specify an option file within this directory. `DSMI_CONFIG` should specify the `dsm.opt` file in this directory. The `DSMI_DIR` environment variable must also specify the directory where the `dscamen.txt` file resides. This is typically the `c:\Program Files\Tivoli\tsm\api` directory.

Providing information to IBM or Tivoli support

Provide this information when contacting IBM or Tivoli support:

- The Data Protection for SAP® version.
- The operating system level and patches that were applied.
- The Oracle or DB2 database version
- The Tivoli Storage Manager server version.
- The Tivoli Storage Manager server operating system level.

- Data Protection for SAP® for DB2 configuration files (vendor.env, initSID.utl or Data Protection for SAP® for Oracle configuration file (initSID.utl), including Tivoli Storage Manager client configuration files (dsm.sys, dsm.opt).
- On Data Protection for SAP® for DB2, the SAP®-DB2 Administration Tools log file. On Data Protection for SAP® for Oracle, the BR*Tools output for the operation in question (brarchive, brrestore)
- The change history of the system components (if the process worked previously).

Additional information might also be requested from the service representative.

Troubleshooting Data Protection for SAP® for DB2 problems

Information on how to resolve errors that might occur during Data Protection for SAP® for DB2 operations is provided.

General problem resolution

The following graphic (Figure 3) will help you to isolate problems that occur when backing up or restoring of your DB2 database.

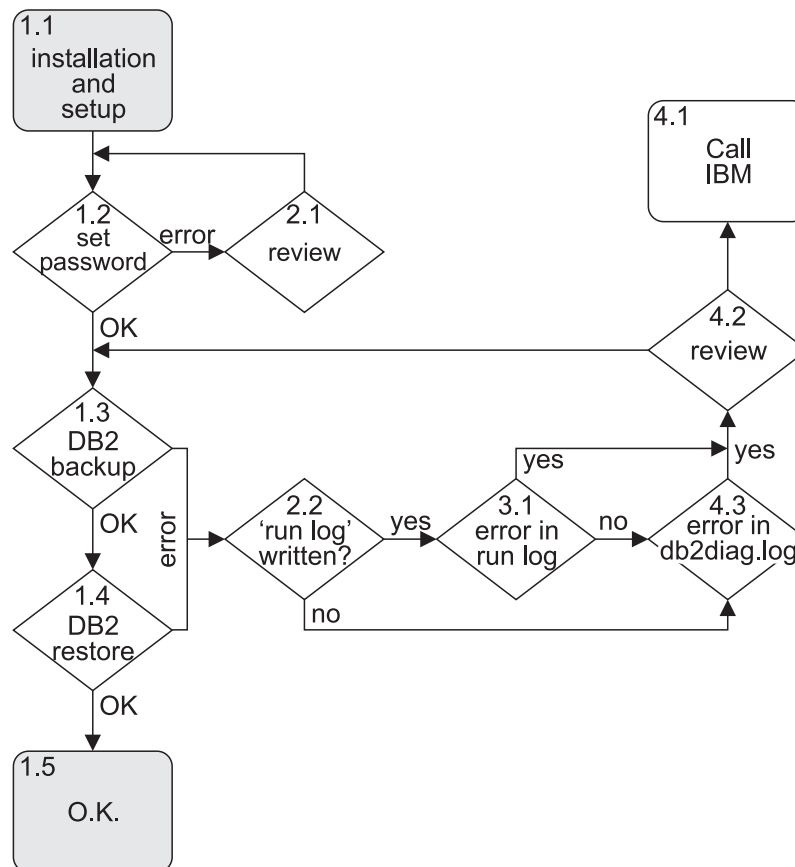


Figure 3. General Problem Isolation

After installation is completed (Step 1.1) and manual password handling is specified, set the password (Step 1.2) as described in the *User's Guide*. When the operation completes successfully, the informational messages BKI0051I: Password successfully verified for node <NODENAME> on server <SERVERNAME> and BKI0024I: Return code is: 0. display for each server configured within the

init<SID>.utl file. An error message displays when a problem occurred. The Administration Assistant can also be used. The Configurator feature loads the configuration of the node on which problems are encountered and allows the Administration Assistant to check the configuration.

These errors are frequently encountered at Step 1.2:

BKI2001E: Socket error while connecting to ProLE at <IP-Address>:<PORT>: Connection refused

On Windows, verify that the ProLE Service is running by viewing the Computer Management Services screen or issue this command:

```
net start
```

A list of all running services displays. On UNIX or Linux, verify that the background daemon is running by issuing this command:

```
ps -ef | grep prole
```

Check the entry in /etc/services (UNIX or Linux) and %SYSTEMROOT%\system32\drivers\etc\services (Windows). Compare the port number from the error message with the port number within /etc/services. Also check the entry in /etc/inittab (UNIX or Linux). If another port was set using the option -p<PORT>, check this as well. If all of this will not help, start the ProLE from another shell on UNIX or Linux with this command:

```
prole -p <PORT>
```

Issue this command on Windows:

```
prole -console -p <PORT>
```

Attempt to start backom again.

BKI5001E: Tivoli Storage Manager Error: Server not found in configuration file

On UNIX or Linux, the Tivoli Storage Manager server defined in the init<SID>.utl file does not match the server specified in the dsm.sys file. On Windows, the <server>.opt file might be missing.

BKI5001E: Tivoli Storage Manager Error: ANS1353E (RC53) Session rejected: Unknown or incorrect ID entered

This message can display when the node in the server stanza of the UTL file is not valid on the server.

HANG If backom hangs after the password is entered, the server IP address specified in the UNIX or Linux dsm.sys file might be incorrect.

When Step 1.2 (setting the password) is successful, proceed to Step 1.3 and perform a backup using the DB2 backup command to verify the settings are correct as described in the *User's Guide*. If the backup was successful you will see a message from DB2:

```
Backup successful. The timestamp for this backup image is: <timestamp>
```

If an error message displays, view the error description in the *User's Guide* for information regarding how to resolve it.

When an error occurs, always view the Data Protection for SAP® run log `tdpdb2.<SID>.<nodename>.log` first. This log file is located in the directory specified by the `TDP_DIR` environment variable. If the variable is not specified, the log file resides in the system temporary directory. If the `tdpdb2.<SID>.<nodename>.log` file does not exist (Step 2.2), then either DB2 was unable to load the shared library that contains the DB2 connector for Data Protection for SAP® or an error was encountered before calling the Data Protection for SAP® library. In both cases, a DB2 error message should display on the command line that begins with the SQL prefix and is also written in the DB2 diagnostic log `db2diag.log` (Step 4.3). DB2 provides detailed error descriptions by issuing this command:

```
db2 ? SQL<number>
```

Replace `<number>` with the appropriate message number. Try to resolve this problem using the DB2 documentation.

If the `tdpdb2.<SID>.<nodename>.log` file exists, search for a message beginning with `BKIXXXXY` where `XXXX` is a four digit number and `Y` is the letter I, W, or E. When such a message occurs, the DB2 connector for Data Protection for SAP® loaded correctly was called by DB2. In Step 3.1, the `tdpdb2.<SID>.<nodename>.log` file is created and an error message starting with `BKI` is recorded.

Location of log files

Text displayed on the screen during DB2 backup, DB2 restore, and BackOM operations are typically written to log files. DB2 also writes messages of internal operations, events, or status in the administration notification log file (`db2<SID>.nfy`) and diagnostic log file (`db2diag.log`). These log files reside in the directory specified with the DB2 database management configuration parameter `DIAGPATH`. Query the DB2 database management configuration with this command:

```
db2 get dbm cfg
```

Information about how to locate these log files is available in the *User's Guide*.

DB2 vendor reason codes

Data Protection for SAP® for DB2 uses these reason codes which might also be displayed or logged by DB2 in the case of problems.

Table 11. DB2 Vendor Reason Codes

| Reason Code | Explanation | User Response |
|-------------|---|--|
| 1 | The library specified could not be loaded. | Check the DB2 diagnostic log for further details. |
| 2 | Communication error between shared library and ProLE | Check the Data Protection for SAP® run log <code>filetdpdb2.<SID>.<nodename>.log</code> for further details. |
| 6 | Object specified cannot be found on Tivoli Storage Manager. | There is no backup image on Tivoli Storage Manager matching the given search criteria. |

Table 11. DB2 Vendor Reason Codes (continued)

| Reason Code | Explanation | User Response |
|-------------|---|---|
| 10 | Invalid options specified with the options parameter of the DB2 backup/restore command. | Check the options string specified and check the Data Protection for SAP® run log file tdpdb2.<SID>.<nodename>.log for further details. |
| 11 | Initialization procedure for shared library failed. | Check the Data Protection for SAP® run log file tdpdb2.<SID>.<nodename>.log and the DB2 diagnostic log file for further details. |
| 17 | During end processing of either backup/archive or restore/retrieve session(s), an error occurred. | Check the Data Protection for SAP® run log file tdpdb2.<SID>.<nodename>.log for further details. |
| 18 | An error occurred during reading or writing data from or to Tivoli Storage Manager. | Check the Data Protection for SAP® run log file tdpdb2.<SID>.<nodename>.log for further details. |
| 26 | An error occurred during deleting data from Tivoli Storage Manager. | Check the Data Protection for SAP® run log file tdpdb2.<SID>.<nodename>.log for further details. |
| 29 | An abort request from DB2 could not be handled correctly. | Check the Data Protection for SAP® run log file tdpdb2.<SID>.<nodename>.log and the DB2 diagnostic log file for further details. |
| 30 | A severe error occurred. | Check the DB2 diagnostic log file for further details. |

Troubleshooting Data Protection for SAP® for Oracle problems

Information on how to resolve errors that might occur during Data Protection for SAP® for Oracle operations is provided.

Location of log files

Text displayed on the screen during brbackup, brrestore, and SAP® Tools operations are typically written to a log file. Oracle also writes internal operations in the alert log and core files that reside in the directory specified in the Oracle control files, for example \$SAPDATA_HOME/saptrace/background/alert_<SID>.log. Information about how to locate these log files is available in the *User's Guide*.

Messages

During BR*Tools processing, logs that contain all issued messages are written to paths /oracle/<SID>/sapbackup (for BRBACKUP) or /oracle/<SID>/saparch (for BRARCHIVE). The message prefix indicates the issuing components. Refer to the documentation for the component that issued the message for detailed information. However, the following prefixes are used when employing BR*Tools with Data Protection for SAP® for Oracle:

Table 12. Prefixes when using BR*Tools

| Prefix | Issuing Component |
|-----------|--------------------------|
| ANS / ANR | Tivoli Storage Manager |
| BKI | Data Protection for SAP® |
| BR | BR*Tools |
| ORA | Oracle database kernel |
| RMAN | RMAN |

File Manager

The most important requirement for File Manager is that Data Protection for SAP® for Oracle is set up correctly. This is especially true in regard to the backint executable file, as this file must be able to connect to the Tivoli Storage Manager server without errors. If this call fails, the File Manager displays an error message but does not analyze the reason for the failure. To analyze the error, invoke backint manually with the inquire function and check the output for error messages.

BACKINT problem resolution

Figure 4 on page 109 displays how to isolate the problem once the settings performed by the installer are verified. Make sure the BACKINT interface is working correctly before examining the RMAN interface.

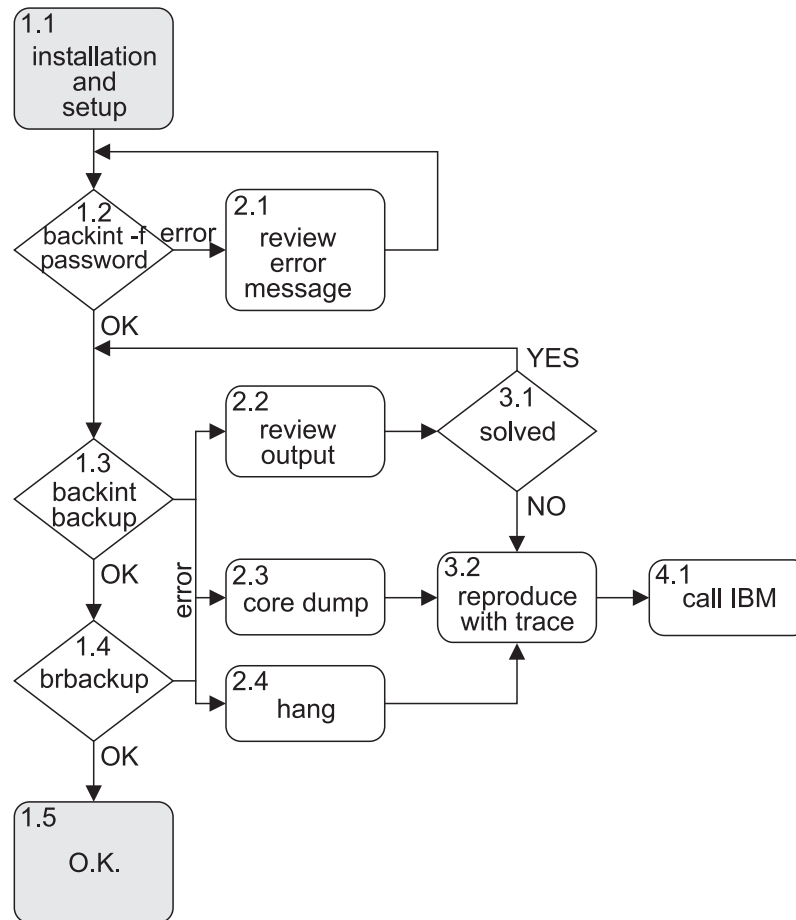


Figure 4. Problem Isolation for Backint

After installation is completed (Step 1.1) and manual password handling is specified, set the password (Step 1.2) as described in the *User's Guide*. When the operation completes successfully, the informational messages BKI0051I: Password successfully verified for node <NODENAME> on server <SERVERNAME> and BKI0024I: Return code is: 0. display for each server configured within the init<SID>.utl file. An error message displays when a problem occurred. The Administration Assistant can also be used. The Configurator feature loads the configuration of the node on which problems are encountered and allows the Administration Assistant to check the configuration.

These errors are frequently encountered at Step 1.2:

BKI2001E: Socket error while connecting to ProLE at <IP-Address>:<PORT>: Connection refused

On Windows, verify that the ProLE Service is running by viewing the Computer Management Services screen or issue this command:

```
net start
```

A list of all running services displays. On UNIX or Linux, verify that the background daemon is running by issuing this command:

```
ps -ef | grep prole
```

Check the entry in /etc/services (UNIX or Linux) and %SYSTEMROOT%\system32\drivers\etc\services (Windows). Compare the port number from the error message with the port number within /etc/services. Also check the entry in /etc/inittab (UNIX or Linux). If another port was set using the option -p<PORT>, check this as well. If all of this will not help, start the ProLE from another shell on UNIX or Linux with this command:

```
prole -p <PORT>
```

Issue this command on Windows:

```
prole -console -p <PORT>
```

Attempt to start backint again.

BKI5001E: Tivoli Storage Manager Error: Server not found in configuration file On UNIX or Linux, the Tivoli Storage Manager server defined in the init<SID>.utl file does not match the server specified in the dsm.sys file. On Windows, the <server>.opt file might be missing.

BKI5001E: Tivoli Storage Manager Error: ANS1353E (RC53) Session rejected: Unknown or incorrect ID entered

This message can display when the node in the server stanza of the UTL file is not valid on the server.

HANG If backint hangs after the password is entered, the server IP address specified in the UNIX or Linux dsm.sys file might be incorrect.

When Step 1.2 (setting the password) is successful, proceed to Step 1.3 and perform a backup using backint to verify the settings are correct as described in "Backup function" on page 113. When the backup completes successfully, the message #SAVED<BID><FILENAME> displays for each saved file and BKI0024I: Return code is: 0 also displays. If an error message displays, view the error description in the *User's Guide* for information regarding how to resolve it. At this point, the primary Data Protection for SAP® for Oracle setup is almost complete. The BR*Tools and Oracle (when using RMAN) must also be configured correctly. Proceed to Step 1.3 and start brbackup as described in the *User's Guide*.

RMAN problem resolution

The following graphic (Figure 5 on page 111) will help you to isolate problems that occur when using RMAN.

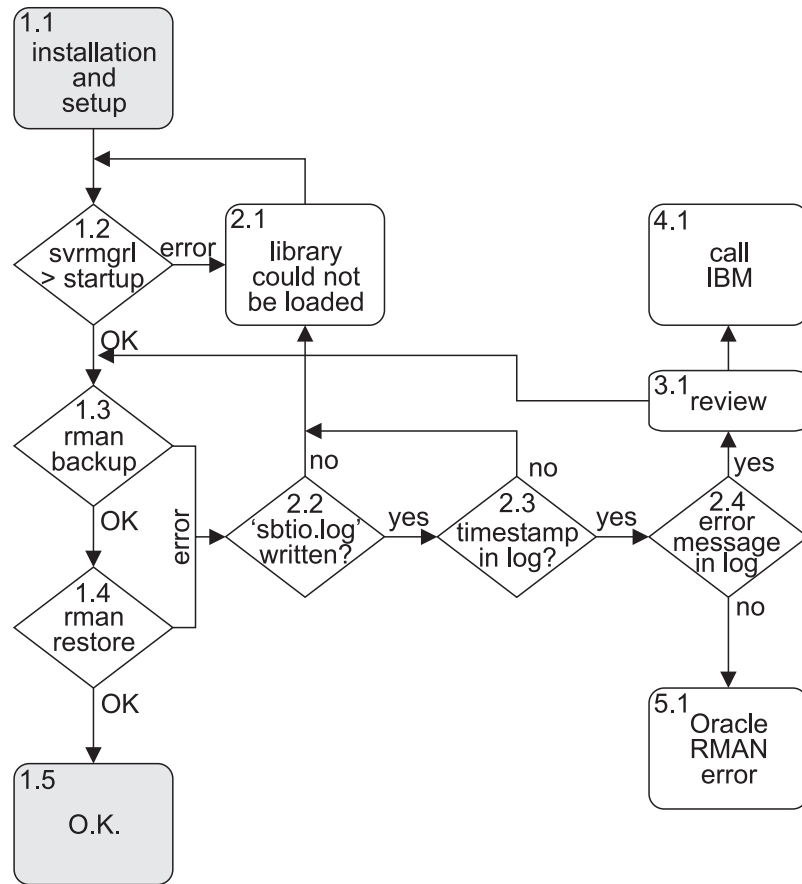


Figure 5. Problem Isolation for RMAN

After Data Protection for SAP[®] for Oracle and Oracle are configured to work together (Step 1.1 in Figure 5), attempt to start Oracle using the server manager `svrmgrl` (on UNIX or Linux) or `svrmgr30` (on Windows) with Oracle 8.x. Use SQL Plus (`sqlplus`) with Oracle 9.x. When an error occurs while using RMAN, always view the `sbtio.log` file first. This file is located in the directory specified by the `user_dump_dest` keyword in the Oracle `init<SID>.ora` profile (located at `$ORACLE_HOME/saptrace/usertrace/sbtio.log` by default). If the `sbtio.log` file does not exist (Step 2.2), then either Oracle was unable to load the shared library that contains the RMAN connector for Data Protection for SAP or an error was encountered before the Data Protection for SAP library was called. In both cases, an Oracle error message should exist in the `brbackup` log file that begins with `ORA-`, `PLS-`, or `RMAN-`. Try to resolve this problem using the Oracle and SAP[®] documentation. If the `sbtio.log` file exists, search for a message beginning with `BKIXXXXY` where `XXXX` is a four digit number and `Y` is the letter `I`, `W`, or `E`. When such a message occurs, the RMAN connector for Data Protection for SAP loaded correctly and was called by RMAN. This should be the first message for every new session in Step 2.3:

BKI7060I: Data Protection for SAP <version and build number> session: 764

If this message is not available, Oracle loaded an incorrect library.

Perform these tasks on Windows when an incorrect library is loaded by Oracle:

1. Remove or rename all occurrences of the file `orasbt.dll` except the one in the Data Protection for SAP installation directory. Then copy this one to `%ORACLE_HOME%\bin`.
2. Stop the `OracleService<SID>` and restart it.

Several factors must be considered when an incorrect library is loaded by Oracle on UNIX or Linux. For example, the RMAN library `libtdp_r3.<ext>` is not located by the Oracle executable. Oracle suggests to use the `SBT_LIBRARY` variable to specify the library. However, do not use this variable for a version of Oracle prior to Oracle 9.2. Be aware that Oracle recommends not to issue the `make` command as described in the *User's Guide*. However, this recommendation is not applicable for all combinations of operating system and Oracle combinations. As a result, issuing the `make` command on any UNIX or Linux system with Data Protection for SAP® is acceptable. When issued correctly, this command can confirm that the library and the Oracle executable are compatible. Also, make sure the library and soft link entered during the command exists and that the soft link is valid:

```
make -f ins_rdbms.mk ioracle LLIBMM=<lib or link>
```

It might be helpful to add the location of the link or library to the `LIBPATH` environment variable (on AIX) or to the `LD_LIBRARY_PATH` environment variable (on other UNIX or Linux systems).

On Windows based systems, the location of `orasbt.dll` must be in the `PATH`. Also, ensure that you have only one `orasbt.dll` in your system's `PATH`. It will be helpful as well to review the setup procedure according to the *User's Guide* and the information given in that chapter. Also, check if a core file is written or if Oracle has written a trace within the `saptrace/usertrace` directory.

In (Step 2.4) the file `sbtio.log` is written and you find an error message starting with `BKI` see the *User's Guide*. Using the `backint` executable file to determine any problems may make it easier because you can see all messages on the screen. Also, you will not disturb Oracle if something goes wrong. If `backint` is working as expected, return to problem determination with RMAN.

When isolating a problem with Data Protection for SAP and RMAN, you can follow the same steps as in "BACKINT problem resolution" on page 108. There must be a connection established to ProLE and the Tivoli Storage Manager server, and a password must be set (using `backint`) as well. If some of these steps fail, you will get exactly the same error messages with RMAN as you get with `backint`. Use the *User's Guide* to review these messages.

Manually invoke Data Protection for SAP® for Oracle

Information about how to invoke Data Protection for SAP® for Oracle from the command line to assist with troubleshooting efforts is provided.

Data Protection for SAP® for Oracle is typically invoked by the BR*Tools utilities with a set of appropriate parameters. For troubleshooting purposes, call Data Protection for SAP® directly from the command line:

```
backint -?
```

This command displays a list of all possible Data Protection for SAP® command line options. It enables you to manually perform data protection operations which can assist with correcting errors. For the C shell, enclose the option string in quotes (`backint '-?'`).

Backup function:

Data Protection for SAP® for Oracle is typically invoked by the BR*Tools utilities with a set of appropriate parameters. For troubleshooting purposes, call Data Protection for SAP® directly from the command line:

```
backint -?
```

This command displays a list of all possible Data Protection for SAP® command line options. It enables you to manually perform data protection operations which can assist with correcting errors. For the C shell, enclose the option string in quotes (backint '-?').

The backup function is typically invoked by the SAP® database utilities BRBACKUP and BRARCHIVE. These programs provide an input file (in the case of backup and inquire) to Data Protection for SAP® that contain the names and paths of the database files to be processed. For troubleshooting purposes, however, it might be necessary to directly call this Data Protection for SAP® function directly in order to back up individual files as shown in these examples. Issue this command on UNIX or Linux systems:

```
backint -p /oracle/SID/dbs/init<SID>.utl -f backup
```

Issue this command on Windows systems:

```
backint -p <drive: or UNC name>\orant\database\init<SID>.utl -f backup
```

The Data Protection for SAP® profile init<SID>.utl has to be specified with the path and file name statement as shown in the examples. The program prompts you to enter one (or more) file names. Every successful backup operation (collection of one or more files) is allocated its own backup ID within Tivoli Storage Manager. Remember to press CTRL + D (on a UNIX or Linux system) or CTRL + Z (on a Windows system) after the file name to backup has been entered.

Delete function:

Data Protection for SAP® for Oracle is typically invoked by the BR*Tools utilities with a set of appropriate parameters. For troubleshooting purposes, call Data Protection for SAP® directly from the command line:

```
backint -?
```

This command displays a list of all possible Data Protection for SAP® command line options. It enables you to manually perform data protection operations which can assist with correcting errors. For the C shell, enclose the option string in quotes (backint '-?').

The delete function is used as part of the Data Protection for SAP® version control mechanism and can only be called by Data Protection for SAP® or by a user. The delete function allows you to delete individual files, which might be necessary for recovering from an error. This function can be invoked from the command line as shown in these examples. Issue this command on UNIX or Linux systems:

```
backint -p /oracle/SID/dbs/init<SID>.utl -f delete
```

Issue this command on Windows systems:

```
backint -p <drive: or UNC name>\orant\database\init<SID>.utl -f delete
```

You will be prompted to enter the backup ID and the full file names of the files to be deleted.

Inquire function:

Data Protection for SAP® for Oracle is typically invoked by the BR*Tools utilities with a set of appropriate parameters. For troubleshooting purposes, call Data Protection for SAP® directly from the command line:

```
backint -?
```

This command displays a list of all possible Data Protection for SAP® command line options. It enables you to manually perform data protection operations which can assist with correcting errors. For the C shell, enclose the option string in quotes (backint '-?').

The inquire function (typically invoked by BR*Tools and BRRESTORE) is used to query the Tivoli Storage Manager server for backup IDs or files which belong to a particular backup ID. For troubleshooting purposes, however, it might be necessary to invoke this function manually as shown in these examples. Issue this command on UNIX or Linux systems:

```
backint -p /oracle/SID/dbs/init<SID>.utl -f inquire
```

Issue this command on Windows systems:

```
backint -p <drive: or UNC name>\orant\database\init<SID>.utl -f inquire
```

Data Protection for SAP® prompts you to enter the inquiry in one of these four formats:

- **#NULL:** Display all backup IDs that have been saved to this point. A typical line of the response could be #BACKUP JE0__A0DNE9Z74C. The backup ID in this case is JE0__A0DNE9Z74C (#BACKUP does not belong to the backup ID). The first six characters are the user defined prefix (see BACKIDPREFIX as described in the *User's Guide*). The next ten characters after this represent a unique ID of the backup.
- **BackupID:** Display all of the files which belong to that backup ID. A typical result could be ##BACKUP JE0__A0DNE9Z74C /oracle/C21/dbs/initC21.utl.
- **#NULL filename:** Display all of the backup IDs corresponding to the specified file. *Filename* requires an input consisting of path and name of the file.
- **BackupID filename:** Verify whether a particular file has been saved under a certain backup ID. *Filename* requires an input consisting of path and name of the file.

Restore function:

Data Protection for SAP® for Oracle is typically invoked by the BR*Tools utilities with a set of appropriate parameters. For troubleshooting purposes, call Data Protection for SAP® directly from the command line:

```
backint -?
```

This command displays a list of all possible Data Protection for SAP® command line options. It enables you to manually perform data protection operations which can assist with correcting errors. For the C shell, enclose the option string in quotes (backint '-?').

The restore function is typically started by the SAP® database utility BRRESTORE. For troubleshooting purposes, however, it might be necessary to directly call this Data Protection for SAP® function directly in order to restore individual files as shown in these examples. Issue this command on UNIX or Linux systems:

```
backint -p /oracle/SID/dbs/init<SID>.utl -f restore
```

Issue this command on Windows systems:

```
backint -p <drive: or UNC name>\orant\database\init<SID>.utl -f restore
```

You will be prompted to enter the backup ID and the full file names of the files to be restored. If the files are to be restored to another directory, it is necessary to specify the path to the input files. If a file is restored directly, any existing file with the same name will be overwritten without warning. Thus, it is recommended that you restore database files directly only in a very controlled manner, when it is absolutely necessary in order to remove an error. In normal operation, a database should never be restored directly because this could corrupt the SAP database.

Troubleshooting Data Protection for Snapshot Devices

Resolving problems encountered when using Data Protection for Snapshot Devices requires tasks specific to the database environment.

Related reference

“Log and trace files summary” on page 118

Log and trace files are update during Data Protection for Snapshot Devices operations.

General troubleshooting procedure

This procedure is valid for all Data Protection for Snapshot Devices applications.

The starting point for problem determination is the log file of the ACS daemon (acsd). In this file, all components involved in the current operation are listed, together with their respective log files. The sample below shows 3 different types of entries in the log file. Messages without a prefix (starting with the timestamp) are issued by acsd itself. This means that the last message (BKI1223W) indicates that acsd is not able to send the performance data to the Administration Assistant.

Messages prefixed with 'DB' are issued by the database client (this is the application which requests the backup operation), while messages prefixed with

'DEV' are issued by the device agent (this is the application with interacts directly with the storage hardware). The numbers after the strings 'DB' or 'DEV' differentiate instances of the same application type. In the sample below (for a DB2 configuration), there are two database clients (0002 and 0003) and two device clients (0001 and 0002) connected to the ACS daemon. The clients all have their own log files. The location of these files is shown in messages BKI1515I and BKI1557I. In case of an error, these files should be checked as well, in order to provide more detailed information.

```
07/08/08 17:41:07 BKI1511I:
```

```
=====
```

```
New backup operation started for database instance db2as1, database AS1.
```

```
=====
```

```
DB 0002 07/08/08 17:41:07 BKI1510I: New connection received.
DB 0002 07/08/08 17:41:07 BKI1513I: ***** Database client connected: Instance db2as1, database ...
DB 0002 07/08/08 17:41:07 BKI1515I: Client is logging to somehost.mydomain.com:/db2/AS1/acs/logs/...
DB 0003 07/08/08 17:41:07 BKI1510I: New connection received.
DB 0003 07/08/08 17:41:07 BKI1513I: ***** Database client connected: Instance db2as1, database...
DB 0003 07/08/08 17:41:07 BKI1515I: Client is logging to somehost.mydomain.com:/db2/AS1/acs/logs...
DEV 0001 07/08/08 17:41:09 BKI1510I: New connection received.
DEV 0002 07/08/08 17:41:09 BKI1510I: New connection received.
DEV 0002 07/08/08 17:41:09 BKI1514I: ***** Device client connected.
DEV 0002 07/08/08 17:41:09 BKI1557I: Device client is logging to somehost.mydomain.com:/db2/AS1/...
DEV 0001 07/08/08 17:41:09 BKI1514I: ***** Device client connected.
DEV 0001 07/08/08 17:41:09 BKI1557I: Device client is logging to somehost.mydomain.com:/db2/AS1/...
07/08/08 17:41:09 BKI1223W: A Problem occurred during send of performance data to the ...
```

Troubleshooting tips for Data Protection for Snapshot Devices for Oracle

Resolving problems encountered when using Data Protection for Snapshot Devices requires tasks specific to the native Oracle database environment.

If an error condition occurs during a Data Protection for Snapshot Devices event, there are several sources of information you can view to help determine what the problem might be. The sources of information are listed below. If you still encounter problems after reviewing this section, you can contact Tivoli Customer Support for assistance.

Be aware of the following information:

- Make sure to increase the size of the following two Oracle options located in the \$ORACLE_HOME/dbs/init(database_name).ora file:

```
sort_area_size = 10000000
sort_area_retained_size = 10000000
```

- When using Data Protection for Snapshot Devices to back up an Oracle database, the target database being backed up *cannot* reside on the same volume group as the file system containing \$ORACLE_HOME. Make sure that the Oracle Server does not share a volume group with the target database.
- When performing a full offline backup of a database, the target database on the production system must be in "startup mount" state at the time **acsora** is issued. Otherwise it will not be possible to restore the resulting backup without performing recovery.

This RMAN script template will restore the database backed up offline as described in the previous paragraph. It restores control files, datafiles, and opens

the database *without* any application of logs. This script must be started with the target database in a "startup mount" state:

```
run
{
allocate channel ch1 type 'SBT_TAPE' parms
'ENV=(TDPO_OPTFILE=<full path of tdpo.opt file>)';
set until scn = <Ckp SCN for backup being restored>;
restore control file to '<full path of 1st control file>';
restore control file to '<full path of 2nd control file>';
restore control file to '<full path of 3rd control file>';
alter database mount;
restore
(database);
sql 'alter database open RESETLOGS';
release channel ch1;
}
```

The database will in an open state and in a new incarnation after this script completes. All that remains is to issue the **reset database** command to RMAN and back up the database again since the previous backups are now rendered unusable since the database is in a new incarnation.

The <Ckp SCN for backup being restored> value is the Checkpoint SCN listed for the backup being restored in the RMAN **list backup** command. For example, the Checkpoint SCN is 32024 in the following list:

```
List of Backup Sets
Key Recid Stamp LV Set Stamp Set Count Completion Time
-----
26081 4 469212393 0 469212319 5 06-AUG-02

List of Backup Pieces
Key Pc# Cp# Status Completion Time Piece Name
-----
26082 1 1 AVAILABLE 06-AUG-02 05dvf74v_1_1

Lis of Datafiles Included
File Name LV Type Ckp SCN Ckp Time
-----
1 /dev/rmyfilelv 0 Full 32024 06-AUG-02
2 /dev/rmyrollbk1v 0 Full 32024 06-AUG-02
3 /dev/rmytemplv 0 Full 32024 06-AUG-02
4 /dev/rmyuserlv 0 Full 32024 06-AUG-02
```

Note that for an offline backup, the Checkpoint SCN should be the same for all of the datafiles.

Guidelines for Oracle variables

Data Protection for Snapshot Devices processing can be impacted when certain Oracle parameter and environment variable settings are not set with appropriate values.

It is recommended that you review this information for clarification.

PFILE parameter

When setting parameters in the profile, make sure the `TARGET_DATABASE_PARAMETER_FILE` parameter specifies a text-based Oracle initialization parameter file (PFILE) and not an Oracle server file (SFILE). Use of an Oracle server file will cause Data Protection for Snapshot Devices processing to fail. To ensure that Oracle obtains initialization parameter settings from a text-based file and therefore, can

access the TARGET_DATABASE_PARAMETER_FILE-specified value successfully, specify the PFILE parameter with the STARTUP command when starting Oracle.

TNS_ADMIN environment variable

This environment variable must be set when the SQL*Plus or Oracle Net configuration files do not reside in their default location.

Data Protection for Snapshot Devices for Oracle miscellaneous errors

Certain unique errors might display when using Data Protection for Snapshot Devices for native Oracle.

If you receive the following errors:

Data Protection for Snapshot Devices fails on the backup system in DBCS locales when the datafile or the path to the datafile contains a DBCS name.

This is an Oracle problem that has been reported to the Oracle development team. The Oracle tar number for this problem is 2367962.999.

The following procedure provides a workaround until the problem is resolved by Oracle:

1. Take the table space that contains the DBCS name in its datafile or the path to its datafile offline.
2. If the DBCS name is in the datafile, rename the DBCS datafile to an English name. If the DBCS name is in the path to the datafile, move the datafile to a path with an English name.
3. Log in to the Server Manager and issue the following command:

```
ALTER TABLESPACE <dbcs_tablespace_name> RENAME DATAFILE  
'dbcs_path/dbcs_datafile' TO 'english_path/english_datafile';
```
4. Bring the table space online.
5. Delete the DBCS datafile (if necessary).

Although Data Protection for Snapshot Devices supports table spaces named with DBCS, datafiles or paths to the datafiles that contain DBCS must be renamed to English before running Data Protection for Snapshot Devices.

ANS1132E - "Backup Access rule already defined for node <nodename>. Old rule must be deleted before new one can be defined."

This message can be ignored. It is logged whenever Data Protection for Snapshot Devices attempts to give another node permission to access a file and the permission was previously granted.

Log and trace files summary

Log and trace files are update during Data Protection for Snapshot Devices operations.

Log and trace files are written to during backup and restore processing by these products:

- DB2
- DB2 Advanced Copy Services
- Oracle
- Data Protection for Snapshot Devices
- Storage system
- CIM
- Tivoli Storage Manager for ERP

- Operating system

Data Protection for Snapshot Devices log and trace files

Refer to these examples of the log and trace files maintained by DB2 Advanced Copy Services and Data Protection for Snapshot Devices.

Data Protection for Snapshot Devices (and DB2 Advanced Copy Services) document each operation in log files. In addition, trace files can be requested via the TRACE parameter in the profile. However, it is recommended to not activate tracing unless specifically requested by IBM Support.

The following table lists the log and trace files maintained by DB2 Advanced Copy Services and Data Protection for Snapshot Devices. These files reside in <ACS_DIR>/logs

Table 13. DB2 Advanced Copy Services and Data Protection for Snapshot Devices Log and Trace Files

| Component | File |
|---|---|
| Management Agent (acsd) | acsd.<id>.<type> |
| Application client (for DB2, the Snapshot Backup Library) | client.<instance>.<db name>.<node>.<id>.<type> |
| Device Agent for CIM Devices | acscim.<db hostname>.<device class>.<node num>.<id>.<type> acscimd.<db hostname>.<device class>.<node num>.<id>.<type> |
| Device Agent for N Series Devices (SAN) | acsnsan.<db hostname>.<device class>.<node num>.<id>.<type> acsnsand.<db hostname>.<device class>.<node num>.<id>.<type> |
| Device Agent for N Series Devices (NAS) | acsnnas.<db hostname>.<device class>.<node num>.<id>.<type> acsnnasd.<db hostname>.<device class>.<node num>.<id>.<type> |
| Device Agent for IBM XIV® Storage System Devices | acsxiv.<db hostname>.<device class>.<node num>.<id>.<type> acsxivd.<db hostname>.<device class>.<node num>.<id>.<type> xivadapter_<id>_<function>.log |
| Offload Agent (tsm4acs) | tsm4acs.<host>.<id>.<type>tsm4acs d.<host>.<id>.<type> |
| RMAN (when invoked by Data Protection for Snapshot Devices) | rman.<SID>.id.log |
| Notes: <ul style="list-style-type: none"> • Names ending in '-d' are daemon processes (started with '-D' option). • <id> is the date ('yyyymmdd') for log files written by daemon processes, date and process ID ('yyyymmdd.xxxxxx') for trace files written by daemon processes or a timestamp (yyyymmddHHMMSS) for log and trace files for other processes. • <type> is "log" or "trace". • <device class> can be a device class specified in the profile or 'all' if no command line parameter '-s device class' was specified for the device agent. It can also be omitted for traces of the device agent. • <instance> and <db hostname> can be 'undef' for query/delete requests started with db2acsutil. • <node num> is the DB2 partition number in the case of DB2 and SAP with DB2. It is '0' for Oracle and SAP with Oracle or it can also be omitted for Oracle and SAP with Oracle. • <function> is backup, delete, restore, mount, unmount or reconcile. | |

The log file written by the Management Agent should always be used as an entry point. All major events, such as the start of a new operation or errors, are recorded

here and references are made from here to the appropriate other logs. The Management Agent starts a new log file every day and records all operations of one day within a single file. If TRACE is set to YES, each component of Data Protection for Snapshot Devices creates an additional trace file, also in the logs directory.

Storage system log and trace files

Storage system log and trace files are updated during Data Protection for Snapshot Devices operations.

Consult the documentation for the configured storage system.

CIM log and trace files

CIM log and trace files are updated during Data Protection for Snapshot Devices operations.

Consult the CIM documentation for logging and tracing information. Currently, only the DS Open API and the SAN Volume Controller master console produce log and trace output.

Tivoli Storage Manager for ERP log and trace files

Tivoli Storage Manager for ERP log and trace files are updated during backup and restore operations.

See the section "How To Find Files Containing Message Output (Log Files)" in the Tivoli Storage Manager for ERP *Installation and User's Guide* for details concerning logs and traces within Tivoli Storage Manager for ERP.

Important: A trace file can be requested by specifying the TRACEFILE parameter in the Tivoli Storage Manager for ERP profile. However, do not place this file on NFS, because this might cause network problems due to the high volume of trace entries being written.

Data Protection for Exchange with VSS backup-restore support

Data Protection for Exchange provides support for protecting Microsoft Exchange databases through two different methods. The most common method is through the Microsoft Legacy API. Data Protection for Exchange also can use the Microsoft Virtual Shadow Copy Service (VSS).

If you encounter a problem during Data Protection for Exchange processing using VSS for backup and restore, perform the following steps as your first attempt to resolve the problem:

1. Retry the operation that failed.
2. If the problem still exists, close other applications, especially those applications that interact with Exchange (antivirus applications, for example). Retry the operation that failed.
3. If the problem still exists:
 - a. Shut down the Exchange server.
 - b. Restart the Exchange server.
 - c. Run the operation that failed.
4. If the problem still exists:
 - a. Shut down the entire computer.
 - b. Restart the computer.

- c. Run the operation that failed.
5. If the problem still exists, determine if it is occurring on other Exchange servers.

Determining if the problem is a Data Protection for Exchange issue or a general VSS issue

The Data Protection client interacts closely with the backup-archive client (DSMAGENT), which performs all of the Virtual Shadow Copy Service (VSS) operations. Determine first if the problem is with the Microsoft VSS service or with the Tivoli Storage Manager.

Perform the following steps to try to isolate the source of the error:

1. Test the connectivity between the Data Protection client and the Tivoli Storage Manager dsmagent. Issue the TDPEXCC QUERY EXCHANGE command on the computer where the Exchange server is installed to verify that your installation and configuration is correct. This command returns information on the following items:
 - Exchange Server status
 - Storage groups
 - Circular logging
 - VSS components

The following example shows the output generated by the TDPEXCC QUERY EXCHANGE command:

```
Volume Shadow Copy Service (VSS) Information
-----
Writer Name           : Microsoft Exchange Writer
Local DSMAgent Node   : SERVERA
Remote DSMAgent Node  : SERVERX
Writer Status         : Online
Selectable Components : 4
```

If the TDPEXCC QUERY EXCHANGE command does not return all of this information, you might have a proxy configuration problem. Refer to your User's manual for instructions on setting up proxy configurations. If all of the information returned to you seems correct, proceed to the next step.

2. Use the vssadmin or vshadow utility to recreate the VSS operation without the Tivoli Storage Manager intervening. When VSS operations are failing, use these programs to recreate the error to determine if this is a general VSS problem or a problem within the Tivoli Storage Manager code.

vssadmin

A utility that is installed with your operating system. It can display current volume shadow copy backups and all installed shadow copy writers and providers in the command window. The following commands are examples of possible VSSADMIN commands:

```
VSSADMIN LIST WRITERS
VSSADMIN LIST PROVIDERS
VSSADMIN LIST SHADOWS
```

vshadow

A utility included with the Microsoft Volume Shadow Copy Services SDK that can be used to exercise most of the VSS infrastructure, such as creating/querying/deleting shadow copies. You can also use

vshadow to create both persistent and nonpersistent shadow copies, transportable snapshots, as well as assign a drive letter or mount point to a shadow copy.

- The following items can be determined by using the vssadmin or vshadow utility:
 - Verify VSS Provider configurations
 - Rule out any possible VSS problems before running the Tivoli Storage Manager VSS functions
 - That you might have a VSS configuration problem or a real hardware problem if an operation does not work with vshadow/vssadmin
 - That you might have a Tivoli Storage Manager problem if an operation works with vshadow/vssadmin but not with the Tivoli Storage Manager
- Perform the following tests to ensure that VSS is working correctly:

Test nonpersistent shadow copy creation and deletion

- a. Run “VSHADOW *k*: *l*:” where *k*: and *l*: are the Exchange Server database and log volumes.
- b. Repeat the step above four times.
- c. Inspect the Windows Event Log to ensure that things look appropriate.

Test persistent shadow copy creation and deletion

- a. Run “VSHADOW -p *k*: *l*:” (where *k*: and *l*: are the Exchange Server database and log volumes. You might have to run “VSHADOW -da” to remove this if you do not have enough space.
- b. Repeat the previous step four times.
- c. Inspect the Windows Event Log to ensure that things look appropriate.

Test nonpersistent transportable shadow copy creation and deletion (VSS Hardware Provider environments only)

- a. Run “VSHADOW -p -t=export.xml *k*: *l*:” where *k*: and *l*: are the Exchange Server database and log volumes.
- b. Copy the resultant “export.xml” file from computer 1 to computer 2 before performing the next step.
- c. On the computer you have set aside for offload, run “VSHADOW -i=export.xml”
- d. Inspect the Windows Event Log to ensure that things look appropriate.

If any of these tests fail repeatedly, there is hardware configuration problem or a real VSS Problem. Consult your hardware documentation for known problems or search Microsoft Knowledge Database for any information.

If all tests pass, continue to Step 3.

3. Recreate your specific problem by using vshadow. If you can only recreate your problem through a series of steps (for example: a backup fails only when you perform two consecutive local backups), try to perform those same tests by using vshadow.
 - Exchange VSS backups to Local are simulated by running a vshadow persistent snapshot.
 - Exchange VSS backups to the Tivoli Storage Manager are simulated by running a vshadow nonpersistent snapshot.
 - Exchange VSS backups to Local and to the Tivoli Storage Manager are simulated by running a vshadow persistent snapshot.
 - Offloaded Exchange VSS backups to the Tivoli Storage Manager are simulated by running a vshadow nonpersistent, transportable snapshot.

Refer to the VSHADOW documentation for the specific commands for performing backups.

If you can recreate the problem, it most likely is a general VSS issue. Refer to Microsoft Knowledge Database for information. If your operation passes successfully with vshadow, it most likely is a Tivoli Storage Manager/Data Protection for Exchange client problem.

Tracing the Data Protection client when using VSS technology

You must gather traces for Data Protection for Exchange, the Tivoli Storage Manager application programming interface (API), and the DSMAGENT processes to ensure proper diagnosis of the Virtual Shadow Copy Service (VSS) operation.

The following traces are the different traces to gather when you diagnose Data Protection for Exchange VSS operational problems:

- **Data Protection for Exchange trace**

To create the trace flag, issue the “/TRACEFILE” and “/TRACEFLAGS” command-line options with the following example command:

```
TDPEXCC BACKUP SG1 FULL /TRACEFILE=DPTRACE.TXT /TRACEFLAG=SERVICE
TDPEXC /TRACEFILE=DPTRACE.TXT /TRACEFLAG=SERVICE
```

- **Tivoli Storage Manager API trace**

Enable tracing with the DP/Exchange DSM.OPT file and the “TRACEFILE” and “TRACEFLAGS” keywords. The following text is an example of the entry in the DP/Exchange DSM.OPT file:

```
TRACEFILE APITRACE.TXT
TRACEFLAG SERVICE
```

- **DSMAGENT trace**

Enable tracing with the DSMAGENT DSM.OPT file and the “TRACEFILE” and “TRACEFLAGS” keywords. The following text is an example of the entry in the DSMAGENT DSM.OPT file:

```
TRACEFILE AGTTRACE.TXT
TRACEFLAG ALL_VSS
```

The trace flag, in this instance, is ALL_VSS (you might need different traceflags, depending on the circumstance).

Gathering Exchange with VSS information before calling IBM

The Data Protection client is dependent upon the operating system and the Exchange application. Collecting all the necessary information about the environment can significantly assist in determining the problem.

Gather as much of the following information as possible before contacting IBM Support:

- The exact level of the Windows operating system, including all service packs and hotfixes that were applied.
- The exact level of the Exchange Server, including all service packs and hotfixes that were applied.
- The exact level of Data Protection for Exchange with Virtual Shadow Copy Service (VSS) Backup/Restore support.
- The exact level of the Tivoli Storage Manager API.
- The exact level of the Tivoli Storage Manager server.
- The exact level of the Tivoli Storage Manager backup-archive client.

- The exact level of the Tivoli Storage Manager storage agent (if LAN-free environment).
- The Tivoli Storage Manager server platform and operating system level.
- The output from the Tivoli Storage Manager server QUERY SYSTEM command.
- The output from the Data Protection for Exchange TDPEXCC QUERY EXCHANGE command.
- The device type (and connectivity path) of the Exchange databases and logs.
- The specific hardware that is being used (for example: HBA, driver levels, microcode levels, SAN Volume Controller levels, DS6000™, DS8000® hardware details).
- Permissions and the name of the user ID being used to run backup and restore operations.
- The name and version of antivirus software.
- The IBM VSS hardware provider level.
- The IBM CIM agent level for DS6000 or DS8000 or the SAN Volume Controller.
- A list of third-party Exchange applications running on the system.
- A list of other applications running on the system.
- A list of the steps needed to recreate the problem (if the problem can be recreated).
- If the problem can not be recreated, list the steps that caused the problem.
- Is Data Protection for Exchange running in a Microsoft Cluster Server (MSCS) environment?
- Is the problem occurring on other Exchange servers?

Some operating system information that is listed above can be gathered by using the MPS Reports Tool. This is a Microsoft Reporting tool which lets you gather levels of operating system, software installed, driver versions, and other data. You can download the MPS Reports Tool at Microsoft.com.

Gathering Exchange with VSS files before calling IBM

Several log files and other data can be collected for Data Protection for Exchange server diagnosis.

Gather as many of the following files as possible before contacting IBM Support:

- The Data Protection for Exchange configuration file. The default configuration file is `tdpexc.cfg`.
- The Data Protection for Exchange Tivoli Storage Manager API options file. The default options file is `dsm.opt`.
- The Tivoli Storage Manager registry hive export.
- The Exchange Server registry hive export.
- The Tivoli Storage Manager Server activity log. The Data Protection client logs information to the server activity log. A Tivoli Storage Manager administrator can view this log for you if you do not have a Tivoli Storage Manager administrator user ID and password.
- If the Data Protection client is configured for LAN-free data movement, also collect the options file for the Tivoli Storage Manager storage agent. The default name for this file is `dsmsta.opt`.
- Any screen captures or command-line output of failures or problems.

Log files can indicate the date and time of a backup, the data that is backed up, and any error messages or completion codes that could help to determine your problem. The following files are the Tivoli Storage Manager log files that you can gather:

- The Data Protection for Exchange log file. The default location of this file is C:\Program Files\Tivoli\TSM\TDPEXchange\tdpexc.log
- The Tivoli Storage Manager API Error log file. The default location of this file is C:\Program Files\Tivoli\TSM\TDPEXchange\dsierror.log
- The DSMAGENT error log file. The default location of this file is C:\Program Files\Tivoli\TSM\baclient\dsmerror.log

The Windows event log receives information from the Exchange Server and many different components involved during a Virtual Shadow Copy Service (VSS) operation. Microsoft provides a tool in the system32 directory on Windows XP and Windows 2003, called eventquery.vbs (it is a VBS script, not a binary executable file) to retrieve event log data. You might use the tool as an alternative method of getting Windows event log data. To invoke the utility, issue the following CSCRIPT command:

```
cscript c:\windows\system32\eventquery.vbs parameters > outfile
```

The utility, by default, produces a tabular listing of all event log records in three sections (one section per event log type). To get all log data in default format, issue the following command:

```
cscript c:\windows\system32\eventquery.vbs >eq.out
```

Specify the type of event log you require by using one of the following /L parameters:

```
/L Application  
/L Security  
/L System
```

The following example generates output only for the application and system event logs:

```
cscript c:\windows\system32\eventquery.vbs /L Application >eq_app.out  
cscript c:\windows\system32\eventquery.vbs /L System >eq_sys.out
```

You can utilize the /V parameter to receive detailed (verbose) output:

```
cscript c:\windows\system32\eventquery.vbs /V >eq.out  
cscript c:\windows\system32\eventquery.vbs /L System /V >eq_sys.out
```

You can utilize the /FO parameter to specify tabular, list, or comma-separated (CSV) output. The following are the different methods of specifying the output:

```
/FO TABLE  
/FO LIST  
/FO CSV
```

The default format is TABLE. The LIST output puts each column of the record on a separate line, similar to how the Tivoli Storage Manager administrator's command-line interface (CLI) displays output when it is too wide for tabular display. The CSV output can be loaded into a spreadsheet or database tool for easier viewing. The following example generates a detailed CSV file of the application log:

```
cscript c:\windows\system32\eventquery.vbs /L Application /FO CSV /V >eq_app.out
```


You can get additional help information for the tool by using the following example:

```
cscript c:\windows\system32\eventquery.vbs /?
```

The following VSS provider log files can also be helpful, if applicable:

- System Provider - (Windows Event Log)
- IBM System Storage™ SAN Volume Controller, DS6000, DS8000 - D:\Program Files\IBM\Hardware Provider for VSS\IBMVss.log
- NetApp - D:\Program Files\SnapDrive*.log

Troubleshooting Data Protection for Exchange VSS and SAN Volume Controller

The troubleshooting tips included here are designed to help you accelerate your problem determination task.

Important: If you plan to perform Data Protection for Exchange Virtual Shadow Copy Service (VSS) Instant Restore operations using SAN Volume Controller or DS6000/DS8000 disk subsystems, you must use non-SSL communications with the CIMOM. By default, the CIMOM is configured to use SSL communications. The Tivoli Storage Manager only supports non-SSL communications with the CIMOM. See the *Data Protection for Exchange User's Guide* for information on enabling non-SSL communications.

The following areas are where you can troubleshoot when you are having VSS and SAN Volume Controller or DS6000/DS8000 problems:

- CIMOM (Common Information Model Object Manager) Connectivity issues

To verify connectivity to the CIMOM, perform the following steps:

1. Refer to your SAN Volume Controller documentation.
2. Run the IBMVCFG LIST command. The default location is D:\Program Files\IBM\Hardware Provider for VSS-VDS.
3. Issue the IBMVCFG SHOWCFG command to view the provider configuration information.
4. Check that the CIMOM is properly configured. Run `verifyconfig.bat -u username -p password` on the SAN Volume Controller Master Console.
5. Check the username and password. If there is a problem with the truststore, follow the procedure in the documentation to generate a new truststore.
6. Set up the CIMOM properties file in non-SSL mode if you are using the SAN Volume Controller or DS6000/DS8000 and you plan to use Instant Restore.

- CIMOM operational issues

If your backup or restore fails, check the IBMVSS.log file. If the failure is due to a CIMOM failure, the log displays output similar to the following example:

```
Wed Jan 11 17:34:34.793 - Calling AttachReplicas
Wed Jan 11 17:34:35.702 - AttachReplicas: 909ms
Wed Jan 11 17:34:35.702 - returnValue: 34561
Wed Jan 11 17:34:35.718 - AttachReplicas returned: 34561
java.util.MissingResourceException: Can't find resource for
bundle java.util.PropertyResourceBundle, key 1793
at java.util.ResourceBundle.getObject(ResourceBundle.java:329)
at java.util.ResourceBundle.getString(ResourceBundle.java:289)
at com.ibm.cim.CIMException.<init>(CIMException.java:472)
at ESSService.executeFlashCopy(ESSService.java:3168)
Wed Jan 11 17:34:35.779 - IBMVSS: AbortSnapshots
```


A return value of 0 means that it was successful. To determine why it failed, look at the log files generated by the CLI or graphical user interface (GUI), depending on how you run your operation. These might provide more information on the failure.

- Host configuration issues

If the failure seems to be for a different reason than a CIMOM failure, verify your configuration. Run the latest support levels of the software for the SAN Volume Controller or DS6000/DS8000. Check the IBM Storage web site for details.

- Collecting logs in this environment

If you are unable to resolve these problems, provide the following information to IBM Support:

- Information listed in the Tivoli Storage Manager diagnostic information section
- HBA type, firmware and driver levels
- SDD version
- SAN Volume Controller microcode version (if applicable)
- DS6000/DS8000 microcode version (if applicable)
- SAN Volume Controller Master Console version (if applicable)
- For DS6000/DS8000, the CIM Agent version (if applicable)
- IBMVSS.log
- Application Event Log
- System Event Log

If the problem appears related to CIMOM, you also need the CIMOM logs. Run CollectLogs.bat and send the file that is created (CollectedLogs.zip) to IBM Support. The default location for the SAN Volume Controller is C:\Program Files\IBM\svcconsole\support, and the default location for the DS6000/DS8000 is C:\Program Files\IBM\cimagent.

Chapter 6. Using trace to resolve problems

The Tivoli Storage Manager can, at times, experience problems that you can resolve through trace.

Enabling Administration Center trace

Tracing is available for the Tivoli Storage Manager Administration Center.

Perform the following steps to enable tracing for the Administration Center:

1. Start the Administration Center support utility. This utility is located in the Tivoli Storage Manager installation directory under `Tivoli\TSM\AC\products\tsm\bin`. Start the utility by typing `supportUtil.bat` on Windows or `supportUtil.sh` on UNIX.
2. Choose which trace classes to enable or simply turn all tracing on. See the trace classes for the Administration Center for more information about the different trace classes. Follow the on-screen instructions to enable tracing.

```
C:\Program Files\Tivoli\TSM\AC\products\tsm\bin>supportutil
```

```
Administration Center Support Utility - Main Menu
```

```
=====
```

1. Manage Administration Center tracing
2. Manage the maximum memory size the Administration Center can use
3. Manage the Administration Center session timeout setting
4. Collect trace files, logs and system information to send to support
5. View the log file for this utility

```
9. Exit
```

```
Enter Selection: 1
```

```
Administration Center Support Utility - Manage Tracing
```

```
=====
```

1. Turn all tracing on
2. Turn all tracing off
3. Turn a single trace class on
4. View the current trace specification

```
99. Return to main menu
```

```
Enter Selection: 3
```

```
Administration Center Support Utility - Turn Single Class On
```

```
=====
```

1. ADMCNTR - traces the Java classes in com.tivoli.dsm.admcntr*
2. CONTROL - traces the Java classes in com.tivoli.dsm.admcntr.cntl*
3. UTIL - traces the Java classes in com.tivoli.dsm.admcntr.util*
4. PS - traces the Java classes in com.tivoli.dsm.admcntr.ps*
5. COMPS - traces the Java classes in com.tivoli.dsm.admcntr.comp*
6. SERVERS - traces the Java classes in com.tivoli.dsm.admcntr.comp.servers*
7. ENTMGMT - traces the Java classes in com.tivoli.dsm.admcntr.comp.entmgmt*
8. DRM - traces the Java classes in com.tivoli.dsm.admcntr.comp.drm*
9. MPLAN - traces the Java classes in com.tivoli.dsm.admcntr.comp.mplan*
10. STGDEVS - traces the Java classes in com.tivoli.dsm.admcntr.comp.stgdevs*
11. REPORTS - traces the Java classes in com.tivoli.dsm.admcntr.comp.reports*
12. DOMAIN - traces the Java classes in com.tivoli.dsm.admcntr.comp.domain*
13. NAS - traces the Java classes in com.tivoli.dsm.admcntr.comp.naswiz*
14. NODES - traces the Java classes in com.tivoli.dsm.admcntr.comp.nodes*
15. ADMINAPI - traces the Java classes in com.tivoli.dsm.adminapi*
16. SERVICE - traces the Java classes in com.tivoli.dsm.service*
17. HEALTH - traces the Java classes in com.tivoli.dsm.service.health*

18. CONNS - traces the Java classes in com.tivoli.dsm.service.conns*

98. Return to mange tracing menu

99. Return to main menu

Enter Selection:

3. Perform the operation that is causing the problem to create a trace of the problem, that is then written to the trace file. The trace file is located in the Tivoli Storage Manager installation directory under Tivoli\TSM\AC\ISCW61\profiles\TsmAC\logs\tsmServer\trace.log.
4. Disable tracing. Leaving tracing "enabled" might cause performance problems.
5. Run Collect trace files, logs and system information to send to support. This procedure packages up the trace information collected and log files into a single file called AdminCenterSupport.zip. This file can then be sent to support.

Related reference

"Administration Center support utility" on page 96

The Administration Center Support Utility is a command-line driven utility designed to assist in performing basic support tasks with the Administration Center.

"Trace classes for the Administration Center"

The Administration Center provides individual and aggregate trace classes.

Aggregate classes are a shortcut for enabling many related trace classes by simply specifying the aggregate trace class name.

Trace classes for the Administration Center

The Administration Center provides individual and aggregate trace classes.

Aggregate classes are a shortcut for enabling many related trace classes by simply specifying the aggregate trace class name.

The trace classes documented in table Table 14 are those that are most typically requested or used for diagnosing problems. Those trace classes that are included does not entail all possible trace classes that are available.

The trace class name should be used when activating tracing using the Administration Center support utility.

Table 14. Trace classes for the Administration Center

| Trace Class | Description | Recommendation |
|-------------|---|--|
| ACTIONS | Displays processing information for the action classes. | Useful for problems related to action objects. Use this trace class to debug problems that occur as an action, before displaying a page. |
| ALL | Displays all processing information for the Administration Center. An aggregate that includes all of the trace classes listed here. | Useful in most cases. Generally recommended when the nature of the problem is unknown. If the ALL trace flag is used, it is not necessary to specify any other trace flags because it already includes all of the trace classes. |

Table 14. Trace classes for the Administration Center (continued)

| Trace Class | Description | Recommendation |
|-------------|--|--|
| API | Displays information in the processing of the API interface. The API interface is used for communications between the Administration Center and the Tivoli Storage Manager server. | Use this trace class for problems related to command implementation on the Tivoli Storage Manager server. |
| CONTROL | Displays processing information for the connection manager, the portlet factory and other key control components. | Useful for problems related to control objects. Use this trace class to debug problems that occur when you perform actions that use internal control objects, such as the connection manager. |
| HEALTH | Displays all information about the health monitor. | Use this trace class for problems related to the Health Monitor. |
| PS | Displays general information in the processing of Presentation Services object extensions. This traces all listener, validator, and JavaServer Page (JSP) bean classes. | Use this trace class for problems related to graphical user interface objects, such as tables and buttons. |
| SNAPIN | Displays processing information for the snapin portlet classes. An aggregate that includes most of the Administration Center trace classes documented here. | Useful in many cases. Generally recommended for diagnosing problems with the Administration Center when the Health Monitor and XML files are working fine. Aggregate of all trace classes except HEALTH, XMLVAL, and TAGLIB. |
| TAGLIB | Displays all information related to the JSP tag library extensions. | Use this trace class for problems related to JSP pages. |
| UTIL | Displays processing information for the utility classes. | Useful for problems related to utility objects. Use this trace class to debug problems that occur in various internal utility routines. |
| VIEWS | Displays processing information for the view classes. | Useful for problems related to view objects. Use this trace class to debug problems that occur while you are displaying a page. |
| XMLVAL | Displays all information in the processing of XML files. | Use this trace class for problems related to the file controlling the servers that the Administration Center knows about (tsmservers.xml) and the command file cache. |

Related reference

“Administration Center support utility” on page 96

The Administration Center Support Utility is a command-line driven utility designed to assist in performing basic support tasks with the Administration Center.

Enabling a trace for the server or storage agent

Trace commands can be issued from the server console, storage agent console, administrative client connected to either the server or storage agent, server options file (dsmserv.opt), or the storage agent options file (dsmsta.opt).

Trace commands apply to the server or storage agent to which the command was submitted. Trace commands in the options files are used to trace the applications during startup and initialization or to provide a default set of trace classes. There are two trace classes that are always enabled by default, whether they appear on the options file or not. These are ADDMSG and SYSTIME. It is best to trace to a file. Typically, the tracing for the server or storage agent will generate a large amount of output.

Perform the following steps to enable trace classes for the server or storage agent:

1. Determine the trace classes to enable. To have trace messages issued for a given trace class, that trace class needs to be enabled either prior to beginning the trace or after the tracing has begun.
2. Issue the TRACE ENABLE<traceClassName> command to enable one or more trace classes. Note that <traceClassName> might be a space-delimited list of trace classes. For example, this command could be entered as TRACE ENABLE TM SESSION. The TRACE ENABLE command is cumulative, such that extra trace classes can be enabled by issuing TRACE ENABLE numerous times. For example, if you wanted to add the PVR trace class in addition to those that were already enabled, issue: TRACE ENABLE PVR. To stop having trace messages issued for a given trace class, that trace class needs to be disabled either prior to beginning the trace or after the tracing has begun.
3. Issue the TRACE DISABLE<traceClassName> command to disable one or more trace classes. Note that <trace class name> might be a space delimited list of trace classes. For example, this command could be entered as TRACE DISABLE TM SESSION. Additional trace classes can also be disabled by issuing TRACE DISABLE. For example, if you wanted to remove the PVR trace class in addition to those that were already disabled, issue: TRACE DISABLE PVR. By issuing TRACE DISABLE without specifying any trace classes, all currently enabled trace classes will be disabled.
4. Tracing can occur to the console or to a file. Perform the following tasks to begin tracing:
 - For tracing to the console, issue: TRACE BEGIN
 - For tracing to a file with no size limitation, issue: TRACE BEGIN <fileName>
 - For tracing to a file with a size limitation, issue: TRACE BEGIN <fileName> MAXSIZE=<maximum size in megabytes>

Note: The *fileName* can be a fully-qualified path such as /opt/tmp or c:\temp. If a full path is not given, the trace file will be located in the same directory as the running executable file.

5. Perform the operation that is causing the problem.

6. Issue the TRACE END command to stop trace messages from being issued. If tracing was being done to a file, ending the trace will write any remaining trace messages to the file and then close the file.

It is possible to enable tracing and begin it using the server or storage agent options file. The commands and syntax discussed are the exact same for the server or storage agent options file, and they are generally used to trace startup and initialization of the server. For example, if the following lines were added to the server's option file, tracing would be started for the DB, TM, and LOG trace classes, and the trace messages written to the file MYTRACE.OUT.

```
TRACE ENABLE DB TM LOGTRACE BEGIN MYTRACE.OUT
```

Related reference

"Trace classes for a server or storage agent" on page 134

The server and storage agent provide aggregate trace classes. These are a shortcut for enabling many related trace classes by simply specifying the aggregate trace class name for the TRACE ENABLE command.

Enabling a stack trace for specific messages for the server or storage agent

A stack trace reveals information about an application that IBM Software Support can use to help you diagnose your problems faster.

Remember: Stack trace can be extremely robust and might flood the activity log, depending on the frequency of the failure. You might not be able to view the activity log, therefore you might want to disable stack trace after completion.

IBM Software Support might find it helpful to enable stack trace on specific messages issued by the server or storage agent. The types of messages on which a stack trace can be enabled are server console, storage agent console, and the administrative client connected to either the server or storage agent.

To get a stack trace when a specific message is issued by the server or storage agent, enable the message for stack trace. Issue the MSGSTACKTRACE ENABLE *<messageNumber>* command to enable one or more messages for stack trace.

Restriction: *<messageNumber>* might be a space-delimited list of message numbers.

This command could be entered as MS ENABLE 2017. The MSGSTACKTRACE ENABLE command is cumulative, such that extra messages are enabled by issuing the MSGSTACKTRACE ENABLE command additional times. If you want to add message 985, in addition to those that are already enabled, issue MS ENABLE 985. Notice that only the number part of the message is allowed in the MSGSTACKTRACE command. To stop getting stack trace for messages issued by the server or storage agent, the stack trace for those messages needs to be disabled. Issue the MSGSTACKTRACE DISABLE *<messageNumber>* command to disable one or more messages.

Note that *<messageNumber>* might be a space-delimited list of message numbers. For example, this command could be entered as MSGSTACKTRACE DISABLE 2017 985. Additional messages can also be disabled by issuing MS DISABLE. For example, if you wanted to remove message number 7837 in addition to those that are already disabled, issue MSGSTACKTRACE DISABLE 7837.

The following messages are enabled for stack trace by default:

| | | | | | | | | | |
|------|------|------|------|------|------|------|------|------|------|
| 435 | 437 | 486 | 661 | 685 | 727 | 728 | 780 | 781 | 782 |
| 784 | 785 | 786 | 790 | 793 | 794 | 860 | 881 | 882 | 883 |
| 884 | 1032 | 1078 | 1092 | 1117 | 1156 | 1227 | 5010 | 5015 | 5019 |
| 5021 | 5093 | 5099 | 5100 | 5267 | 6753 | 7823 | 7837 | 9600 | 9601 |
| 9602 | 9604 | 9605 | 9606 | 9607 | 9608 | 9999 | | | |

Trace classes for a server or storage agent

The server and storage agent provide aggregate trace classes. These are a shortcut for enabling many related trace classes by simply specifying the aggregate trace class name for the TRACE ENABLE command.

The trace classes listed in Table 15 are those that are most typically requested or used for diagnosing problems. This table does not include all possible trace classes that are available. The trace class name should be used with the TRACE ENABLE and TRACE DISABLE commands.

Table 15. Server or storage agent trace classes

| Trace Classes | Description | Recommendation |
|---------------|--|--|
| ADDMSG | Issues console messages (ANR, ANE, and so on) to the trace file. | This trace class is valuable for correlating server messages to trace messages and for preserving the timing for when each was issued. |
| ADMCMD | Traces related to command processing. | Use this trace class to debug the command interpreter, including the PARALLEL and SERIAL command handling. |
| AF | Displays information about user data stored on sequential media devices. This is an aggregate trace class that enables AFCREATE, AFMOVE, AFLOCK, AFTXN, and AFCOPY. Typically recommended to issue TRACE DISABLE AFLOCK, unless the locking information is explicitly requested or needed. | Use this trace class to diagnose problems reading or writing user files to sequential media volumes. |
| AFCREATE | Displays information about storing user data on sequential media volumes. | Use this trace class to diagnose writing user data on sequential media volumes. |

Table 15. Server or storage agent trace classes (continued)

| Trace Classes | Description | Recommendation |
|---------------|--|---|
| AFMOVE | Displays operations that move user data using sequential media volumes. Move operations are performed by MIGRATION, RECLAMATION, MOVE DATA, and MOVE NODEDATA server processes. | Use this trace class to diagnose problems with the data movement server processes. |
| AS | Displays information volume selection and assignment, coordination of drives (mount points), and management of data placement on volumes. This is an aggregate trace class that enables ASALLOC, ASRTRV, ASDEALLOC, ASMOUNT, ASVOL, ASTXN, and ASSD. Typically recommended to issue TRACE DISABLE ASTXN, unless the locking information is explicitly requested or needed. | Use this trace class to diagnose many different problems relating to volumes, mount points, or data read and write operations. |
| ASALLOC | Displays information about reserving and allocating space on sequential media volumes for the purpose of storing data. This might be for storing data on behalf of a client session or for server data movement operations such as MIGRATION, RECLAMATION, MOVE DATA, or MOVE NODEDATA | Use this trace class to diagnose problems where the server or storage agent report no space available but there should be space available in the storage hierarchy. |
| ASDEALLOC | Displays information about releasing and de-allocating space on sequential media volumes for the purpose of storing data. Typical deallocation operations on the server are EXPIRATION, MIGRATION, RECLAMATION, MOVE DATA, MOVE NODEDATA, AUDIT VOLUME, DELETE VOLUME, and DELETE FILESPACE. | Use this trace class to diagnose during the deletion of data. |

Table 15. Server or storage agent trace classes (continued)

| Trace Classes | Description | Recommendation |
|---------------|---|---|
| ASMOUNT | Displays information about drive (mount point) selection and assignment for sequential media devices. | Use this trace class to diagnose situations where sessions or processes are waiting for mount points or cases where an operation fails because no mount point is available. Also useful in cases where a mount point is preempted. |
| ASRTRV | Displays information about reading data from sequential media volumes. | Use this trace class to diagnose problems reading data such as RESTORE or RETRIEVE client by the client, or MIGRATION, RECLAMATION, STORAGE POOL BACKUP, AUDIT VOLUME, GENERATE BACKUPSET, EXPORT, MOVE DATA, or MOVE NODEDATA by the server. |
| ASTXN | Displays information about transactions used to make database updates relating to information for sequential media volumes, storage pools, device classes, and other attributes. | Use this trace class to diagnose stoppages, database operations, failures reported for sequential media operations, or general data storage problems. |
| ASVOL | Displays information about volume selection and assignment for sequential media volumes. | Use this trace class to diagnose situations where sessions or processes are waiting for volumes, or cases where an operation fails because no volume is available. Also useful in cases where volume access is preempted. |
| ASSD | Displays information about sequential stream data operations. These are operations that use sequential media device classes, volumes, or mount points but do not store data in the storage hierarchy. Server processes that perform sequential stream data operations are BACKUP DB, EXPORT/IMPORT, and GENERATE BACKUPSET. | Use this trace class to diagnose server processes that perform sequential stream data operations. |

Table 15. Server or storage agent trace classes (continued)

| Trace Classes | Description | Recommendation |
|---------------|---|---|
| BF | Information about user data (files) stored in the storage hierarchy. This is an aggregate trace class that enables BFCREATE, BFRTRV, BFSALVAGE, BFLOCK, BFAGGR, BFREMOTE, and BFTRG. | Use this trace class to diagnose general data read or write problems for client operations and server processes. |
| BFAGGR | Displays information about server aggregation of user data. The server will aggregate many smaller user files into a larger file in the storage hierarchy to optimize performance for data movement operations such as MIGRATION, MOVE DATA, and MOVE NODEDATA. | Use this trace class to diagnose general data read or write problems for client operations and server processes, or both. |
| BFCREATE | Displays information about client operations that store data in the storage hierarchy. Typically, these are BACKUP, ARCHIVE, or SPACE MANAGE operations by the client. | Use this trace class to diagnose failures or other problems while a client is storing data. |
| BFREMOTE | Traces the first stage of NDMP backup and restore processes. | This trace class is used to identify NDMP-related backup or restore operations. These trace classes are specific to the functions which implement the NDMP protocol. The SPID trace class provides more detailed tracing, including tracing all NDMP file history records sent by the NDMP file server. |
| BFRTRV | Displays information about client operations that read data from the storage hierarchy. | Use this trace class to diagnose failures or other problems while a client is reading data. |
| BITVECTOR | Diagnoses problems where the server reports problems with disk storage pools. | Use this trace class to display information about reserving and allocating space on volumes in disk storage pools. |
| BKSET/OBJSET | Trace class for backup set functions. The BKSET and OBJSET trace classes are synonymous. | Use this trace class to debug problems in the GENERATE BACKUPSET command or during a client restore from a backup set. |

Table 15. Server or storage agent trace classes (continued)

| Trace Classes | Description | Recommendation |
|---------------|---|--|
| BLKDISK | Trace class for viewing disk I/O activity to storage pool, database, and log volumes. | Use this trace class to view I/O activity to disk to diagnose performance and disk I/O errors. |
| BRNODE | Trace class for the BACKUP and RESTORE NODE commands, used during NDMP operations. | Use this trace class to debug problems in the BACKUP and RESTORE NODE commands. |
| COLLOCATE | Displays information about collocation processing on storage pools. COLLOCATEDDETAIL trace class can also be used to get more detailed information about the collocation processing, such as files being processed for a collocation group. This can cause a large amount of output trace statements. | Use this trace class to diagnose problems with collocation processing. |
| CRC | Displays information about generating and managing CRCs on the server or storage agent. This is an aggregate trace class that enables CRCDATA, CRCPROTO, and CRCVAL. | Use this trace class to diagnose data corruption issues where CRC processing did not report data corruption. |
| CRCDATA | Displays information about generating and managing CRCs for data stored in storage pools with CRCDATA=YES set. | Use this trace class to diagnose data corruption issues where CRC processing did not report data corruption. |
| CRCPROTO | Displays information about generating and managing CRCs for data exchanged between the client and either the server or storage agent where this node is configured with VALIDATEPROTOCOL=ALL or VALIDATEPROTOCOL=DATAOnly on the server. | Use this trace class to diagnose data corruption issues where CRC processing did not report data corruption. |
| CRCVAL | Displays information about generating and comparing CRC values. | Informational for displaying CRC values during processing. |
| CRYPTO | Displays information about AES encryption operations and some general encryption settings. | Use this trace class to isolate and identify encryption related problems. |
| DBCLI | Traces the general set of interactions. | Use this trace class to trace the general set of interactions and the support of the DB2 command line interface. |

Table 15. Server or storage agent trace classes (continued)

| Trace Classes | Description | Recommendation |
|---------------|--|--|
| DBCONN | Traces connection activities. This shows such things as the creation of connection handles and the assignment of connections to transaction. | Use this trace class to trace Tivoli Storage Manager connections to DB2 connections. |
| DBDBG | Traces debugging processes. This is the first trace class to consider when debugging a database issue. | Use this trace class to show function entry/exit, exit return codes, and the statements that have been built and are being executed. |
| DBITXN | Traces database transaction-related activities. Transaction-related activities concerns transaction latch acquisition and release, dbTxnDesc allocation and free, and transaction commit processing from the prepare and commit phase functions. | Use this trace class to trace transaction-related activities for the database interface. |
| DBNETDB | Displays information about LAN-free operations and the negotiation and management of information between the server and storage agent. Typically applies to server and storage agent prior to Tivoli Storage Manager Version 5.2. After Tivoli Storage Manager Version 5.2, this still displays information but was superseded by the LANFREE trace class. Typically it is best to enable this trace class on both the server and storage agent. | Use this trace class to diagnose problems with LAN-free data movement. |
| DBRC | Traces the return codes from functions in the database component. | Use this trace class to trace the return codes. |
| DEDUP | Traces the general logic path tracing for deduplication processing. Does not typically include error paths. | Use this to trace general logic paths for deduplication processing. |
| DEDUP1 | Traces error paths for deduplication processing. | Use this to trace error paths for deduplication processing. |
| DEDUP2 | Traces the fingerprinting and digital signatures path. | Use this to trace fingerprinting and digital signature paths. |

Table 15. Server or storage agent trace classes (continued)

| Trace Classes | Description | Recommendation |
|---------------|---|--|
| DELTA | Trace class for logical group functions. The DELTA and GROUP trace classes are synonymous. | Use this trace class to debug problems with logical groups, whether delta-base groups (subfile backup) or peer groups (Windows SYSTEM OBJECT or image backups). Group processing is relevant during just about any operation that references backup objects, including client backup and restore, expiration, deletion (DELETE FILESPACE, DELETE VOLUME), export/import, backup set generation and restore, no-query restore, db audit, etc. |
| DF | Displays information about user data stored on disk volumes. This is an aggregate trace class that enables DFCREATE, DFRTRV, DFMOVE, DFLOCK, DFTXN, and DFCOPY. It is recommended to issue the TRACE DISABLE DFLOCK command unless the locking information is explicitly requested or needed. | Use this trace class to diagnose problems reading or writing user files to disk volumes. |
| DFCREATE | Displays information about storing user data on disk volumes. | Use this trace class to diagnose writing user data on disk volumes. |
| DFMOVE | Displays operations that move user data by using disk volumes. Move operations are performed by the MIGRATION, MOVE DATA, and MOVE NODEDATA server processes. | Use this trace class to diagnose problems with the data movement server processes. |
| DFRTRV | Displays information about reading user data from disk volumes. | Use this trace class to diagnose reading user data from disk volumes. |

Table 15. Server or storage agent trace classes (continued)

| Trace Classes | Description | Recommendation |
|---------------|--|--|
| DS | Displays information about volume selection, space reservation, assignment, and management of data placement on disk volumes. This is an aggregate trace class that enables DSALLOC DSRTRV DSDEALLOC DSVOL. It is recommended to issue TRACE DISABLE DSTXN unless the locking information is explicitly requested or needed. | Use this trace class to diagnose many different problems relating to disk volume data read and write operations. |
| DSALLOC | Displays information about reserving and allocating space on disk volumes for the purpose of storing data. This might be storing data on behalf of a client session or for server data movement operations such as MIGRATION, MOVE DATA, or MOVE NODEDATA. | Use this trace class to diagnose problems where the server or storage agent report that no space is available, but there should be space available in the storage hierarchy. |
| DSDEALLOC | Displays information about releasing and de-allocating space on disk volumes. Typical deallocation operations on the server are EXPIRATION, MIGRATION, MOVE DATA, MOVE NODEDATA, AUDIT VOLUME, DELETE VOLUME, and DELETE FILESPACE. | Use this trace class to diagnose during the deletion of data. |
| DSRTRV | Displays information about reading data from disk volumes. | Use this trace class to diagnose problems reading data such as RESTORE or RETRIEVE client by the client, or MIGRATION, STORAGE POOL BACKUP, AUDIT VOLUME, GENERATE BACKUPSET, EXPORT, MOVE DATA, or MOVE NODEDATA by the server. |
| DSVOL | Displays information about volume selection and assignment for disk volumes. | Use this trace class to diagnose situations where sessions or processes are waiting for volumes or cases where an operation fails because no volume is available. |

Table 15. Server or storage agent trace classes (continued)

| Trace Classes | Description | Recommendation |
|---------------|--|--|
| ICVOLHST | Trace class for volume history functions. | Use this trace class to debug problems with creating volume history entries (for example: during EXPORT, BACKUP DB, or GENERATE BACKUPSET) or deleting volume history entries (for example: during DELETE VOLHISTORY). |
| IMFS | Trace class for file space functions. | Use this trace class to debug problems related to inventory file spaces (e.g. during DELETE FILESPACE). |
| LANFREE | Displays general information about LAN-free operations on either the server or storage agent. Also displays error information for LAN-free-related operations. This is an aggregate trace class that enables LNFVERB, LNFMEM, LNFENTRY, and LNFDATA. | Any LAN-free failure. |
| MMS | Displays information about tape libraries and the server or storage agent use of these. This trace class is not Available for z/OS . This is an aggregate trace class that enables MMSBASE, MMSTXN, MMSLIB, MMSDRIVE, MMSOP, MMSMAN, MMSSCSI, MMSFLAG, MMSACSLs, and MMSSHARE. Include NA and PVR trace classes when tracing MMS (suggested). | Used to diagnose problems with tape libraries, library volume inventories, or other general library issues. |

Table 15. Server or storage agent trace classes (continued)

| Trace Classes | Description | Recommendation |
|---------------|---|--|
| NA | Displays information about path information for the server or storage agent. This relates to the DEFINE PATH, UPDATE PATH, DELETE PATH, and QUERY PATH commands. This trace class is also useful for identifying issues related to operations involving NDMP file servers, for example, DEFINE DATAMOVER, UPDATE DATAMOVER, BACKUP NODE, and RESTORE NODE commands. This is an aggregate trace class that enables NALOCK, NAPATH, NAMOVER, NADISK, and NACONFIG. It might be best to include MMS and PVR trace classes when tracing NA. | Use this trace class to diagnose problems with paths to devices. |
| PROXYNODE | Displays information about proxynode sessions and the commands related to proxynode associations (GRANT, REVOKE, QUERY PROXYNODE). | Use this trace class to diagnose problems with proxynode sessions and related commands. It might be best to include SESSION trace when analyzing proxynode session problems. |
| PVR | Displays information about sequential media devices and the server or storage agent use of these devices. This is an aggregate trace class that enables PVRVOL, PVRCLASS, PVRMP, and PVRREMOTE. Additionally, this aggregate enables the following classes for open platforms only: PVR8MMBASE, PVR4MMBASE, PVRQICBASE, PVRDLTBASE, PVRECARTBASE, PVRDTFBASE, PVRTAPIBASE, PVRGTS, PVRFILE, PVRTAPE, PVRRODSK, PVRNTP, PVRSHARE, and PVRNAS. It is often useful to include MMS and NA trace classes on open platforms and TAPE on z/OS when tracing PVR. | Use this trace class to diagnose problems with tape drives, failures reading or writing tape volumes, or other tape-volume-related issues. |

Table 15. Server or storage agent trace classes (continued)

| Trace Classes | Description | Recommendation |
|---------------|--|--|
| RETPROT | Trace class for the archive retention protection functions. | Use this trace class to debug problems using the RETINIT and RETMIN parameters in the archive copy group. You can also use this trace class for problems caused by using the VB_SignalObject verb (only supported via the client API) to signal an object's event or to hold or release an object, or problems during expiration or deletion of retention protected objects. |
| ROWMGR | Traces activities for row-based operations. Row-based operations are the following operations: <ul style="list-style-type: none"> • Abbrev • Delete • Fetch • FetchNext • FetchPrev • Insert • SearchBounds • Update | Use this trace class to trace the activities for row-based operations. |
| SCHED | Trace class for the central scheduler functions. This trace class applies to classic and enhanced schedules equally. | Use this trace class to debug problems related to schedule commands like DEFINE/UPDATE/QUERY SCHEDULE or DEFINE ASSOCIATION . Also use this trace class to debug problems related to the central scheduler background processes, such as the schedule manager and schedule prompter. |
| SESSION | Displays information about sessions connected to the server, including all verbs sent and received by the server. | This trace class is useful in many cases. It is generally recommended for protocol violations, transaction processing errors, or in cases where the client is stopped and not responding. |
| SESSREMOTE | Traces communication between the Tivoli Storage Manager server and the Tivoli Storage Manager client during NDMP backup and restore operations. | This trace class is used to identify NDMP-related backup or restore operations that are initiated using the Tivoli Storage Manager Web or command line client. |

Table 15. Server or storage agent trace classes (continued)

| Trace Classes | Description | Recommendation |
|---------------|--|--|
| SHRED | Displays information related to data-shredding operations on the server. The SHRED command is available in Tivoli Storage Manager, Version 5.4. | This trace class is used to diagnose problems with data shredding. Data shredding is only applicable if one or more storage pools on the server has a non-zero value for the SHRED attribute. Activity that is related to data shredding occurs primarily during the EXPIRE INVENTORY, DELETE FILESPACE, DELETE VOLUME, MOVE DATA, MIGRATE, and SHRED DATA commands. Other trace classes that report activity related to data shredding are BFDESTROY, DFDESTROY, DSALLOC, DSDEALLOC, and CRCDATA. |
| SPI/SPID | Traces the Server's NDMP protocol interface. | The SPI and SPID trace classes are used to identify issues related to NDMP backup or restore operations of NAS file servers. These trace classes are specific to the functions that implement the NDMP protocol and communicate with a NAS file server. The SPID trace class provides more detailed tracing, including tracing all NDMP file history records sent by the NAS file server. |
| SSLDATA | Detailed secure socket layer (SSL) trace used to display byte-level information about data that is sent or received between the backup-archive client and the server. Available in Tivoli Storage Manager Version 5.5 and later. | Use the SSLDATA trace class to debug the session data corruption issues that might be caused by SSL that is running through the SSLTCP or SSLTCPADMIN server options. Because this is a byte-level trace, it can collect a large amount of data. |
| SSLINFO | General secure socket layer (SSL) trace used to display setup and characteristics of SSL sessions between the backup-archive client and the server. Available in Tivoli Storage Manager Version 5.5 and later. | Use the SSLINFO trace class to debug session connection and handshake errors that might be caused by the SSL that is running through the SSLTCP or SSLTCPADMIN server options. This can be used in tandem with the TCPINFO and SESSION trace classes. |

Table 15. Server or storage agent trace classes (continued)

| Trace Classes | Description | Recommendation |
|---------------|--|--|
| TAPE | Displays information about sequential media devices and the server or storage agent use of these devices. This trace class is only available on z/OS. This is an aggregate trace class that enables CART, CARTDATA, CARTINFO, REEL, REELDATA, FLAT, and FLATDATA. It is often useful to include the PVR trace class when tracing TAPE. | Used to diagnose problems with tape drives, failures reading or writing tape volumes, or other tape-volume-related issues. |
| TBLMGR | Traces activities for table-based operations. | Use the TBLMGR trace class to view table-based operations such as table registration, table open, and table close. |
| TCP | Collects information regarding TCP/IP used between the client and either server or storage agent. This is an aggregate trace class. It enables TCPINFO and TCPERROR. | Use this trace class to debug session connection errors or data corruption issues that might be caused by the network. |
| TCPDATA | Detailed TCP/IP trace used to display byte-level information about data that is sent or received. | Use this trace class to debug session data corruption issues that might be caused by the network. |
| TCPINFO | General TCP/IP trace used to display setup and characteristics of TCP/IP on the server or storage agent. | Use this trace class to debug session data corruption issues that might be caused by the network. |
| TEC | Provides information regarding events sent to a TEC server. Corresponds to the 'tivoli' event receiver. | To debug connection issues encountered with TEC event logging. |
| TOC | General trace class for the Table Of Contents (TOC) component, used during file-level NDMP operations. This is an aggregate trace class that enables TOCBUILD, TOCLOAD, TOCREAD, and TOCUTIL. | Use this trace class to debug problems during file-level NDMP operations, such as an NDMP backup with the TOC=YES parameter, or an NDMP restore with the FILELIST parameter. |
| TOCBUILD | Table Of Contents (TOC) build functions. | Use this trace class to debug problems during an NDMP backup with the TOC=YES parameter. |
| TOCLOAD | Table Of Contents (TOC) load functions. | Use this trace class to debug problems while displaying files and directories on the client GUI. |

Table 15. Server or storage agent trace classes (continued)

| Trace Classes | Description | Recommendation |
|---------------|--|---|
| TOCREAD | Table Of Contents (TOC) read functions. | Use this trace class to debug problems during a QUERY TOC command or while trying to load a TOC for displaying files and directories on the client GUI. |
| TOCUTIL | Table Of Contents (TOC) utility functions. | Use this trace class to debug problems related to TOC component initialization or TOC retention. |
| UNICODE | Displays information about code page conversions and Unicode filespace operations. | Use this trace class to debug problems related to code page conversion problems or unicode filespace problems. |
| XI | Displays general information for the IMPORT and EXPORT commands. | Use this trace class to debug problems related to IMPORT and EXPORT commands. |

Related tasks

“Enabling a trace for the server or storage agent” on page 132

Trace commands can be issued from the server console, storage agent console, administrative client connected to either the server or storage agent, server options file (dsmserv.opt), or the storage agent options file (dsmsta.opt).

Utilizing storage agent diagnostic tips

The storage agent is a program that enables Tivoli Storage Manager to back up and restore client data directly to and from SAN-attached storage.

Checking the server activity log

Check the server activity log for other messages, 30 minutes before and 30 minutes after the time of the error.

Storage agents start and manage many sessions to the server. Review the server activity log for messages from the storage agent. To review the activity log messages, issue the QUERY ACTLOG command. See the Tivoli Storage Manager Administrator’s Reference for more details.

If no messages are seen for this storage agent in the server activity log, verify the communication settings:

- Issue QUERY SERVER F=D on the server and verify that the high-level address (HLA) and low-level address (LLA) set for the server entry representing this storage agent are correct.
- In the device configuration file specified in the dsmsta.opt file, verify that the SERVERNAME as well as the HLA and LLA are set correctly in the DEFINE SERVER line.

If messages are seen on the server for this storage agent, do any error messages give an indication about why this storage agent is not working with the server?

Resolving an error caused by reading or writing to a device

If the problem is an error involving the reading or writing of data from a device, many systems and devices record information in a system error log.

The system error log for AIX is `errpt`, and for Windows it is the Event Log.

If a device or volume that is used by the Tivoli Storage Manager is reporting an error to the system error log, it is likely a device issue. The error messages recorded in the system error log might provide enough information to resolve the problem.

Storage agents are particularly vulnerable if path information is changed or not correct. Issue the `QUERY PATH F=D` command on the server. For each of the storage agent's paths, verify that the settings are correct. In particular, verify that the device listed matches the system device name. If the path information is not correct, update the path information with the `UPDATE PATH` command.

Resolving problems caused by changing storage agent options

Changes to options in the storage agent option file might cause operations to fail, even though they had previously succeeded.

Review any changes to the storage agent option file. Try reverting the settings to their original values and retrying the operation. If the storage agent now works correctly, try reintroducing changes to the storage agent option file one-at-a-time and retry storage agent operations until the option file change that caused the failure is identified.

Resolving problems caused by changing server options or settings

Changes to options in the server option file or changes to server settings using the `SET` commands might affect the storage agent.

Review any changes to server option settings. Try reverting the settings to their original values and retrying the operation. If the storage agent now works correctly, try reintroducing changes to the storage agent option file one-at-a-time and retry storage agent operations until the option file change that caused the failure is identified.

Review server settings by issuing the `QUERY STATUS` command. If any settings reported by this query have changed, review the reason for the change and, if possible, revert it to the original value and retry the storage agent operation.

Storage agent LAN-free setup

LAN-free data movement is the direct movement of client data between a client computer and a storage device on a SAN, rather than on a LAN. You might be experiencing problems with the storage agent that are related to your LAN-free setup.

To manage your LAN-free data movement, access the LAN-free configuration wizard in the Administration Center.

Resolving the issue of data being sent directly to the server

The client summary statistics do not report any bytes transferred LAN-free.

The client reports the bytes sent LAN-free by issuing the “ANE4971I LAN-free Data Bytes: xx KB” command. Similarly, the server does not report any instance of “ANR0415I Session SESS_NUM proxied by *STORAGE_AGENT* started for node *NODE_NAME*” for this node and storage agent, indicating that the LAN-free proxy operation was done for this client node.

The client will only attempt to send data LAN-free using the storage agent if the primary storage pool destination in the server storage hierarchy is LAN-free. A server storage pool is LAN-free enabled for a given storage agent if one or more paths are defined from that storage agent to a SAN device.

To determine if the storage pool destination is configured correctly, perform the following procedures:

1. Issue the QUERY NODE *nodeName* command to report the policy domain to which this node is assigned.
2. Issue the QUERY COPYGROUP *domainName policySetName mgmtclassName* F=D command for the management classes that this node would use from their assigned policy domain. Note that this command reports information for backup files. To query copy-group information for archive files, issue the QUERY COPYGROUP *domainName policySetName mgmtclassName* TYPE=ARCHIVE F=D command.
3. Issue the QUERY STGPOOL *stgpoolName* command, where *stgpoolName* is the destination reported from the previous QUERY COPYGROUP queries.
4. Issue the QUERY DEVCLASS *deviceClassName* command for the device class used by the destination storage pool.
5. Issue the QUERY LIBRARY *libraryName* command for the library reported for the device class used by the destination storage pool.
6. Issue the QUERY DRIVE *libraryName* F=D command for the library specified for the device class used by the destination storage pool. If no drives are defined to this library, review the library and drive configuration for this server and use the DEFINE DRIVE command to define the needed drives. If one or more of the drives report “ONLINE=No,” evaluate why the drive is offline and, if possible, update it to online by issuing the UPDATE DRIVE *libraryName driveName* ONLINE=YES command.
7. Issue the QUERY SERVER command to determine the name of the storage agent as defined to this server.
8. Issue the QUERY PATH *stgAgentName* command, where *stgAgentName* is the name of the storage agent defined to this server and reported in the QUERY SERVER command. Review this output and verify that one or more paths are defined for drives defined for the device class used by the destination storage pool. If no paths are defined for this storage pool, use DEFINE PATH to define the needed paths. Also, review this output and verify that the path is online. If paths are defined but no paths are online, update the path to online by issuing the UPDATE PATH *srcName destName* SRCTYPE=SERVER DESTTYPE=DRIVE ONLINE=YES command.

Resolving z/OS LAN-free session failure

If a LAN-free session fails, ensure that the storage pool contains volumes that were formatted for LAN-free operations.

To format volumes automatically, set the value of the LFBVOLUMEFORMATCOUNT server option from 1 to 255. Volumes are formatted at the time the storage agent makes a request if the storage pool does not contain any formatted volumes. By using the FORMAT LFBVOLUME command, you can format volumes before LAN-free sessions begin and have them available in a storage pool.

Resolving storage pool configuration not working for LAN-free

The server disqualifies a storage pool as being a LAN-free-enabled storage pool if it was configured for simultaneous write.

In this case, data from the client is sent directly to the server which will not be using a LAN-free storage pool.

Issue the QUERY STGPOOL *stgpoolName* F=D command for the destination storage pool for this client. If the storage pool is set for simultaneous write operations, the "Copy Storage Pool(s):" value references one or more other storage pool names and Tivoli Storage Manager interprets the simultaneous write operation to be a higher priority than the LAN-free data transfer. Because simultaneous write is considered a higher priority operation, this storage pool is not reported as LAN-free enabled and as such, the client will send the data directly to the server. The storage agent does not support simultaneous write operations.

Validating LAN-free definitions on the server

It can be difficult to determine if all the appropriate definitions are defined on the server to allow a given client node to perform LAN-free operations with a storage agent.

Similarly, if the configuration changes, it might be difficult to determine if the definitions on the server for a previously configured LAN-free client are still appropriate.

The VALIDATE LANFREE command evaluates the destination storage pools for the domain to which this client node is assigned. The policy destinations are evaluated for BACKUP, ARCHIVE, and SPACEMANAGED operations for this node. For a given destination and operation, VALIDATE LANFREE reports whether or not it is LAN-free capable. If it is not LAN-free capable, these commands give an explanation about why this destination cannot be used.

The VALIDATE LANFREE command is available from the server. The following syntax is for this command:

```
SHOW LANFREE nodeName stgAgentName VALIDATE LANFREE nodeName stgAgentName
```

The following definitions are for the variables in the previous commands:

nodeName

A client node registered to the server.

stgAgentName

A storage agent defined to the server.

The following example output comes from this command:


```
tsm: SRV1>q lanfree fred stal
ANR0391I Evaluating node FRED using storage agent STA1 for LAN-free data movement.
ANR0387W Node FRED has data path restrictions.
```

| Node Name | Storage Agent | Operation | Mgmt Class Name | Destination Name | LAN-Free capable? | Explanation |
|-----------|---------------|-----------|-----------------|------------------|-------------------|---|
| NODE1 | STA1 | BACKUP | NOLF | OUTPOOL | NO | No available online paths |
| NODE1 | STA1 | BACKUP | LF | LFPOOL | YES | |
| NODE1 | STA1 | BACKUP | NOLF_SW | PRIMARY | NO | Destination storage pool is configured for simultaneous write |
| NODE1 | STA1 | ARCHIVE | NOLF | OUTPOOL | NO | No available online paths |
| NODE1 | STA1 | ARCHIVE | LF | LFPOOL | YES | |
| NODE1 | STA1 | ARCHIVE | NOLF_SW | PRIMARY | NO | Destination storage pool is configured for simultaneous write |

```
ANR1706I Ping for server 'STA1' was able to establish a connection.
ANR0392I Node FRED using storage agent STA1 has 2 storage pools capable of
LAN-free data movement and 4 storage pools not capable of LAN-free data movement.
```

Ensuring that data is transferred using a LAN-free environment

The storage agent and client are both able to manage failover directly to the server, depending upon the LAN-free configuration and the type of error encountered.

Because of this failover capability, it might not be apparent that data is being transferred over the LAN when it was intended to be transferred LAN-free. It is possible to set the LAN-free environment to limit data transfer to only LAN-free.

To test a LAN-free configuration, issue the `UPDATE NODE nodeName DATAWRITEPATH=LAN-FREE` command for the client node whose LAN-free configuration you want to test. Next, try a data store operation such as backup or restore. If the client and storage agent attempt to send the data directly to the server using the LAN, the following error message is received:

```
ANR0416W Session sessionNumber for node nodeName not allowed to operation
using path data transfer path
```

The *operation* reported indicates either READ or WRITE, depending upon the operation attempted. The path is reported as LAN-free.

If this message is received when trying a LAN-free operation, evaluate and verify the LAN-free settings. Generally, if data is not sent LAN-free when the client is configured to use LAN-free, the storage pool destination for the policy assigned to this node is not a LAN-free enabled storage pool, or the paths are not defined correctly.

Show commands for the server or storage agent

SHOW commands are unsupported diagnostic commands that are used to display information about in-memory control structures and other runtime attributes. The SHOW commands are used by development and service only as diagnostic tools. Several SHOW commands exist for the backup-archive client.

Depending upon the information that a SHOW command displays, there might be instances where the information is changing or cases where it might cause the application (client, server, or storage agent) to stop. The SHOW commands should only be used at the recommendation of IBM Software Support. The SHOW commands that are included here are not all of the available SHOW commands.

Table 16. Server or storage agent *SHOW* commands

| SHOW Command | Description | Recommendation |
|--------------|--|--|
| AGGREGATE | Displays information about an aggregate object in the server storage hierarchy. The syntax is <code>SHOW AGGRegate aggrID-high aggrID-low</code> . <i>aggrID-high</i> and <i>aggrID-low</i> are the high-order and low-order 32-bit words of the 64-bit aggregate id of the aggregate that is being queried. | Issue this command to determine the existence and logical files stored in an aggregate object in the server's storage hierarchy. The offset, length, and active state of backup files is displayed for files within the aggregate. You might issue this command if you are having trouble restoring or retrieving files, expiring or moving data, backing up primary storage pools, copying active data to active data pools, or auditing volumes. |
| ASQUEUED | Displays the mount point queue. The syntax is <code>SHOW ASQueued</code> . | In order to use a drive, a client session or server process must first obtain a mount point. The mount point management on the server allows for queuing waiters for mount points if more mount points are needed than are available. This command is useful for determining the state of a mount point request, especially if a session or process appears to be stopped and waiting for a mount point. |

Table 16. Server or storage agent *SHOW* commands (continued)

| SHOW Command | Description | Recommendation |
|--------------|---|---|
| ASVOL | Displays assigned volumes. The syntax is <code>SHOW ASVol</code> . | As sequential media volumes are assigned for use by a session or a process, they are tracked in an in-memory list. You can view this list to determine the state of in-use volumes, as well as stoppages or deadlock situations where a session or process appears to be stuck waiting for a volume or holding a volume and waiting for something else. |
| BFOBJECT | <p>Displays the following information in the server storage hierarchy data:</p> <ul style="list-style-type: none"> • The active/inactive state of logical files within an aggregate • The offset/length of logical files within an aggregate • The active state or owner bitfile ID of logical files within an aggregate • The link bitfile ID if the deduplicated extent is linked to another extent <p>The syntax is <code>SHOW BFObjct</code>.</p> | This command helps you determine the existence and attributes of a bitfile object in the server's storage hierarchy. You might issue this command if you are having trouble restoring, retrieving, expiring, or auditing the object. |
| BUFSTATS | Displays usage statistics for the database buffer pool. The <code>BUFSTATS</code> command shows the cache hit percentage of the buffer pool, which is suggested to be above 98%. The syntax is <code>SHOW BUFStats</code> . | Issue this command to determine if the configured database buffer pool size is large enough. |

Table 16. Server or storage agent SHOW commands (continued)

| SHOW Command | Description | Recommendation |
|----------------|---|--|
| BUFVARS | Displays database buffer pool global attributes. The syntax is SHOW BUFVars. Important: Ensure that the IMEXP trace class is active. | Issue this command to determine if the configured database buffer pool size is large enough. This might also be useful for diagnosing cases where the server is stopped, or when the server runs out of recovery log space. The database buffer pool performance and characteristics can influence the server's running out of recovery log space because the ability to write (flush) the changed pages to the database volumes can impact the ability of the recovery log to manage its space. |
| CONFIGURATION | The CONFIGURATION command is a summary SHOW command that actually issues many different show commands and queries. The syntax is SHOW CONFIGuration. | Issue this command to provide a general configuration and other information about the server to IBM service. |
| DB2CONNECTIONS | The DB2CONNECTIONS command shows the defined DB2 connections from the various connection pools. This command does not require any additional parameters. The syntax is SHOW DB2CONnections. | Issue this command to show how many DB2 connections are defined, in-use, and free in total and within a given pool. |
| DB2TABLES | The DB2TABLES command shows the registered tables and their column attributes. This command does not require any additional parameters. The syntax is SHOW DB2TABLEs. | Issue this command to show the registered tables and their column attributes. |

Table 16. Server or storage agent *SHOW* commands (continued)

| SHOW Command | Description | Recommendation |
|--------------|---|---|
| DBTXNTABLE | Displays information about transactions that are performing database operations. The syntax is <code>SHOW DBTXNTable</code> . | Issue this command to display the following information: <ul style="list-style-type: none"> • Database tables that are open (in-use) • Recovery-log usage information such as the number of log records written and the recovery log space used • The first, last, and next recovery log records that were written • Whether or not a transaction is valid or being rolled back |
| DBVARS | Displays database global attributes. The syntax is <code>SHOW DBVars</code> . | Issue this command to view the current state and attributes of the server database. |
| DEDUPOBJECT | Displays deduplication information for files. When you issue this command, you must specify the objectID parameter, which you can determine by first issuing the <code>SHOW VERSION</code> command. The syntax is <code>SHOW DEDUPOObject</code> . | Issue this command to display deduplication information, such as: <ul style="list-style-type: none"> • The bit file ID for each extent • The owning bit file ID • The OFFSET/LENGTH of the owning bit file • The digest type and value of the deduplication object |

Table 16. Server or storage agent *SHOW* commands (continued)

| SHOW Command | Description | Recommendation |
|--------------|--|--|
| DEVCLASS | Displays information about device classes. The syntax for this command is SHOW DEVClass. | Issue this command to display the states of allocated drives, device class attributes, and other information. This command is often used to diagnose problems with devices or locks up waiting for a drive, library, or volume. The command SHOW LIBRARY also gives good complementary information about drives and libraries. |
| GROUPLEADERS | Displays all backup group leaders for an object in the server's inventory. The syntax is SHOW GROUPLeaders <i>objID-high</i> <i>objID-low</i> . <i>objID-high</i> and <i>objID-low</i> are the high-order and low-order 32-bit words of the 64-bit object id of the object being queried. The high-order word is optional; if not specified, a value of zero is assumed. The object must be a backup object. | Issue this command to determine the backup group relationships of an object in the server's inventory. You might issue this command if you are having trouble restoring, retrieving, expiring, or auditing the object. |
| GROUPMEMBERS | Displays all backup group members for an object in the server's inventory. The syntax is SHOW GROUPMembers <i>objID-high</i> <i>objID-low</i> . <i>objID-high</i> and <i>objID-low</i> are the high-order and low-order 32-bit words of the 64-bit object id of the object being queried. The high-order word is optional; if not specified, a value of zero is assumed. The object must be a backup object. | Issue this command to determine the backup group relationships of an object in the server's inventory. You might issue this command if you are having trouble restoring, retrieving, expiring, or auditing the object. |

Table 16. Server or storage agent *SHOW* commands (continued)

| SHOW Command | Description | Recommendation |
|--------------|--|--|
| INVOBJECT | Displays information about an inventory object in the server. The syntax is <code>SHOW INVObject objID-high objID-low</code> . <i>objID-high</i> and <i>objID-low</i> are the high-order and low-order 32-bit words of the 64-bit object ID of the object being queried. The high-order word is optional; if not specified, a value of zero is assumed. The object can be a backup object, an archive object, a space-managed object, and so on. | <p>Issue this command to determine the existence and attributes of an object in the server's inventory. You might issue this command if you are having trouble restoring, retrieving, expiring, or auditing the object.</p> <p>This command reports the following items:</p> <ul style="list-style-type: none"> • New information for archive retention protected objects. • If the archive object is in deletion hold. • If the object uses event-based retention. |
| LIBINVENTORY | Displays the current state of the library inventory for the library specified. The syntax is <code>SHOW LIBINVENTORY libraryName</code> where <i>libraryName</i> is optional, and if left out, the command will return the inventory information for all libraries. | Issue this command if there is a problem with the library inventory information. The command will display current in-memory properties of the library inventory. |
| LIBRARY | Use the LIBRARY command to display the current state of the specified library and all of its drives. The syntax is <code>SHOW LIBRARY libraryName</code> where <i>libraryName</i> is optional. If left out, the command will return information for all the libraries. | This command is useful to gather a quick view of all in-memory information about a library and its drives. This output can be gathered for any problem related to libraries or drives (e.g. mounting problems). |

Table 16. Server or storage agent *SHOW* commands (continued)

| SHOW Command | Description | Recommendation |
|--------------|---|--|
| LOCK | Displays lock holders and waiters. The syntax is SHOW LOCK. | The server and storage agent use locks as a mechanism to serialize access and updates to information and other constructs. This information is used to diagnose stoppages or other resource contention issues. |
| LOGPINNED | Evaluates and determines whether or not the server recovery log is pinned. A pinned recovery log might cause the recovery log to run out of space and possibly cause the server to stop. The syntax is SHOW LOGPInned. To recover from a pinned recovery log, issue 'SHOW LOGPInned Cancel' to cause the server to cancel or terminate the session, transaction, or process. Under some conditions, the pinning session or transaction might not terminate after issuing the CANCEL parameter. | This SHOW command interrogates a number of server control structures and correlates the data to determine if a session, transaction, or process is pinning the recovery log. If it determines that something is pinning the recovery log, it reports this information. |
| LOGVARS | Displays recovery log global attributes. The syntax is SHOW LOGVars. | Issue this command to determine the state of the recovery log. |

Table 16. Server or storage agent *SHOW* commands (continued)

| SHOW Command | Description | Recommendation |
|--------------|--|--|
| MEMTREND | The MEMTREND command reports the memory used by the server, in megabytes, recorded at hourly intervals for the last 50 hours (this is a constant in the server code and is not user-configurable). The command also displays a histogram to help visualize the usage trend. The syntax is SHOW MEMTREnd. | Issue this command to determine if the server has a memory leak. If the memory usage is constantly increasing, this might indicate a leak. Note that for the measurements to be valid, the measurement period (the last 50 hours) should represent normal, steadystate server activity. The reported usage represents the amount of memory that internal server routines request from the pseudo-kernel memory routines. It does NOT represent the total amount of memory that the server is using. Nevertheless, it is still useful in determining the server's memory usage trend. |
| MP | Displays mount points. The syntax is SHOW MP. | Issue this command to determine which volume is in-use by a given mount point and other attributes for the assigned mount points. SHOW LIBRARY and SHOW DEVCLASS have useful complimentary information with this command to display the current state of drives and current devclass mount point counts. |
| NASDEV | Displays the SCSI devices attached to a NAS file server associated with a NAS datamover definition. The syntax is SHOW NASDev. | Create an NDMP connection to the specified NAS file server and display the attached SCSI devices on the file server. This command only requires a NAS node and datamover definition. |

Table 16. Server or storage agent *SHOW* commands (continued)

| SHOW Command | Description | Recommendation |
|----------------|---|---|
| NASFS | Displays the file systems on a NAS file server associated with a NAS datamover definition. The syntax is SHOW NASFs. | Create an NDMP connection to the specified NAS file server and display the file systems defined on the file server. Any file systems displayed by this command might be backed up by the Tivoli Storage Manager. This command requires only a NAS node and datamover definition. |
| NASINFORMATION | Displays configuration information about the NAS file server associated with a NAS datamover definition. The syntax is SHOW NASInformation. | Create an NDMP connection to the specified NAS file server and display general configuration information retrieved from the file server. This command is useful for identifying basic communication problems with NAS file servers such as authentication errors. This command only requires a NAS node and datamover definition. |
| NASWORKLOAD | Displays the workload of NAS filers that are used for all Tivoli Storage Manager operations. The syntax is SHOW NASWorkload. | Issue this command to determine the workload of backend data movement, as well as backup and restore operations. |

Table 16. Server or storage agent *SHOW* commands (continued)

| SHOW Command | Description | Recommendation |
|--------------|--|--|
| RESQUEUE | Displays the resource queue. The syntax is SHOW RESQueue. | Use the resource queue to monitor common resources on the server. If a resource appears to be stopped or holding a resource for an unreasonable amount of time, the resource monitoring algorithms for the server will take action and cancel or terminate the resource user. Typically, this is used to display information about transactions, locks, and other resources used by a storage agent on the database server that it is configured to use. |
| SESSIONS | Displays information about sessions connected to the server or storage agent. The syntax is SHOW SESSIONS. | Issue this command to diagnose stoppages or other general session problems while a session is still connected to the server. This is also useful in cases where a session is canceled or terminated and still appears in QUERY SESSION. |

Table 16. Server or storage agent *SHOW* commands (continued)

| SHOW Command | Description | Recommendation |
|--------------|--|--|
| SLOTS | Displays the current state of the specified library's slot information (for example: which volumes are in the library and in which slots). The syntax is <i>SHOW SLOTS libraryName</i> . | <p>The information displayed is what is saved directly from the library hardware to in-memory values and can be used to determine if this information is out-of-sync, incorrect, or to determine if the values returned from the library hardware itself are incorrect.</p> <p>Alternatively, issue this command to determine the drive element numbers for a SCSI library if <i>QUERY SAN</i> is unavailable for a particular library (for example: 3570 library).</p> |
| SSPOOL | Displays information storage pools. The syntax is <i>SHOW SSPool</i> . | Issue this command to display the states and attributes of defined storage pools. |
| THREADS | <p>Displays information about all threads known to the server. The syntax is <i>SHOW THReads</i>.</p> <p>Important: On some platforms (as an example: HP), the information reported is obtained without serialization. On a busy system, the information might be inconsistent, multiple threads might report holding the same mutex, or a thread might report that it is waiting on a mutex held by another thread that does not claim to hold it.</p> | <p>The server displays information about each thread, typically including the Tivoli Storage Manager thread ID, the system thread id, the thread name, mutexes it holds (if any), and mutex or condition it is awaiting (if any). This command is platform-specific, so each platform might have slightly different information. You might want to issue this command if the server or a particular server process appears to be stopped, in order to see if there are threads waiting for resources held by another thread.</p> |

Table 16. Server or storage agent *SHOW* commands (continued)

| SHOW Command | Description | Recommendation |
|--------------|--|---|
| TOCSETS | Displays all Table Of Contents (TOC) sets known to the server. The syntax is <code>SHOW TOCSETS DELETE=setNum TOUCH=setNum</code> . The DELETE parameter causes the specified TOC set number to be deleted. The TOUCH parameter updates the last used date of the specified TOC set number. A TOC set is retained for the TOC retention period following the last used date (see <code>SET TOCRETENTION</code> command). | A TOC set is used during file-level NDMP operations. During an NDMP backup with the TOC=YES parameter, a TOC is built in the server database. During a restore, one or more TOCs might be loaded into the server database in order to provide file and directory names to the client GUI. This command displays the status of the TOC set (e.g. building or loading) and how much temporary database space is in use for each TOC set. You might issue this command if you are having trouble doing an NDMP backup with the TOC=YES parameter, or having trouble restoring files from an NDMP backup, or if TOC sets are being retained in the server database too long or not long enough. |
| TOCVARS | Displays information about the Table Of Contents (TOC) component of the server. The syntax is <code>SHOW TOCVARS</code> . | Issue this command to determine the status of the TOC component. You might issue this command if you are having trouble doing an NDMP backup with the TOC=YES parameter, or having trouble restoring files from an NDMP backup. |

Table 16. Server or storage agent *SHOW* commands (continued)

| SHOW Command | Description | Recommendation |
|---------------------|---|---|
| TXNTABLE | Displays information about transactions that are on the in-use list on the server. The syntax is <code>SHOW TXNTable</code> . | The transactions that are mined by this command are used by server processes, sessions, or other operations to read information from the database, make updates to the database (such as insert, update, or delete information), or to manage locks. This information is useful for diagnosing stoppages or other transaction-related failures while the transaction is still open on the server. |
| VALIDATE LANFREE | This command lets you validate whether the definitions are in place that must be on the server in order for a given client to perform LAN-free data movement operations. In cases where these definitions are not present or are incorrect, it might be difficult to determine if the LAN-free environment is configured correctly. The syntax is <code>VALIDATE LANFREE nodeName storageAgent</code> . Note: The <code>VALIDATE LANFREE</code> command replaced the <code>SHOW LANFREE</code> command. | This command evaluates all possible destination storage pools for this client node and reports whether or not the storage pool is capable of LAN-free data movement operations. |
| VERSIONS | Retrieves an objectID that can then be used with the <code>SHOW DEDUPOBJECT</code> command. The syntax is <code>SHOW Versions</code> . | Issue this command to display object IDs. |
| VOLINUSE | Displays whether the volume specified is currently in the server's in-use list. The <code>VOLINUSE</code> command displays additional information that might be helpful, including whether the volume is currently pending removal from the in-use list. The syntax is <code>SHOW VOLINUSE volumeName</code> . If the volume must be removed from the in-use list, you can specify the following additional parameter to remove the volume from the list: <code>SHOW VOLINUSE volumeName REMOVE=YES</code> . | Issue this command to determine whether a volume is on the in-use list and, if necessary, to remove it from that list. Operations that are associated with this volume might fail if the volume is removed from the in-use list. |

Enabling a trace for the Tivoli Storage Manager device driver

Tracing is available for the Tivoli Storage Manager device driver. The Tivoli Storage Manager device driver can be traced from the server console, an administrative client, or from a shell running on the system where the device driver is installed.

The tracing instructions apply to the Tivoli Storage Manager device driver on all platforms where the device driver is supported. For devices that use device drivers other than the Tivoli Storage Manager device driver, the ability to trace and instructions on how to trace those device drivers is provided by the device vendor.

Related reference

“Tracing from the server console”

To trace the driver from the server, you must first issue the proper commands.

“Tracing data from a command shell for AIX, Sun Solaris, and Windows” on page 166

The stand-alone utility, `ddtrace`, exactly mimics the `DDTRACE` server commands.

Tracing from the server console

To trace the driver from the server, you must first issue the proper commands.

Issue the `TRACE ENABLE` and `TRACE BEGIN` commands to trace the driver from the server.

The Tivoli Storage Manager device driver actually consists of three drivers: one for library-autochanger devices, one for tape devices, and one for optical drives. You might choose which one you want to trace. The following syntax is for the command:

```
DDTRACE START [ LIBRARYDD | TAPEDD | OPTICALDD ]
[flags=EE |, FULL |, SYSLOG | BASE ]
DDTRACE GET [ LIBRARYDD | TAPEDD | OPTICALDD ]
DDTRACE END [ LIBRARYDD | TAPEDD | OPTICALDD ]
```

The following options are available:

START

Turns on tracing and writes the trace to a memory buffer based on the default or specified `FLAGS` option.

GET Writes the memory buffer to the same file that was specified with the server `TRACE BEGIN` command.

END Stops writing trace to the memory buffer but does not wipe out the contents of the buffer, so you might run `END` before running `GET`.

LIBRARYDD

Traces the device driver that controls library-autochangers.

TAPEDD

Traces the device driver that controls tape drives.

OPTICALDD

Traces the device driver that controls optical drives.

For the options listed above, you might specify any one device driver or the library device driver, and one of the other two. These are space delimited. For example:

DDTRACE START TAPEDD - Starts tracing the device driver that controls tape drives.

DDTRACE START OPTICALDD Starts tracing the device driver that controls optical drives.

DDTRACE START LIBRARYDD Starts tracing the library-autochanger.

DDTRACE START LIBRARYDD TAPEDD Traces both the library and the tape drives.

DDTRACE START LIBRARYDD OPTICALDD Traces both the library and the optical drives.

Whichever of these you use, specify the same ones for all commands in the start-get-end series.

The **FLAGS** parameter is optional and usually not required. The following values are for the **FLAGS** parameter:

EE Traces all device driver routine entries and exits.

FULL Turns on more debug tracing. It provides more detail, but because the memory buffer size is fixed, fewer events are traced. It also does not trace routine entry and exit points.

SYSLOG

On some platforms, SYSLOG directs the trace statements to be written to the system log in addition to the memory buffer. This offering is most useful in debugging kernel stoppages or in circumstances where the trace wraps in the memory buffer.

BASE BASE is the default and cannot be specified with any other flags. It is only used to turn off the EE, FULL, and SYSLOG flags without turning off trace.

Tracing data from a command shell for AIX, Sun Solaris, and Windows

AIX

Solaris

Windows

The stand-alone utility, `ddtrace`, exactly mimics the DDTRACE server commands.

A stand-alone utility, `ddtrace`, is installed in the devices directory, which is the same directory as the `mttest`, `lbtest`, and `optest` utilities. Its syntax and options are identical to the DDTRACE server command. For example:

```
$ ddtrace start librarydd tapedd flags=EE - Start tracing both the library and tape drivers, and get additional entry/exit trace.
```

```
$ ddtrace get librarydd tapedd - Get the trace from memory and write it to the file ddtrace.out.
```

```
$ ddtrace end librarydd tapedd - Stop tracing to memory.
```

The main use of this stand-alone utility is primarily for cases when the driver needs to be traced during the Tivoli Storage Manager server initialization. It writes the memory buffer to the “`ddtrace.out`” file in the current directory. If the file exists, it appends to the file and does not overwrite it.

Tracing data for the client

You can enable tracing on the client or client API by altering the client options file.

Perform the following steps to enable tracing on the client or client API:

1. Determine the trace classes to enable from the following table:

| Trace Class Name | Description | When to use | Additional Notes |
|------------------|---|---|--|
| SERVICE | Display general processing information for the client. | Useful in many cases. Generally recommended for protocol violations, transaction processing errors, or in cases where the client is stopped and not responding. | |
| VERBINFO | Collect information regarding the client-server protocol used by IBM Tivoli Storage Manager. | To debug protocol violations, transaction processing errors, or in cases where the client is stopped and not responding. | |
| VERBDETAIL | Detailed information regarding the client-server protocol used by IBM Tivoli Storage Manager. This displays internal memory buffers containing the verbs sent and received by the client. | To debug session data corruption issues that might be caused by the network. | This generates a large amount of output. |

2. Enable the trace by adding the following text to the client options file:
`traceflag <trace class name>`.
Attention: `<trace class name>` might be a comma-delimited list of trace classes. For example, this text could be entered as `traceflag service,verbinfo,verbdetail`.
3. Configure trace to begin and issue the trace messages to a file by adding the following text to the client options file: `tracefile <file name>`.
4. Perform the operation that is causing the problem.

Tip: Tracing might also be configured and started by invoking the client from a command prompt and specifying the flags above. For example, `dsm -traceflags=service -tracefile=file.out`.

Client and Journal Daemon traceflags

To run journal-based backup, you must use the Journal Daemon process. This process is used to track file system changes and maintain change journal databases.

The Journal Daemon uses the same tracing mechanism as the client, but the trace settings are specified in the journal configuration file (tsmjbbd.ini) as follows:

```
[JournalSettings]
TraceFlags=all_jbb
;
; the following two settings allow tracefile segmentation
;
TraceMax=100
TraceSegMax=1
tracefile=tracefiles\trace.out
```

Journal Daemon specific trace settings:

- BTREEDB - low-level BTREE database base class
- CACHEDB - disk cache backup and Windows 2003 exclude cache processing
- DBPERF - low-level database operation performance
- DBSTATS - performance tracking of database query, insert/update, delete, and tree walk operations
- FILEOPS - internal database activity
- JBBCOMM - listening thread
- JBBDAEMON - process manager
- JBBFILEMON - file system monitor
- JBBDBACCESS - database controller thread
- JBBDBINFO - low-level database access
- JBBNPCOMM - named pipe communications
- JBBSERVICE - Windows platform-specific service tracing
- JBBVERBINFO - detailed verb information
- ALL_JBB - aggregate traceflag that includes all of the above settings

Trace Settings for the backup-archive client specified in dsm.opt:

- JOURNAL - journal based backup tracing

Client trace classes

The client provides individual and aggregate trace classes. Aggregate classes are a shortcut for enabling many related trace classes by specifying the aggregate trace class name. For the documented trace classes, there might be references to trace classes that are enabled as part of an aggregate trace class but are not explicitly discussed on their own.

The documented trace classes in table Table 17 on page 169 are those that are most typically requested or used for diagnosing problems. The trace class name should be used with the TRACEFLAG options in DSM.OPT.

Table 17. Trace classes

| Trace Class | Description | Recommendation |
|--------------|--|--|
| ALL_BACK | Displays general backup processing information for the client. Aggregate of TXN, INCR, POLICY, and PFM trace classes and implicitly included in the SERVICEtrace class. | Use this trace class for problems related to selective or incremental backups. |
| ALL_FILE | Displays general backup processing information for the client. Aggregate of DIROPS, FILEOPS, and FIOATTRIBS trace classes and implicitly included in the SERVICE trace class. | Use this trace class for problems related to reading and writing of data and obtaining file attribute information. |
| ALL_IMAGE | Displays image processing information for the client. Aggregate of several image-related trace classes and implicitly included in the SERVICE trace class. | Use this trace class for problems related to all aspects of volume image backup and restore operations. |
| ALL_JBB | Displays journal-based backup processing information for the client. Aggregate of several journal-based backup-related trace classes and implicitly included in the SERVICE trace class. | Use this trace class for problems related to all aspects of journal-based backups. |
| ALL_NAS | Displays NDMP processing information for the client. Aggregate of several NDMP-related trace classes and implicitly included in the SERVICE trace class. | Use this trace class for problems related to all aspects of NDMP backup and restore operations. |
| ALL_SESS | Displays all session and verb information sent between the client and the server. Aggregate of SESSION, VERBINFO, SESSVERB, VERBADMIN, and VERBDETAIL trace classes. All of the trace classes in this aggregate are implicitly included in the SERVICEtrace class, except for VERBDETAIL | Use this trace class for problems related to the client and server session, such as communication timeouts, protocol violations, and instances where the client appears to be stopped and waiting for the server, or vice versa. |
| ALL_SNAPSHOT | Displays information relating to volume snapshot operations. Aggregate of several volume snapshot-related trace classes and implicitly included in the SERVICE trace class. | Use this trace class to determine problems related to volume snapshots that are used in online image backup and open file-support operations. |

Table 17. Trace classes (continued)

| Trace Class | Description | Recommendation |
|-------------|---|---|
| ALL_WAS | Displays Web Application Server (WAS) processing information for the client. Aggregate of several WAS related trace classes and implicitly included in the SERVICE trace class. | Use this trace class for problems related to all aspects of WAS backup and restore operations. |
| AUDIT | Displays auditing information for backup and restore processing. Part of the SERVICE trace aggregate. | Use this trace class to keep record of files processed, committed and restored in a file. |
| CLIENTTYPE | Displays client type on each trace output line. | Use this trace class for tracing situations when more than one client component is involved, such as the client acceptor and the file system agent. |
| COMPRESS | Displays compression information. Part of the SERVICE trace aggregate. | Use this trace class to determine how much data is compressed on a per-file basis. |
| DELTA | Displays adaptive subfile backup processing information. Part of the SERVICE trace aggregate. | Use this trace class to determine errors in adaptive subfile backup and restore operations. |
| DIROPS | Displays directory read and write operations. Part of the SERVICE and ALL_FILE trace aggregates. | Use this trace class when problems occur in a directory, read or write. |
| DOMAIN | Displays incremental domain processing information. Part of the SERVICE trace aggregates. | Use this trace class for determining how DOMAIN statements are resolved during backup processing, such as problems in resolving the ALL-LOCAL domain. |
| ENCRYPT | Displays data encryption information. Part of the SERVICE trace aggregate. | Use this trace class to determine if a file is included for encryption processing. |
| ERROR | Displays operating system specific error information. Part of the SERVICE trace aggregate. | Use this trace class to determine error codes generated by the operating system. |
| FILEOPS | Displays file read and write operations. Part of the SERVICE and ALL_FILE trace aggregates. | Use this trace class when problems occur in a file open, read, write, or close operation. |

Table 17. Trace classes (continued)

| Trace Class | Description | Recommendation |
|-------------|---|--|
| FIOATTRIBS | Displays comparisons of file attributes between the local client version and the active version on the Tivoli Storage Manager server. Part of the SERVICE, ALL_BACK, and ALL_FILE trace aggregates. | Use this trace class in determining why a file was backed up during an incremental backup. |
| INCR | Displays incremental list processing comparisons between the client and server. Part of the SERVICE and ALL_BACK trace aggregates. | Use this trace class for determining if files are candidates for incremental backup, especially in conjunction with the FIOATTRIBS trace class. |
| INCLEXCL | Displays include-exclude status for the object being processed. This flag is also used for the Preview function. | Use this trace class to determine which object (usually file or directory) is included or excluded during backup-archive/preview. |
| MEMORY | Displays memory allocation and free requests. This trace class writes a large amount of information into the trace file and is not included in any aggregate classes. | Use this trace class to determine memory leaks, memory spikes, and other memory-related problems. |
| NETWARE | Displays detailed information relating to the Novell SMS backup API. Aggregate of the SMS_DEBUG, SMS_DETAIL, TXN, and TID trace classes. | Use this trace class for isolating NetWare client problems between the backup application and operating system. |
| OPTIONS | Displays current processing options. Part of the SERVICE trace aggregate. | Use this trace class to determine which options are in effect for the current session and problems in accepting processing options from server client-options sets. |
| PASSWORD | Displays password file-access information (does not show passwords). Part of the SERVICE trace aggregate. | Use this trace class to determine problems with reading the Tivoli Storage Manager server passwords from local storage, for example, PASSWORDACCESS=GENERATE errors. |
| PID | Displays process ID on each trace statement. Part of the SERVICE trace aggregate. | Use this trace class to diagnose problems that might involve multiple processes. |
| POLICY | Displays policy information available to the backup-archive client. Part of the SERVICE and ALL_BACK trace aggregates. | Use this trace class to see which policies are available during a backup or archive operation. |

Table 17. Trace classes (continued)

| Trace Class | Description | Recommendation |
|-------------|---|--|
| SCHEDULER | Displays general processing information for the scheduler. An aggregate that includes most of the client trace classes listed in this table. Aggregate of all trace classes except MEMORY, THREAD_STATUS, and *DETAIL classes. | Useful in many cases. This trace class is generally recommended for diagnosing scheduler problems when the nature of the problem is unknown. If the SCHEDULER trace flag is used, it will generally not be necessary to specify any other trace flags because it already includes most of the basic trace classes. |
| SERVICE | Displays general processing information for the client. An aggregate that includes most of the client trace classes listed in this table. Aggregate of all trace classes except MEMORY and *DETAIL classes. The SERVICE trace flag can generate a substantial amount of information. Consider using the TRACEMAX option in conjunction with the SERVICE trace flag. | Useful in many cases. This trace class is generally recommended when the nature of the problem is unknown. If the SERVICE trace flag is used, it will generally not be necessary to specify any other trace flags because it already includes most of the basic trace classes. |
| SESSION | Displays minimal session information between the client and the server. Part of the SERVICE and ALL_SESS trace aggregates. | Use this trace class to give session context to general processing errors, or in conjunction with one of the VERB* trace classes, to determine session problems such as session timeouts and protocol violations. |
| SESSVERB | Displays additional session information between the client and the server. Part of the SERVICE and ALL_SESS trace aggregates. | Use this trace class to give session context to general processing errors, or in conjunction with one of the VERB* trace classes, to determine session problems such as session timeouts and protocol violations. |
| SMS_DETAIL | Displays detailed information relating to the Novell SMS backup API. Part of the SERVICE and NETWARE trace aggregates. | Use this trace class to isolate NetWare client problems between the backup application and operating system. |
| SMS_DEBUG | Displays detailed information relating to the Novell SMS backup API. Part of the SERVICE and NETWARE trace aggregates. | Use this trace class to isolate NetWare client problems between the backup application and operating system. |

Table 17. Trace classes (continued)

| Trace Class | Description | Recommendation |
|---------------|---|---|
| STATS | Displays final processing statistics in the trace file. Part of the SERVICE trace aggregate. | Use this trace class for collecting final processing statistics into a file. |
| THREAD_STATUS | Displays thread status. Part of the SERVICE trace aggregate. | Use this trace class when diagnosing problems related to threading. |
| TXN | Displays transaction processing information. Part of the SERVICE, ALL_BACK and NETWARE trace aggregates. | Use this trace class when diagnosing problems related to transaction processing problems on the server such as transaction aborts and retries. |
| VERBDETAIL | Displays detailed verb information pertinent to client-server sessions. Part of the ALL_SESS trace aggregates. | Use this trace class to determine contents of verbs sent between the client and server. |
| VERBINFO | Displays verb information pertinent to client-server sessions. Part of the SERVICE and ALL_SESS trace aggregates. | Use this trace class in conjunction with the SESSION traceflag to give session context to general processing errors or to determine session problems like session timeouts and protocol violations. |
| WIN2K | Displays Windows system object or system state processing. Part of the SERVICE trace aggregates. Only valid on the Windows backup-archive client. | Use this trace class to determine errors with backup or restore of the system state information. |

Enabling a backup-archive client trace

There are two methods of tracing that are available for the backup-archive client. The first method is to configure trace parameters prior to starting the backup-archive client. The second, more recent method, is to enable tracing while the client is running. Choose which method of tracing to enable.

Enabling a client trace using the command line

You can trace the available backup-archive client by enabling client trace on the command line.

Perform the following steps to enable client tracing on the command line:

1. Determine the trace classes to enable.
2. Choose which trace classes to enable by adding the following text to the client options file: `traceflags <trace class name>`
3. Use a minus sign (-) in front of a trace class to subtract the class from tracing. Make sure that the subtracted trace classes are placed at the end of the trace class list. For example, if you want to collect a SERVICE trace without the SESSION or SESSVERB classes, then specify the following text:

Correct: `tracelflags service,-session,-sessverb`
Incorrect: `tracelflags -session,-sessverb,service`

Attention: *<trace class name>* might be a comma-delimited list of trace classes. For example, this text could be entered `astracelflags service,verbdetail`

4. Choose the location of the trace messages output by adding the following text to the client options file: `tracefile <file name>`.

The *tracefile* name should be fully-qualified, for example:

```
tracefile c:\service\trace.out (Windows)
tracefile /home/spike/trace.out (UNIX)
tracefile SYS:\PUBLIC\TRACE.OUT (NetWare)
tracefile trace.txt (Macintosh)
```

5. You can also set a maximum size for the trace file between 1 and 4,294,967,295 MB by specifying the following variable in the client options file: `tracemax <size in mb>`

If a maximum value is specified, the client starts writing information from the beginning of the trace file (that is, wrapping) when the trace reaches its maximum size. This information can be useful if you are trying to capture an event that happens at the end of a long-running process. For example, to specify a maximum trace file size of 10 MB: `tracemax 10` After a tracefile reaches the limit specified with `tracemax`, "Continued at beginning of file" is written to the end of the trace file and tracing continues from the top of the file. The end of the tracefile is indicated with "END OF DATA." You can locate the end of the trace by searching for this string. If you specify a `TRACEMAX` size of 1001 or higher and `TRACESEGSIZE` is not specified, then the trace file is automatically split into multiple segments of 1000 MB per segment (see `TRACESEGSIZE` discussion).

6. You can choose to let the client split the trace into smaller segments between 1 and 1,000 MB per segment by specifying the following variable in the client options file: `tracesegsize <trace segment size in MB>`

Splitting the trace into small segments allows you to more easily manage very large amounts of trace data, avoiding the problems associated with compressing very large files and eliminating the need to use a separate "file splitter" utility. For example, issue the following command to specify a trace segment size of 200 MB: `tracesegsize 200`

Trace file segments are named using the name specified with the `tracefile` option plus an extension indicating the segment number. For example, if you specify `tracefile tsmtrace.out` and `tracesegsize 200`, then the trace will be segmented into multiple separate files of no more than 200 MB each, with file names `tsmtrace.out.1`, `tsmtrace.out.2`, and so on. Note that when specifying the segment size, do not use any comma separators:

Correct: `tracemax 1000`
Incorrect: `tracemax 1,000`

If you use the `tracesegsize` option, the trace file segments will be named using the `tracefile` option with an additional extension using the segment number. For example, `trace.out.1`

7. Perform the operation that exhibits the problem.

Tracing might also be configured and started by invoking the client from a command prompt and specifying the previously defined flags. For example:

```
dsmc -tracelflags=service,verbdetail -tracefile=tsmtrace.out
-tracemax=2500 -tracesegsize=200
```


Related reference

“Client trace classes” on page 168

The client provides individual and aggregate trace classes. Aggregate classes are a shortcut for enabling many related trace classes by specifying the aggregate trace class name. For the documented trace classes, there might be references to trace classes that are enabled as part of an aggregate trace class but are not explicitly discussed on their own.

Enabling a trace while the client is running

You can trace the available backup-archive client while the client is running.

- The backup-archive client must be installed to use dynamic tracing.
- The DSMTRACELISTEN YES option must be in effect when the client is started. On Windows, this option is specified in the client options file (usually `dsm.opt`). On UNIX, this option is specified in the system options file (`dsm.sys`) in the stanza that the client uses.
- UNIX users must be logged in as root in order to use `dsmtrace`.
- Windows users must be logged in as a member of the Administrators group.

When the client starts, it launches a separate “trace listener” thread. This thread “listens” on a named pipe, waiting to be contacted by the `dsmtrace` utility. In order to make the named pipe name unique, the client process ID (PID) is a part of the pipe name. When `dsmtrace` is used to configure tracing, it contacts the client through the named pipe on which the client is listening and passes to it the desired trace configuration operation. The client then passes the results of the operation back to `dsmtrace` through another similarly-named output pipe. `dsmtrace` displays the results to the console. The client starts the trace listener thread only when client option DSMTRACELISTEN YES is in effect. If DSMTRACELISTEN NO is in effect, then the listener thread is not started and dynamic tracing is not available to that client. DSMTRACELISTEN NO is currently the default value.

The steps for gathering a Tivoli Storage Manager client trace are as follows:

1. Stop the Tivoli Storage Manager client.
2. Configure the client options file with the desired trace options.
3. Restart the client and reproduce the problem.
4. Stop the client.
5. Remove the trace options from the client options file.
6. Send the resulting trace file to IBM technical support for analysis.

You can also use the `dsmtrace` utility to start, stop, and configure client tracing dynamically without having to stop the client or modify the options file. Dynamic tracing is especially useful when you need to trace only the beginning of a long-running client operation, or when you need to start tracing after the client was running for some time.

The `dsmtrace` utility includes the following features:

- Identify running processes and their process IDs (PIDs)
- Enable client tracing
- Disable client tracing
- Query client trace status

The following table summarizes the availability of this feature:

| Client Component | UNIX Program Name | Windows Program Name |
|---|-------------------|----------------------|
| Backup-Archive Client (command line) | dsmc | dsmc.exe |
| Backup-Archive Client (GUI) | N/A | dsm.exe |
| Client acceptor | dsmcad | dsmcad.exe |
| Remote Client Agent | dsmagent | dsmagent.exe |
| Scheduler Service | N/A | dsmcsvc.exe |
| Journal Service | N/A | tsmjbbd.exe |
| Data Protection for Domino (command line) | domdsmc | domdsmc.exe |
| Data Protection for Domino (GUI) | N/A | domdsm.exe |
| Data Protection for Microsoft Exchange (command line) | N/A | tdpexcc.exe |
| Data Protection for Microsoft Exchange (GUI) | N/A | tdpexc.exe |
| Data Protection for Microsoft SQL Server (command line) | N/A | tdpsqlc.exe |
| Data Protection for Microsoft SQL Server (GUI) | N/A | tdpsql.exe |

Note:

- Dynamic tracing is currently unavailable for NetWare clients.
- The UNIX column above includes Macintosh OS X.
- Tracing for the Data Protection components is for the Tivoli Storage Manager API only.
- The Tivoli Storage Manager API tracing is available with any multithreaded application that uses the Tivoli Storage Manager API. The executable file name is the name of the application program that loads the API.

The following example shows you how to enable client trace while the client is running:

1. Identify the process ID (PID) of the client you want to trace (make sure that DSMTRACELISTEN YES is in effect). Issue the following command to show all running instances of the client: `dsmtrace query pids`

Example output:

```
D:\tsm>dsmtrace query pids
```

```
IBM Tivoli Storage Manager
dsmtrace utility
dsmtrace Version 5, Release 3, Level 0.0
dsmtrace date/time: 10/24/2004 21:07:36
(c) Copyright by IBM Corporation and other(s) 1990, 2004. All Rights Reserved.
```

```
PROCESS ID  PROCESS OWNER  DESCRIPTION                      EXECUTABLE NAME
4020        andy          Backup-Archive Client (CLI)      dsmc.exe
```

```
D:\tsm>
```

Linux Important note for Linux users: the threading model for some versions of Linux is to run each thread as a separate process, meaning that

when you query process information, you might see several processes for each instance of the client. The process you need to identify is the dsmc parent process. For example:

```
fvttlinuxppc:/opt/tivoli/tsm/client/ba/bin # dsmtrace q p
```

```
IBM Tivoli Storage Manager
dsmtrace utility
dsmtrace Version 5, Release 3, Level 0.0
dsmtrace date/time: 10/24/04 08:07:37
(c) Copyright by IBM Corporation and other(s) 1990, 2004. All Rights Reserved.
```

| PROCESS ID | PROCESS OWNER | DESCRIPTION | EXECUTABLE NAME |
|------------|---------------|-----------------------------|-----------------|
| 28970 | root | Backup-Archive Client (CLI) | dsmc |
| 28969 | root | Backup-Archive Client (CLI) | dsmc |
| 28968 | root | Backup-Archive Client (CLI) | dsmc |
| 28967 | root | Backup-Archive Client (CLI) | dsmc |

```
fvttlinuxppc:/opt/tivoli/tsm/client/ba/bin #
```

In such a situation, use the ps command to identify the parent dsmc process:

```
linuxppc:~ # ps -ef | grep dsmc
```

| | | | | | | |
|------|-------|-------|---|--------------|----------|-----------|
| root | 28967 | 1151 | 0 | Oct22 pts/16 | 00:00:00 | dsmc |
| root | 28968 | 28967 | 0 | Oct22 pts/16 | 00:00:00 | dsmc |
| root | 28969 | 28968 | 0 | Oct22 pts/16 | 00:00:00 | dsmc |
| root | 28970 | 28968 | 0 | Oct22 pts/16 | 00:00:00 | dsmc |
| root | 24092 | 24076 | 0 | 08:15 pts/93 | 00:00:00 | grep dsmc |

```
linuxppc:~ #
```

Notice that the parent for processes 28969 and 28970 is 28968. The parent for 28968 is 28967. The parent for 28967 is 1151, but the 1151 process does not appear in this display output. Process 1151 is the process that launched dsmc. So, the correct parent process ID is 28967.

2. Issue the following command to enable tracing on the client:

```
dsmtrace enable 4020 -traceflags=service -tracefile=d:\trace.txt
```

Example output:

```
C:\program files\tivoli\tsm\baclient>dsmtrace enable 4020 -traceflags=service
-tracefile=d:\trace.txt
```

```
IBM Tivoli Storage Manager
dsmtrace utility
dsmtrace Version 5, Release 3, Level 0.0
dsmtrace date/time: 10/24/2004 21:45:54
(c) Copyright by IBM Corporation and other(s) 1990, 2004. All Rights Reserved.
```

```
ANS2805I Tracing has been enabled.
```

```
C:\program files\tivoli\tsm\baclient>
C:\program files\tivoli\tsm\baclient>
```

Important: When tracing an API application: The -pipenameprefix option must be included.

- On UNIX, use prefix /tmp/TsmTraceTargetAPI
- On Windows systems use prefix \\.\pipe\TsmTraceTargetAPI

3. After sufficient trace data is collected, disable the tracing by issuing the following command:

```
dsmtrace disable 4020
```

Example output:

```
C:\program files\tivoli\tsm\baclient>dsmtrace disable 4020
```

```
IBM Tivoli Storage Manager
dsmtrace utility
dsmtrace Version 5, Release 3, Level 0.0
dsmtrace date/time: 10/24/2004 21:47:43
(c) Copyright by IBM Corporation and other(s) 1990, 2004. All Rights Reserved.

ANS2802I Tracing has been disabled.
```

Other examples of enabling client trace while the client is running are defined in the following list:

dsmtrace query pids

This command displays all running processes whose names are listed in the table in the Background section.

dsmtrace query pids -filter=*

This command displays all running processes.

dsmtrace query pids -filter=dsm*

This command displays all running processes whose name begins with "dsm."

dsmtrace query pids -filter=dsm?

This command displays all running processes whose name begins with "dsm" plus one other character.

dsmtrace enable 2132 -traceflags=service -tracefile=c:\trace.txt

This command turns on SERVICE tracing for process 2132. Trace output is written to file c:\trace.txt.

dsmtrace enable 2132 -traceflags=-extrc

This command turns off extrc tracing for process 2132 (presumably tracing is already running for this process).

**dsmtrace enable 4978 -traceflags=fileops -tracefile=/tmp/dsmtrace.out
-tracemax=1000 -tracesegsize=200**

This command turns on FILEOPS tracing for process 4978. The trace is written to files /tmp/dsmtrace.out.1, /tmp/dsmtrace.out.2, and so on, with each file being no larger than 200 MB. After 1000 MB are written, tracing wraps back to /tmp/dsmtrace.out.1.

dsmtrace query trace 4978 -on

This command displays basic trace information and lists trace flags that are turned on for process 4978.

dsmtrace disable 4978

This command disables tracing for process 4978.

dsmtrace disable 364 -pipenameprefix=/tmp/TsmTraceTargetAPI

This command disables tracing for API application process 364.

Known trace problems and limitations

We have gathered the known problems and limitations of trace processes to help you resolve problems you might have encountered when running a trace process.

- If tracing is not currently active for a process, and `dsmtrace` is used only with the `-TRACEFLAGS` option, e.g. `dsmtrace enable 2346 -traceflags=service`, then you still see the following message:

ANS2805I Tracing has been enabled.

In this case, the trace flags were enabled (turned on), but tracing is not actually active until a trace file is specified by using the `-TRACEFILE` option.

- Do not use the `dsmtrace enable` command to start tracing the API for Data Protection applications if the Data Protection application is run in a manner that does not cause it to connect to the Tivoli Storage Manager server. For example, The Data Protection for Lotus Domino command line interface has several such commands:

- `domdsmc help`
- `domdsmc set`
- `domdsmc query domino`
- `domdsmc query pendingdbs`
- `domdsmc query preferences`

If you use `dsmtrace` to enable tracing for such commands, the result can be a stoppage of the `dsmtrace` process and (UNIX only) a residual named pipe in the `/tmp` directory.

- **Windows** On Windows systems, you must be logged in with a local administrative account in order to use `dsmtrace`.
- **HP-UX** On UNIX systems, you must be logged in as root to use `dsmtrace`.
- **HP-UX** On UNIX systems, if a client process stops or is stopped, it might leave a named pipe (UNIX FIFO) in the `/tmp` directory. These FIFOs have names beginning with `TsmTrace` and they include a process ID (PID) number. If a client process stops or is stopped, and then a new client process is started whose PID happens to match that of the old residual FIFO, then the trace listener thread will probably not start. Any old FIFOs with process numbers that do not match those of running the Tivoli Storage Manager processes can be safely deleted. Do NOT delete the FIFO of a running process.
- The threading model for some versions of Linux is to run each thread as a separate process, meaning that when you query process information, you might see several processes for each instance of the client. The process you need to identify is the `dsmc` parent process. For an example, refer to the previous example section.
- When multiple instances of the same program are running, you must identify the PID of the instance you want to trace. In such a situation, using other clues, such as process information from the operating system, might be available to narrow down the desired PID. For example, if you want to trace `dsmc` that is being run by user 'andy' and there are two instances of `dsmc` (one owned by user 'andy' and the other owned by user 'kevin'), you can use the process owner to identify which process to trace.
- If an options file contains a false option and the client does not start, you might see some named pipe errors in the `dsmerror.log` file. These error messages might be safely ignored. A fix for this problem is planned for a future release.

Trace options

Trace has several options that you can employ.

DSMTRACEListen

DSMTRACEListen No | Yes

- | | |
|------------|--|
| No | The client does not start the trace listener thread and dynamic tracing is not available. No is the default. |
| Yes | The client starts the trace listener thread and dynamic tracing is available. |

Windows On Windows, the DSMTRACEListen option is specified in the client options file (usually dsm.opt).

HP-UX On UNIX, the DSMTRACEListen option is specified in the system options file (dsm.sys) in the stanza that the client uses and cannot be specified from the command line.

dsmtrace

dsmtrace enable <pid> <options>

Use this command to start or modify tracing for a process.

pid The process ID (PID) for the client. Use dsmtrace query pids or your operating system facilities to identify the correct PID.

options The client trace options.

dsmtrace disable <pid>[<options>]

Use this command to stop tracing for a process. The trace file will close and the trace flags, maximum trace size, maximum trace segment size, and trace file name will all be cleared.

<pid> The process ID (PID) for the client. Use dsmtrace query pids or your operating system facilities to identify the correct PID.

<options>
The client trace options.

dsmtrace help

This command displays basic syntax for dsmtrace.

dsmtrace query pids [-Filter=<spec>]

<spec> The client process name filter specification, which can include the wildcard characters "?" (match exactly one character) or "*" (match zero or more characters).

If no filter is specified, then the default behavior is to display process information for any running instances of the program names listed in the table in the Background section above.

Important: When using the FILTER option on UNIX, put the * symbol before and after the search text. This adjustment is necessary because the executable file name often includes the path in front of it, and in some cases, the executable file name might have additional characters at the end of it. For example:

- /opt/tivoli/tsm/client/ba/bin/dsmc
- domdsmc_DominoUserID

Thus, instead of `-filter=dsmc` or `-filter=domdsmc`, use `-filter=*dsmc*` or `-filter=*domdsmc*`.

dsmtrace query trace *<pid>* [*<options>*] [*<displayType>*] [-**ALI** | -**ON** | -**Off** | -**BASic**]

<pid> The process ID (PID) for the client. Use dsmtrace query pids or your operating system facilities to identify the correct PID.

<options>
The client trace options.

<displayType>
The display type can be one of the following entries:

- ALI** Displays all trace flags and, for each flag, indicates whether it is turned on or off. The information shown with the -BASIC display type is also included.
- ON** Displays the names of the trace flags that are turned on. The information shown with the -BASIC display type is also included.
- Off** Displays the names of the trace flags that are turned off. The information shown with the -BASIC display type is also included.
- BASic** Displays the name of the trace file and the maximum trace and trace segment sizes. This display type also indicates whether tracing is enabled or disabled.

-PIPENAMEPREFIX

-PIPENameprefix=*<pipeNamePrefix>*

The -PIPENameprefix option must be used when tracing API applications:

- On UNIX, use prefix `/tmp/TsmTraceTargetAPI`
- On Windows, use prefix `\\.\pipe\TsmTraceTargetAPI`

-TRACEFILE

-TRACEFile=*<traceFileName>*

The -TRACEFile option must specify a valid file name to which the trace is written. If tracing is already running, then this option has no effect.

-TRACEFLAGS

-TRACEFLags=*<traceFlags>*

Specify one or more trace flags. Typically, the trace flag `SERVICE` is used. Multiple trace flags are separated with a comma. Trace flags can also be turned off by prefixing the flag name with a minus sign. When combining trace flags that you want to turn on with trace flags that you want to turn off, put the flags that you want to turn off at the end of the list. For example, if you want to turn on `SERVICE` tracing except for `VERBDETAIL`, specify `-TRACEFLAGS=SERVICE,-VERBDETAIL`. If tracing is already running, then this option can be used to turn on additional trace flags or turn off trace flags.

-TRACEMax

-TRACEMax=*<maximumTraceSize>*

This option limits the maximum trace file length to the specified value (by

default the trace file will grow indefinitely). When the maximum length is reached, then the trace will wrap back to the beginning of the file. Specify a value in MB between 1 and 4095. If tracing is already running, then this option has no effect.

-TRACESegsize

-TRACESegsize=<maximumTraceSegmentSize>

This option is used when you anticipate a large trace file and you want the trace file to be written in smaller, more easily-manageable segments. Each segment will be no larger than the specified size. When this option is used, a segment number will be appended to the trace file name for each segment. Specify a value in MB between 1 and 1000. If tracing is already running, then this option has no effect.

Note:

- To turn tracing on for a process, you must use the -TRACEFLAGS and -TRACEFILE options (and -PIPENAMEPREFIX when tracing an API application).
- To modify trace flags for an existing process, use -TRACEFLAGS (and -PIPENAMEPREFIX when tracing an API application).
- If you need to modify the trace file name, maximum trace size, or maximum trace segment size, then you need to first disable tracing altogether (see the dsmtrace disable command).

Determining if data is encrypted or compressed during backup-archive through trace

You must perform several steps to determine whether the data during backup-archive is compressed or encrypted, or both.

1. Add the trace options listed to the client options file prior to backing up or archiving objects:

- TRACEFILE <trace file name>
- TRACEFLAGS api api_detail

2. Examine the trace file after the operation and locate a statement that looks similar to the following statement:

```
dsmSendObj ENTRY:... objNameP: <the file name>
```

This output is followed by the following trace message that indicates whether the object is compressed, encrypted, or both compressed and encrypted:

```
tsmEndSendObjEx: Total bytes send * *, encryptType is *** encryptAlg is ***  
compress is *, totalCompress is * * totalLFBytesSent * *
```

```
+-----+
| encryptType/compress | 0 | 1 |
+-----+
| NO | not compressed, not encrypted | compressed, not encrypted |
| CLIENTENCRKEY | not compressed, encrypted | compressed, encrypted |
| USER | not compressed, encrypted | compressed, encrypted |
+-----+
```

Alternatively, your application itself can determine encryption type/strength and compression of your data by using the dsmEndSendObjEx function call and the dsmEndSendObjExOut_t data structure.


```

/*-----+
| Type definition for dsmEndSendObjExOut_t
+-----*/
typedef struct dsmEndSendObjExOut_t
{
    dsUInt16_t    stVersion;        /* structure version */
    dsStruct64_t  totalBytesSent;    /* total bytes read from app */
    dsmBool_t     objCompressed;     /* was object compressed */
    dsStruct64_t  totalCompressSize; /* total size after compress */
    dsStruct64_t  totalLFBytesSent;  /* total bytes sent LAN Free */
    dsUInt8_t     encryptionType;    /* type of encryption used */
} dsmEndSendObjExOut_t;

objCompressed - A flag that displays if the object was compressed.
encryptionType - A flag that displays the encryption type.

For example:

...
rc = dsmEndSendObjEx(&endSendObjExIn, &endSendObjExOut);
if (rc)
{
    printf("*** dsmEndSendObjEx failed: ");
    rcApiOut(dsmHandle, rc);
}
else
{
    printf("Compression:      %s\n",
        endSendObjExOut.objCompressed == bTrue ? "YES" : "NO");

    printf("Encryption:      %s\n",
        endSendObjExOut.encryptionType & DSM_ENCRYPT_CLIENTENCRKEY ?
        "CLIENTENCRKEY" :
        endSendObjExOut.encryptionType & DSM_ENCRYPT_USER ? "USER" : "NO");
    printf("Encryption Strength: %s\n\n",
        endSendObjExOut.encryptionType & DSM_ENCRYPT_AES_128BIT ? "AES_128BIT" :
        endSendObjExOut.encryptionType & DSM_ENCRYPT_DES_56BIT ? "DES_56BIT" :
        "NONE");
}
...

```

See the *API Function Calls in Using the Application Programming Interface* for more information.

Tracing data for the API

You can enable tracing for the application programming interface (API).

To enable tracing for the Tivoli Storage Manager API, add the following lines to the `dsm.opt` file or another file designated as the client options file:

```

TRACEFILE trace file name
TRACEFLAGS trace flags

```

trace file name

The name of the file where you want to write the trace data.

trace flags

The list of trace flags to enable. Separate each trace flag by a space. The following trace flags are specific to the Tivoli Storage Manager API:

api Information about the API function calls

api_detail

Detailed information about the API function calls

You can also specify other Tivoli Storage Manager backup-archive client and Tivoli Storage Manager API trace flags. Refer to the backup-archive client documentation for a list of any available trace classes. For example:

- TRACEFILE /log/trace.out
- TRACEFLAGS api api_detail verbinfno verbdetail timestamp

Important: If you do not have write permission for the file pointed by the TRACEFILE option, dsmSetup or dsmInitEx/dsmInit will fail with return code DSM_RC_CANNOT_OPEN_TRACEFILE (426).

To enable tracing for the multithreaded API after an application has been started, use the dsmtrace utility. The dsmtrace utility allows you to turn on tracing while the problem is occurring, without having trace constantly enabled. Refer to the *dsmtrace* section.

Chapter 7. Resolving problems with the Tivoli Storage Manager reporting and monitoring feature

The problems that might occur with the reporting and monitoring feature might be resolved through the documented procedures.

Resolving Warehouse Proxy workspace reporting problems

If your reports are not being generated in Japanese, Korean, or Traditional Chinese, you might need to rebuild or reconfigure the UTF8TEST table in the WAREHOUS database.

Tivoli reports are displayed in several languages, but problems have arisen with the output of Japanese, Korean, and Traditional Chinese reports. One reason might be that the historical collection configuration was not set up correctly in the Tivoli Enterprise Portal. Ensure that the following items are completed:

- Modify the UTF8TEST table in the WAREHOUS database.
- Add the environment variable DB2CODEPAGE=1208.
- Recycle all service applications in IBM Tivoli Monitoring by stopping and starting them.

If you are still experiencing problems reporting in Japanese, Korean, or Traditional Chinese, ensure that the following items are set up:

- Verify that the DB2CODEPAGE=1208 environment variable exists. To add this variable, right-click on **My Computer**, select **Properties** → **Advanced** → **Environment Variables** → **New** for the system variables.
- Open the DB2 Control Center and select the WAREHOUSE database, select and open the UTF8TEST table and change the "Results" column on the third row to a 0 (zero).
- Stop and restart the Warehouse Proxy Agent within the Tivoli Enterprise Monitoring Server.

Resolving historical data reporting problems in the Warehouse Proxy workspace

If you are experiencing errors in the Warehouse Proxy workspace in the Tivoli Enterprise Portal browser and you are using a non-English system, you might need to reconfigure the ITMUser ID. You must add the ITMUser ID to the Administrator group or a group with the same authority.

If the ITMUser ID is not part of the Administrators group or part of a group with authority like the Administrators group, errors are generated on non-English systems. The following are examples of possible errors:

- Initialization with Datasource "ITM Warehouse" failed. A retry will be attempted in 10 minutes.
- The bufferpool ITMBUF8K could not be created.

Perform the following steps to resolve the reporting problem:

1. Right-click **My Computer**.
2. Select **Manage**.

- | 3. Select **Local Users and Groups**.
- | 4. Select **Groups**.
- | 5. Select **Administrators** or a group with the same authority.
- | 6. Select **Add**.
- | 7. Type **ITMUser** in the space provided.

Chapter 8. Hints and tips for storage

The hints and tips that are gathered here are from actual problem experiences. You might find that one of the solutions is right for addressing your Tivoli Storage Manager problem.

Device driver hints and tips

There are many possible causes for device driver problems. The problem might be with the operating system, the application using the device, the device firmware, or the device hardware itself.

Whenever a device problem is encountered, ask “Has anything been changed?”

If the adapter firmware changed, this change might cause a device to exhibit intermittent or persistent failures. Try reverting back to an earlier version of the firmware to see if the problem continues.

If cabling between the computer and the device was changed, this change often accounts for intermittent or persistent failures. Check any cabling changes to verify that they are correct.

A device might exhibit intermittent or persistent failures if the device firmware was changed. Try reverting back to an earlier version of the firmware to see if the problem continues.

For SCSI connections, a bent pin in the SCSI cable where it connects to the computer (or device) can cause errors for that device or any device on the same SCSI bus. A cable with a bent pin must be repaired or replaced. Similarly, SCSI buses must be terminated. If a SCSI bus is improperly terminated, devices on the bus might exhibit intermittent problems, or data that is transferred on the bus might be or appear to be corrupted. Check the SCSI bus terminators to ensure that they are correct.

Note: If the “hints and tips” information does not adequately address your device driver issue or this is the initial set up of your system’s device drivers, please refer to the Tivoli Storage Manager Administrator’s Guide and Tivoli Storage Manager Installation Guide. Check, also, that your hardware devices are supported by the Tivoli Storage Manager. See <http://www.ibm.com/software/support/>.

Adjusting to operating system changes

Operating system maintenance can change kernel levels, device drivers, or other system attributes that can affect a device.

Similarly, upgrading the version or release of the operating system can cause device compatibility issues. If possible, revert the operating system back to the state prior to the device failure. If reverting is not possible, check for device driver updates that might be needed based on this fix level, release, or version of the operating system.

Adjusting to changes in the HBA or SCSI adapter connecting to the device

A device driver communicates to a given device through an adapter.

If it is a fibre channel-attached device, the device driver will use a host bus adapter (HBA) to communicate. If the device is SCSI attached, the device driver will use a SCSI adapter to communicate. In either case, if the adapter firmware was updated or the adapter itself was replaced, the device driver might have trouble using the device.

Work with the vendor of the adapter to verify that it is installed and configured appropriately. The following list shows the other possible steps:

- If the adapter was changed, try reverting back to the previous adapter to see if that resolves the issue.
- If other hardware in the computer was changed or the computer was opened, reopen the computer and check to make sure that the adapter is properly seated in the bus. By opening and changing other hardware in the computer, the cards and other connections in the computer might have been loosened, which might cause intermittent problems or total failure of devices or other system resources.

Resolving a loose cable connection

Problems with the device might occur if a connection is loose from the computer to the cable, or from the cable to the device.

Check the connections and verify that the cable connections are correct and secure.

For SCSI devices, check that the SCSI terminators are correct and that there are no bent pins in the terminator itself. An improperly terminated SCSI bus might result in difficult problems with one or more devices on that bus.

Resolving error messages in the system error log

A device might try to report an error to a system error log.

The following examples are of various system error logs:

- errpt for AIX
- Event Log for Windows
- System Log for z/OS

The system error logs can be useful because the messages and information recorded might help to report the problem or the messages might include recommendations on how to resolve the problem.

Check the appropriate error log and take any actions based on the messages issued to the error log.

Supporting 64- or 32-bit Linux kernel modules for 64- or 32-bit applications

Linux

The Linux kernel modules dictate the bit mode of the Linux SCSI generic device driver, all different Host Bus Adapter (HBA) drivers, and other settings.

All of these kernel modules only support applications which have the same bit mode with running kernel modules. In other words, the 64-bit kernel modules only support 64-bit applications on 64-bit Linux systems.

If a 32-bit application runs on a 64-bit Linux system and invokes a 64-bit kernel module, the 32-bit application causes a kernel segmentation fault. The same will happen if a 64-bit application invokes a 32-bit kernel module on a 32-bit Linux system.

To avoid a segmentation fault, ensure that the bit mode of the Linux kernel module and its applications are the same. That means 32-bit applications can only invoke 32-bit kernel modules on 32-bit Linux systems. 64-bit applications can only invoke 64-bit kernel modules on 64-bit Linux systems.

Running a Tivoli Storage Manager Linux server on x86_64 architecture

Linux

The 32-bit and 64-bit Linux operating systems can run on the AMD64 and EM64T systems, which are 64-bit systems.

A 64-bit Tivoli Storage Manager Linux server and storage agent can only run on a AMD64/EM64T system with a 64-bit Linux operating system. Likewise, a 32-bit Tivoli Storage Manager Linux server and storage agent can only run on an AMD64/EM64T system with 32-bit Linux operating system.

A 64-bit Tivoli Storage Manager server issuing the QUERY SAN command requires a 64-bit HBA API on an AMD64/EM64T system. If an AMD64 system is equipped with a Qlogic HBA, it could create a problem since, by default, Qlogic only provides 32-bit HBA API on AMD64 system. You must install the 64-bit HBA API on the system before issuing the 64-bit QUERY SAN command.

Adjusting to HBA driver changes on the Linux 2.6.x kernels

The most distinct change for HBA drivers on the Linux 2.6.x kernels is that all drivers have “ko” as a new suffix.

The following list shows the driver names and locations in 2.6.x kernels:

Adaptec

The driver (aic7xxx.ko) is located in the /lib/modules/kernel-level/drivers/scsi/aic7xxx/ directory.

Emulex

The driver (lpfcdd.ko) is located in the /lib/modules/kernel-level/drivers/scsi/lpfc/ directory.

Qlogic

Its driver names are qla2xxx.ko, qla2100.ko, qla2200.ko, qla2300.ko,

qla2322.ko, and so on. There is a certain order to load the HBA drivers. The qla2xxx.ko is a base driver and should be loaded first. After loading the qla2xxx.ko driver, the system should then load the qla2300.ko driver if it is equipped with a Qla2300 card. All of drivers are located in the /lib/modules/kernel-level/drivers/scsi/qla2xxx/ directory.

Enabling multiple LUN support on Linux kernels

Linux

To configure SCSI devices with multiple LUNs on a Linux system, the Linux kernel must be set to enable multiple LUN support.

Multiple LUN support on some Linux distributions, however, is not a default option and requires users to manually add this option to the running kernel. Perform the following steps to set up multiple LUN enabled on IA32 architecture:

1. Add one parameter to a boot loader configuration file.
 - For LILO boot loader:
 - a. Add append="max_scsi_luns=128" to the /etc/lilo.conf file.
 - b. Run lilo.
 - For GRUB boot loader:
 - a. Add max_scsi_luns=128 after the kernel image list at /etc/grub.conf file for RedHat distribution.
 - b. Add max_scsi_luns=128 after the kernel image list at /boot/grub/menu.1 file for SuSE distribution.
2. Restart the system.

Using Tivoli Storage Manager to perform a ddtrace on Linux or HP-UX

HP-UX

Linux

The passthru device driver can be traced by issuing the ddtrace command.

To enable trace, issue the following commands from the server console or admin client:

- Linux:

```
trace enable lpdd <other server trace class names>
trace begin <file name>
```
- HP-UX:

```
trace enable pvrhppdd <other server trace class names>
trace begin <file name>
```

Select one of the following three options:

- ddtrace start librarydd tapedd (to trace both library and drive)
- ddtrace start librarydd (library trace only)
- ddtrace start tapedd (drive trace only)

Restriction: DDTRACE GET and DDTRACE END are not required.

The Tivoli Storage Manager passthru device driver trace cannot be enabled through the ddtrace utility.

Using the HP-UX passthru driver

HP-UX

If the autoconf utility did not claim your device, ensure that the correct drivers are loaded to the kernel.

For HP-UX 11i v2, the sctl driver, as well as the HP-UX stape, sdisk, and schgr native drivers are required for device configuration for the Tivoli Storage Manager passthru device driver. For HP-UX 11i v3 on IA64, the esctl driver, as well as the HP-UX estape, esdisk, and eschgr native drivers are required for device configuration.

Refer to the HP-UX operating system documentation for information about how to load drivers to the kernel.

Related reference

“Device driver hints and tips” on page 187

There are many possible causes for device driver problems. The problem might be with the operating system, the application using the device, the device firmware, or the device hardware itself.

“Adjusting to changes in the HBA or SCSI adapter connecting to the device” on page 188

A device driver communicates to a given device through an adapter.

“Resolving a loose cable connection” on page 188

Problems with the device might occur if a connection is loose from the computer to the cable, or from the cable to the device.

Updating device information of host systems on a dynamic SAN without restarting

When devices in a storage area network (SAN) environment change, the information about this changed environment is not automatically sent to host systems attached to the SAN.

If the device information has not been updated to host systems attached to the SAN, previously-defined device paths will no longer exist. If you use the existing device information to define device paths, backup, or restore data, these operations might fail. In order to avoid these kinds of failures, use a different method for different platforms to update the device information on the SAN without restarting host systems.

AIX

On AIX, issue the cfgmgr command to force the operating system to re-configure itself. Then run SMIT to re-configure your Tivoli Storage Manager devices.

HP-UX

On HP, run autoconf with the -f option to issue the IOSCAN command which forces the operating system to re-scan SCSI buses and fibre channels.

Linux

On Linux, there is no system command to re-configure the operating system. In order to re-scan SCSI buses and fibre channels, the adapter drivers corresponding to these SCSI adapters and fibre channel adapters must be unloaded and then reloaded into the Linux kernel. After reloading HBA drivers, run autoconf or TSMSCSI to re-configure Tivoli Storage Manager devices on Linux. You might issue the LSPCI command to find out which SCSI adapter and fibre channel adapter is available on the system. The RMMOD command unloads a driver from

the kernel and the MODPROBE command loads a driver to the kernel.

Table 18. HBA adapters and corresponding drivers for all architectures of Linux

| HBA Adapters | HBA Driver Name | Available Architectures |
|--------------|-----------------|-------------------------|
| Adaptec 7892 | aix7xxx | IA32, AMD64 |
| Qlogic 22xx | qla2200 | IA32, AMD64 |
| Qlogic 23xx | qla2300 | IA32, AMD64 |
| Qlogic 2362 | qla2362 | EM64T |
| Emulex | lpfcdd | IA32, iSeries®, pSeries |

Setting the multiple LUN options to “on” for Adaptec SCSI and Qlogic Fibre-Channel HBA BIOS settings on Linux

By default, Adaptec SCSI adapters set the multiple logical unit number (LUN) option to “off” in their BIOS which makes the SCSI adapter driver unable to probe a SCSI unit with multi-LUN properly.

The multiple LUN option must be turned on.

Perform the following steps to turn on the multiple LUN options:

1. Press the Ctrl and A keys at the same time.
2. Select **SCSI Device Configuration** in the **Configure/View Host Adapter** Setting.
3. Change No to Yes for Bios Multiple LUN support.

Turning on the tape enable option

By default, Qlogic Fibre host bus adapters set the tape enable option as off in their BIOS, which affects the execution of some SCSI commands on several SCSI tape devices, therefore this option must be turned on.

Perform the following steps to turn on the tape enable option:

1. Press the Alt and Q keys at the same time.
2. Select **Advanced Settings**.
3. Change Disable to Enable for Fibre Channel Tape Support.

Hard disk drives and disk subsystems hints and tips

The Tivoli Storage Manager server needs hard disk drives, disk subsystems, vendor-acquired file systems, and remote file systems to perform in a specific way. Performing in a specific way allows Tivoli Storage Manager to appropriately manage and store data by ensuring the integrity of the Tivoli Storage Manager server itself.

The following definitions are provided to help you better understand the hard disk drives and disk subsystems:

Hard disk drive

A hard disk drive storage device is typically installed inside a given computer and used for storage by a Tivoli Storage Manager server on that computer.

Disk subsystem

An external disk subsystem that connects to a computer through a SAN or

some other mechanism. Generally, disk subsystems are outside of the computer to which they are attached and might be located in close proximity or they might be located much farther away. These subsystems might also have some method of caching the input/output requests to the disks. If data is cached, despite a bypass cache request which can occur on remote file systems and certain disk subsystems, input/output failures can result due to a difference between Tivoli Storage Manager's tracking and what is actually resident in a file system. Remote file systems and disk subsystems exhibiting these characteristics are not supported. Disk subsystems often have their own configuration and management software. A disk subsystem must report the results synchronously.

The Tivoli Storage Manager server might define hard disk drives and disk subsystems used by the computer or operating system on the computer where the Tivoli Storage Manager is installed. Typically, a hard disk drive or disk subsystem is defined to the computer where the Tivoli Storage Manager is installed as a drive or file system. After the hard disk drive or disk subsystem is defined to the operating system, Tivoli Storage Manager might use this space by allocating a database, recovery log, or storage pool volume on the device. The Tivoli Storage Manager volume subsequently looks like another file on that drive or file system. Tivoli Storage Manager requires the following conditions for hard disk drives, disk subsystems, third-party file systems, and remote file systems:

Bypassing cache during write operations

When the Tivoli Storage Manager opens database, recovery log, and storage pool volumes, they are opened with the appropriate operating system settings to require data write requests to bypass any cache and be written directly to the device.

By bypassing cache during write operations, Tivoli Storage Manager can maintain the integrity of client attributes and data. Bypassing the cache is required because if an external event, such as a power failure, causes the Tivoli Storage Manager server or the computer where the server is installed to halt or break while the server is running, the data in the cache might or might not be written to the disk. If the Tivoli Storage Manager data in the disk cache is not successfully written to the disk, information in the server database or recovery log might not be complete, or data that was supposed to be written to the storage pool volumes might be missing.

Hard disk drives installed in the computer where the Tivoli Storage Manager server is installed and running have less of an issue with bypassing cache. In this case, the operating system settings that are used when the Tivoli Storage Manager opens volumes on that hard disk drive generally manage the cache behavior appropriately and honor the request to prevent caching of write operations.

Typically, the use and configuration of caching for disk subsystems is a greater issue because disk subsystems often do not receive information from the operating system about bypassing cache for write operations, or else they ignore this information when a volume opens. Therefore, the caching of data write operations might result in corruption of the Tivoli Storage Manager server database or loss of client data, or both, depending upon which Tivoli Storage Manager volumes are defined on the disk subsystem and the amount of data lost in the cache. Disk subsystems should be configured to not cache write operations when a Tivoli Storage Manager database, recovery log, or storage pool volume is defined on that disk. Another alternative is to use nonvolatile cache for the disk subsystem. Nonvolatile cache employs a battery backup or some other sort of scheme to allow

the contents of the cache to be written to the disk if a failure occurs.

Moving existing data to other volumes prior to altering or moving the database

The size and location of the Tivoli Storage Manager storage pool volumes (files) can not change after they are defined and used by the server.

If the size is changed or the file is moved, internal information that the Tivoli Storage Manager uses to describe the volume might no longer match the actual attributes of the file. If you need to move or change the size of a Tivoli Storage Manager storage pool volume, move any existing data to other volumes prior to altering or moving the database.

FILE directory mapping between storage agents and servers for shared files

Tivoli Storage Manager servers and storage agents can access the same data in File device classes by defining a set of directories that should be used within a device class definition.

The directory name in a FILE device-class definition identifies the location where the server places the files that represent storage volumes for the device class. When processing the DEFINE DEVCLASS command, the server expands the specified directory name into its fully-qualified form, starting from the root directory.

You can specify one or more directories as the location of the files used in the FILE device class. The default is the current working directory of the server at the time that the command is issued. You can specify the directories for AIX, Linux, Solaris, or HP-UX, unless the DSMSEV_DIR environment variable is set. For more information about setting the environment variable, refer to the *IBM Tivoli Storage Manager Installation Guide*.

Do not specify multiple directories from the same file system. Doing so can cause incorrect space calculations. For example, if the directories /usr/dir1 and /usr/dir2 are in the same file system, the space check will count each directory as a separate file system. The space check does a preliminary evaluation of available space during store operations. If space calculations are incorrect, the server could commit to a FILE storage pool, but not be able to obtain space, causing the operation to fail. If the space check is accurate, the server can skip the FILE pool in the storage hierarchy and use the next storage pool if one is available.

If the server needs to allocate a scratch volume, it creates a new file in the specified directory or directories. (The server can choose any of the directories in which to create new scratch volumes.) To optimize performance, ensure that multiple directories correspond to separate physical volumes.

The following table lists the file name extension created by the server for scratch volumes depending on the type of data that is stored.

| For scratch volumes used to store this data: | The file extension is: |
|--|------------------------|
| Client data | .BFS |
| Export | .EXP |
| Database backup | .DBB |

For each storage agent that will be sharing FILE access, the PATHs defined to each DRIVE seen by the storage agent must provide access to the same set of directories. When the PATHs are defined, the directories for each storage agent must match in number and ordering for the directories as listed in the device class definition on the server. If these definitions are out of sync, the storage agent might be unable to access the FILE volumes, resulting in successful LAN-restores and mount failures for the LAN-free restore operations.

Tape drives and libraries hints and tips

There are several possible causes for problems with tape drives and libraries. The problem might be with software on the computer trying to use the device, the connections to the device, or the device itself.

Whenever a device problem is encountered, ask, “Has anything been changed?” Suspect anything from the computer trying to use the device to the device itself. Especially if the device worked prior to a given change then stopped working after that change.

- If the adapter firmware changed, a device might exhibit intermittent or persistent failures. Try reverting back to an earlier version of the firmware to see if the problem continues.
- If cabling between the computer and the device was changed, this situation often accounts for intermittent or persistent failures. Check any cabling changes to verify that they are correct.
- If the device firmware has changed, this situation might cause a device to exhibit intermittent or persistent failures. Try reverting back to an earlier version of the firmware to see if the problem continues.

Adjusting to operating system changes

Operating system maintenance can change kernel levels, device drivers, or other system attributes that can affect a device. Similarly, upgrading the version or release of the operating system can cause device compatibility issues.

If possible, revert the operating system to the state prior to the device failure. If you cannot revert the operating system, check for device driver updates that might be needed based on this fix level, release, or version of the operating system.

Adjusting to device driver changes

A device driver upgrade can result in a tape drive or library device not working.

These issues can also occur as a result of the type of driver that you use. When working with IBM libraries or drives, as opposed to using other vendor libraries and drives, the type of device driver that you choose is important. IBM libraries and drives should use the IBM device driver, while other vendor libraries and drives should use the Tivoli Storage Manager device driver.

Revert to the previous (or earlier) version of the device driver to see if the problem was introduced by the newer version of the driver.

Adjusting to a replaced adapter or other hardware changes

A SCSI connection to the device uses a SCSI adapter, while a fibre-channel (optical) connection to the device uses a host bus adapter (HBA). In either case, the cause of the problem might be if an actual adapter was changed or the computer was opened and other hardware changed or fixed.

Remember: The connecting point for the device to the computer is usually referred to as an adapter. Another term for adapter is *card*.

See the following information to help you adjust to a replaced adapter or hardware:

- If the adapter was changed, revert back to the previous adapter to see if that resolves the issue.
- If other hardware in the computer was changed or the computer was opened, reopen the computer and check to make sure that the adapter is properly seated in the bus. By opening and changing other hardware in the computer, the cards and other connections in the computer might have been loosened, which might cause intermittent problems or total failure of the devices or other system resources.

Resolving a loose cable connection

Problems might occur to the device if a connection is loose from the computer to the cable, or from the cable to the device.

Check the connections and verify that the cable connections are correct and secure.

For SCSI devices, check that the SCSI terminators are correct and that there are no bent pins in the terminator itself. An improperly-terminated SCSI bus might result in difficult problems with one or more devices on that bus.

Using error messages to resolve a device malfunction

A device might report an error to a system error log where you can try to find the cause of the problem.

Examples of various system error logs are:

- errpt for AIX
- Event Log for Windows
- System Log for z/OS

The system error logs can be useful because the messages and information recorded might help to report the problem, or the messages might include recommendations on how to resolve the problem. Check the appropriate error log and take any recommended actions based on messages issued to the error log.

Storage area network hints and tips

There are many possible causes or problems with a storage area network (SAN). SAN problems might be with software on the computer trying to use the device, connections to the device, or the device itself.

Whenever a SAN problem is encountered, ask “Has anything been changed?” Any kind of changes, from the computer trying to use the device to the device itself might be suspect, especially if the device worked prior to a given change, then stopped working after that change.

To better understand the following discussion on diagnosing problems with a SAN, review the following terminology and typical abbreviations that are used:

Fibre channel

Fibre channel denotes a fibre-optic connection to a device or component.

Host bus adapter

A host bus adapter (HBA) is used by a given computer to access a storage area network. An HBA is similar in function to a network adapter in how it provides access for a computer to a local area network or wide area network.

Storage area network

A storage area network (SAN) is a network of shared devices that can typically be accessed using fibre. Often, a storage area network is used to share devices between many different computers.

Knowing your SAN configuration

Understanding the storage area network (SAN) configuration is critical in SAN environments. Various SAN implementations have limitations or requirements on how the devices are configured and set up.

The three SAN configurations are point to point, arbitrated loop, and switched fabric.

Point to point

The devices are connected directly to the host bus adapter (HBA).

Arbitrated loop

Arbitrated loop topologies are ring topologies and are limited in terms of the number of devices that are supported on the loop and the number of devices that can be in use at a given time. In an arbitrated loop, only two devices can communicate at the same time. Data being read from a device or written to a device is passed from one device on the loop to another until it reaches the target device. The main limiting factor in an arbitrated loop is that only two devices can be in use at a given time.

Switched fabric

In a switched fabric SAN, all devices in the fabric will be fibre native devices. This topology has the greatest bandwidth and flexibility because all devices are available to all HBAs through some fibre path.

Verifying that your devices are supported by the SAN

Many devices or combinations of devices might not be supported in a given storage area network (SAN). These limitations arise from the ability of a given vendor to certify their device using Fibre Channel Protocols.

For a given device, verify with the device vendor that it is supported in a SAN. Verification includes whether or not it is supported by the host bus adapters (HBAs) used in your SAN environment, meaning that you must verify with the vendors that this device is supported by the hubs, gateways, and switches that make up the SAN.

Ensuring that your HBA works with your SAN

The host bus adapter (HBA) is a critical device for the proper functioning of a storage area network (SAN). The problems that might occur with HBAs range from improper configuration to outdated bios or device drivers.

For a given HBA, check the following items:

BIOS HBAs have an embedded BIOS that can be updated. The vendor for the HBA has utilities to update the BIOS in an HBA. Periodically, the HBAs in use on your SAN should be checked to see if there are BIOS updates that should be applied.

Device driver

HBAs use device drivers to work with the operating system to provide connectivity to the SAN. The vendor will typically provide a device driver for use with their HBA. Similarly, the vendor will provide instructions and any necessary tools or utilities for updating the device driver. Periodically the device driver level should be compared to what is available from the vendor and, if needed, should be updated to pick up the latest fixes and support.

Configuration

HBAs typically have a number of configurable settings. The settings typically affect how Tivoli Storage Manager functions with a SAN device.

Related reference

“HBA configuration issues”

Host bus adapters (HBAs) typically have many different configuration settings and options.

HBA configuration issues

Host bus adapters (HBAs) typically have many different configuration settings and options.

The HBA vendor usually provides information about the settings for your HBA and the appropriate values for these settings. Similarly, the HBA vendor should provide a utility and other instructions on how to configure your HBA. The following settings are those that typically affect using Tivoli Storage Manager with a SAN:

- Storage area network (SAN) topology

The HBA should be set appropriately based on the currently-used SAN topology. For example, if your SAN is an arbitrated loop, the HBA should be set for this configuration. If the HBA connects to a switch, this HBA port should be set to “point to point” and not “loop.”

With Tivoli Storage Manager SAN Device Mapping, you can perform SAN discovery on most of the platforms and the persistent binding of the devices are not required. A Tivoli Storage Manager server can find the device if the device path was changed due to a restart or other reason.

Go to <http://www.ibm.com/software/sysmgmt/products/support/IBMTivoliStorageManager.html> to verify the platform/HBA vendor/driver level support for Tivoli Storage Manager SAN discovery.

- Fibre channel link speed

In many SAN topologies, the SAN is configured with a maximum speed. For example, if the fibre channel switch maximum speed is 1 GB/sec, the HBA should also be set to this same value. Or the HBA should be set for automatic (AUTO) negotiation if the HBA supports this capability.

- Is fibre channel tape support enabled?

Tivoli Storage Manager requires that an HBA is configured with tape support. Tivoli Storage Manager typically uses SANs for access to tape drives and libraries. As such, the HBA setting to support tapes must be enabled.

Fibre-channel switch configuration issues

A fibre-channel switch typically supports many different configurations. The ports on the switch need to be configured appropriately for the type of storage area network (SAN) that is set up, as well as the attributes of the SAN.

The vendor for the switch usually provides information about the appropriate settings and configuration based upon the SAN topology being deployed. Similarly, the switch vendor should provide a utility and other instructions on how to configure it. The following settings typically affect how Tivoli Storage Manager uses a switched SAN:

Fibre-channel link speed

In many SAN topologies, the SAN is configured with a maximum speed. For example, if the fibre-channel switch maximum speed is 1 GB/sec, the host bus adapter (HBA) should also be set to this same value. Or the HBA should be set for automatic (AUTO) negotiation if the HBA supports this capability.

Port mode

The ports on the switch must be configured appropriately for the type of SAN topology being implemented. For example, if the SAN is an arbitrated loop, the port should be set to FL_PORT. For another example, if the HBA is connected to a switch, the HBA options should be set to “point-to-point” and not “loop.”

Data gateway port settings

A data gateway in a storage area network (SAN) translates fibre channel to SCSI for SCSI devices attached to the gateway. Data gateways are popular in SANs because they allow the use of SCSI devices, therefore it is important that the port settings for a data gateway are correct.

The vendor for the data gateway usually provides information about the appropriate settings and configuration based upon the SAN topology being deployed and SCSI devices used. Similarly, the vendor might provide a utility and other instructions on how to configure it. The following settings can be used for the fibre channel port mode on the connected port on a data gateway:

Private target

Only the SCSI devices attached to the data gateway are visible and usable from this port. For the available SCSI devices, the gateway simply passes the frames to a given target device. Private target port settings are typically used for arbitrated loops.

Private target and initiator

Only the SCSI devices attached to the data gateway are visible and usable from this port. For the available SCSI devices, the gateway simply passes the frames to a given target device. As an initiator, this data gateway might also initiate and manage data movement operations. Specifically, there are extended SCSI commands that allow for third-party data movement. By setting a given port as an initiator, it is eligible to be used for third-party data movement SCSI requests.

Public target

All SCSI devices attached to the data gateway, as well as other devices available from the fabric, are visible and usable from this port.

Public target and initiator

All SCSI devices attached to the data gateway, as well as other devices available from the fabric, are visible and usable from this port. As an initiator, this data gateway might also initiate and manage data movement operations. Specifically, there are extended SCSI commands that allow for third-party data movement. By setting a given port as an initiator, it is eligible to be used for third-party data movement SCSI requests.

SAN configuration between devices

Devices in a storage area network (SAN), such as a data gateway or a switch, typically provide utilities that display what that device sees on the SAN. It is possible to use these utilities to better understand and troubleshoot the configuration of your SAN.

The vendor for the data gateway or switch should provide a utility for configuration. As part of this configuration utility there is usually information about how this device is configured and other information that this device sees in the SAN topology (of which it is a part). You can use these vendor utilities to verify the SAN configuration between devices:

Data gateway

A data gateway reports all the fibre-channel devices as well as the SCSI devices that are available in the SAN.

Switch

A switch reports information about the SAN fabric.

Tivoli Storage Manager Management Console

The Tivoli Storage Manager management console displays device names and the paths to those devices, which can be useful to help verify that the definitions for Tivoli Storage Manager match what is actually available.

The fibre-channel link error report

Most storage area network (SAN) devices provide monitoring tools that can be used to report information about errors and performance statistics.

The vendor for the device should provide a utility for monitoring. If a monitoring tool is available, it will typically report errors. The following errors are experienced often:

CRC error, 8b/10b code error, and other similar symptoms

These are recoverable errors where the error handling is usually provided by firmware or hardware. In most cases, the method to recover the device is to retransmit the failing frame. The fibre-channel link is still active when these errors are encountered. Applications using a SAN device that encounter this type of link error usually are not aware of the error unless it is a solid error. A solid error is one where the firmware and hardware recovery cannot successfully retransmit the data after repeated attempts. The recovery for these types of errors is typically very fast and will not cause system performance to degrade.

Link failure (loss of signal, loss of synchronization, NOS primitive received)

This error indicates that a link is actually “broken” for a period of time. It is likely that a faulty gigabit interface connector (GBIC), media interface adapter (MIA), or cable. The recovery for this type of error is disruptive. This error will appear in the application using the SAN device that encountered this link failure. The recovery is at the command exchange level and involves the application and device driver having to perform a reset to the firmware and hardware, which causes the system to run degraded until the link recovery is complete. These errors should be monitored closely, as they typically affect multiple SAN devices.

Note: Often these errors are caused by a customer engineer (CE) action to replace a SAN device. As part of the maintenance performed by the CE to replace or repair a SAN device, the fibre cable might be temporarily disconnected. If the fibre cable is disconnected, the time and duration of the error should correspond to when the service activity was performed.

NDMP filer-to-Tivoli Storage Manager server operation hints and tips

During filer-to-server operations, the Tivoli Storage Manager uses up to two additional TCP/IP ports; a control port used internally by Tivoli Storage Manager during both backup and restore operations, and a data port used during network data management protocol (NDMP) backup operations to a Tivoli Storage Manager native storage pool.

Tivoli Storage Manager defaults to the standard NDMP control port of 10000. If this port is in use by another application (such as a second Tivoli Storage Manager server), all filer-to-server operations fail. To avoid conflicts with other applications, use the `NDMPCONTROLPORT` server option to specify a different port for your server.

The data port is an ephemeral port that is acquired at the beginning of NDMP backup operations to a Tivoli Storage Manager native storage pool. If a port is not available, an error message is issued and backup of NAS devices to Tivoli Storage Manager native pools is not possible. To avoid conflicts with other applications, you can control which port is acquired for use as the data port during NDMP backup operations by setting the `NDMPPORTRANGELOW` and

NDMPPORTRANGEHIGH server options. Note that a data port is not needed by the Tivoli Storage Manager server for NAS restores from Tivoli Storage Manager native pools.

Firewall considerations with NDMP filer-to-Tivoli Storage Manager server backup and restore

A firewall might prevent the NAS file server from contacting the Tivoli Storage Manager server on the acquired data port during NAS backup operations to a native storage pool. If you must modify the data port selected by the Tivoli Storage Manager server, use the NDMPPORTRANGELOW and NDMPPORTRANGEHIGH server options.

A firewall might prevent the Tivoli Storage Manager server from contacting the NAS file server on the configured data port during NAS restore operations from a native storage pool. If a firewall prevents Tivoli Storage Manager from accessing the NAS file server, the outbound connection from Tivoli Storage Manager fails.

Common SAN device errors

You might be experiencing problems with your storage agent SAN devices.

See Table 19 for errors that are generated for SAN devices.

Table 19. Common SAN device errors

| Error | Explanation |
|---|---|
| ANR8302E I/O error on drive <i>TSMDRIVE01 (/dev/mt9)</i> (OP=WRITE, Error Number=5, CC=205, KEY=FF, ASC=FF, ASCQ=FF, SENSE=**NONE**, Description=General SCSI failure). Refer to Appendix D in the 'Messages' manual for recommended action | For SAN device errors, this message is often issued. The CC=205 reports that the device driver detects a SCSI adapter error. In the case of a SAN-attached device that encounters a link reset caused by link loss, it will be reported back to the device driver as a SCSI adapter error. The underlying cause of this error is the event that caused the link reset due to the link loss. The path for this device should be updated to ONLINE=NO by issuing the UPDATE PATH command. Do not set the path to ONLINE=YES until the cause for the link reset was isolated and corrected. |
| ANR8957E: <i>command</i> : Autodetect is OFF and the serial number reported by the library did not match the serial number in the library definition | The Tivoli Storage Manager SAN Device Mapping encountered a path for the library that reports a different serial number than the current Tivoli Storage Manager definition for the library. The AUTODETECT parameter was set to NO for the command which prevented the server from updating the serial number for the library. Determine the new path and issue the UPDATE PATH command to correct this. |
| ANR8958E: <i>command</i> : Autodetect is OFF and the serial number reported by the drive did not match the serial number in the drive definition | Tivoli Storage Manager SAN Device Mapping encountered a path for a drive that reports a different serial number than the current Tivoli Storage Manager definition for that drive. The AUTODETECT parameter was set to NO for the command, which prevents the server from updating the serial number for this drive. Determine the new path and issue the UPDATE PATH command to correct this. |

Table 19. Common SAN device errors (continued)

| Error | Explanation |
|---|--|
| ANR8963E: Unable to find path to match the serial number defined for drive <i>driveName</i> in library <i>libraryName</i> | <p>The SAN Device Mapping was not able to find a SAN device that was previously defined to the server. The most likely cause for this is that the device itself has been removed or replaced in the SAN. The following steps might resolve this:</p> <ul style="list-style-type: none"> • Device Removed If the device was removed from the SAN, simply delete the server definitions that refer to this device. Issue the QUERY PATH F=D command to determine any paths that reference the device. Then issue the DELETE PATH command to remove these paths. • Device Replace A SAN Device was replaced with a new device as a result of maintenance or an upgrade. Perform the following procedures: <ul style="list-style-type: none"> – Try not to delete the drive or drive path definition after you replace the drive. – Issue one of the following server commands: <ul style="list-style-type: none"> - UPDate DRive <<i>libraryName</i>> <<i>driveName</i>> SERIAL=AUTODetect This command will force-record the new serial number into the server database. Because the drive was replaced, the element number stays the same. - UPDate PATH <<i>sourceName</i>> <<i>driveName</i>> SRCT=SERVER DESTT=DRIVE LIBRARY=<<i>libraryName</i>> DEVIce=xxxxx AUTODetect=Yes This command will force-record the new serial number into the database. Because the drive was replaced, the element number stays the same. – If the drive or drive path was deleted, redefine this new, replaced drive. You must restart the Tivoli Storage Manager server so that the element number/serial number map for the library can be refreshed. This mapping only occurs at initialization. <p>Issue the QUERY PATH F=D command to find any paths defined on the server that reference this device, then issue the following command to update the path information: UPDATE PATH AUTODetect=Yes</p> |
| ANR8972E: Unable to find element number for drive <i>driveName</i> in library <i>libraryName</i> | <p>If the ELEMeNt parameter was set to AUTODetect when defining the drive, the Tivoli Storage Manager tries to get the drive's element number automatically. However, if the library does not provide an element number/serial number map, this message is issued.</p> <p>Perform the following steps to correct this:</p> <ol style="list-style-type: none"> 1. Determine the element number for this tape drive. 2. Issue the UPDATE DRIVE command to update the device element number. |

Related concepts

“SAN device mapping errors” on page 64

The errors that are most often generated during storage area network (SAN) device mapping can be related to SAN discovery, SAN device malfunction, libraries that are not valid, and other SAN-related issues.

SAN device mapping hints and tips

Storage area network (SAN) device discovery and device mapping are supported on Windows 2000, Windows 2003 (32 bits), AIX, Solaris, and Linux (except Linux zSeries).

The following items illustrate the advantages of Tivoli Storage Manager SAN device discovery and device mapping:

Tivoli Storage Manager can display all the devices on the SAN

The QUERY SAN server command shows all the devices seen by the Tivoli Storage Manager server via all the Fibre Channel host bus adapters (HBAs) installed on the system. The parameters shown are device type, vendor name, product model name, serial number, and the device name. If FORMAT=DETAIL is specified for the query, additional information such as World Wide Name (WWN), port, bus, target, and LUN are displayed. This information will help identify all the tape, disk, and Data Mover devices on the SAN. For AIX, the data mover is transparent and is not shown.

Tivoli Storage Manager can update the device path automatically when a device's path changes

Tivoli Storage Manager does not require persistent binding for the devices it sees via HBA. Instead, the server uses the SNIA HBAAPI to discover and obtain the serial number for all the devices on the SAN. It can also determine each device's path. By comparing a device's serial number recorded in the Tivoli Storage Manager database with the serial number obtained from the device in real time, a change in a device's path is detected. If the path was changed, SAN discovery automatically performed to obtain the new path for the device. The Tivoli Storage Manager database is also updated with the new path information.

The HBAAPI wrapper library is the wrapper used by the Tivoli Storage Manager server to communicate with the SNIA HBAAPI. The HBAAPI wrapper library is installed in the same directory as the Tivoli Storage Manager executable file (unless the full path is given). The following list shows the HBA wrapper files that are shipped with the Tivoli Storage Manager server package (except on AIX):

- Windows: hbaapi.dll
- AIX: /usr/lib/libhbaapi.a (provided by AIX with HBAAPI installation)
- 32-bit Linux: libhbaapi32.so
- 64-bit Linux: libhbaapi64.so
- 32-bit Solaris: libhbaapi32.so
- 64-bit Solaris: libhbaapi64.so

If any of these files are missing, message “ANR1791W HBAAPI wrapper library xxxxxxxx failed to load or is missing.” is displayed.

Related concepts

“SAN device mapping errors” on page 64

The errors that are most often generated during storage area network (SAN) device mapping can be related to SAN discovery, SAN device malfunction, libraries that are not valid, and other SAN-related issues.

Disabling SAN device mapping

Occasionally you must disable SAN device mapping to circumvent a problem or to isolate a problem when you are troubleshooting device problems.

Perform the following step to disable SAN device mapping and device discovery:

Issue the setopt SANDISCOVER OFF server command. The setopt SANDISCOVERY commands can be issued as many times as needed.

Tip: Another way to disable/enable SAN discovery is to enter the following option in the dsmserv.opt file:

SANDISCOVERY OFF disables SAN discovery.

SANDISCOVERY ON enables SAN discovery.

SANDISCOVERY ON is the default for the Windows platform. SANDISCOVERY OFF is the default for all non-Windows platforms.

Platform-specific information

When working on your SAN device mapping, it is important that you know your platform-specific information.

AIX Query SAN command will NOT show any Gateway devices because Gateway devices are transparent to AIX.

Linux There are separate libraries, utilities, and other items for RHEL3U3. To run them you must also install an Emulex ioctl kernel module in addition to the Emulex driver. Make sure to load the Emulex driver before loading the ioctl module.

Emulex has provided an Application kit for RHEL3. To find the Emulex application kit, go to the Emulex website and click on **Support**. Under **Choose your supplier from the following list**, select vendor **IBM**. A list of drivers and kits are available for you to download.

Note: For a list of supported HBAs and required driver levels by operating system, go to IBM Support and search on keyword TSMHBA.

Chapter 9. Help facilities

The IBM Support Assistant for the Tivoli Storage Manager Backup-Archive Client provides product specific Web search tools as well as a data collector. The data collector can be used to gather various documentation when reporting a problem to IBM technical support.

Tip: The Tivoli Storage Manager has a built-in help facility within the client command line. Issue the `dsmc help` command to access the command line client's help facility. The help facility is a menu-driven interface with information that includes the command reference, option reference, and extended information about client messages.

Backup-archive client help

The command-line client interface includes a help facility that provides descriptions and syntax for client commands and options, and a full description of client messages, including **Explanation**, **System Action**, and **User Response**.

Help for commands

You can access the command-line client help facility by issuing the help command: `dsmc help`.

You are then presented with a menu of help topics. Each topic has a corresponding menu number. You might enter the menu number for a topic or use the “u” (up) and “d” (down) keys to scroll through the menu pages. Use the “q” key to quit the help facility. For example, to locate help for the restore command, use the “d” key until the page containing the RESTORE topic is displayed:

```
The following help topics are available.  
Enter the number of the desired help topic or 'q' to quit,  
'd' to scroll down, 'u' to scroll up.  
57 - QUERY SESSION  
58 - QUERY SYSFILES  
59 - QUERY SYSTEMINFO  
60 - QUERY SYSTEMOBJECT  
61 - QUERY SYSTEMSERVICES  
62 - QUERY SYSTEMSTATE  
63 - QUERY SYSVOL  
64 - QUERY WAS  
65 - QUERY WMI  
66 - RESTART RESTORE  
67 - RESTORE  
68 - RESTORE ACTIVEDIRECTORY  
69 - RESTORE ASR  
70 - RESTORE BACKUPSET  
71 - RESTORE CERTSERVERDB  
72 - RESTORE CLUSTERDB  
73 - RESTORE COMPLUSDB  
74 - RESTORE EVENTLOG  
75 - RESTORE FRS
```

In this example, you would enter 67 to view information on the restore command.

To view information for a message, use the “d” and “u” keys to navigate the menu until you see entries that appear like the following entries:

The following help topics are available.
Enter the number of the desired help topic or 'q' to quit,
'd' to scroll down, 'u' to scroll up.

266 - ANS1820 - ANS1839v
267 - ANS1840 - ANS1859
268 - ANS1860 - ANS1879
269 - ANS1880 - ANS1899
270 - ANS1900 - ANS1919
271 - ANS1920 - ANS1939
272 - ANS1940 - ANS1959
273 - ANS1960 - ANS1979
274 - ANS2000 - ANS2019
275 - ANS2020 - ANS2039
276 - ANS2040 - ANS2059
277 - ANS2600 - ANS2619
278 - ANS2620 - ANS2639
279 - ANS3000 - ANS3019
280 - ANS4000 - ANS4019
281 - ANS4020 - ANS4039
282 - ANS4040 - ANS4059
283 - ANS4900 - ANS4919
284 - ANS4980 - ANS4999

Notice that each topic covers a range of message numbers. For example, to look up help information for message ANS1895I, you would select menu item 269 because ANS1895I is within the range of messages ANS1880 - ANS1899. Tivoli Storage Manager will display help information for all messages within that range. Use the navigation keys to move forward and backward through the information until you find the following text for message ANS1895I:

local filesystem.

ANS1895I Highest macro return code was return code value.
Explanation: This message is issued after all commands in a client macro have completed. The return code represents the highest return code that was issued during processing of the macro. In order of increasing severity, the return code meanings are:
0 - The command completed successfully
4 - One or more files were skipped
8 - One or more warning messages were issued
12 - One or more error messages (except for skipped files) were issued
System Action: None.
User Response: For return codes other than 0, the user might want to verify the results of the client operations and take diagnostic and repair actions, as necessary.
'u' to scroll up, or 'd' to scroll down: <<

Help information for the GUI and Web GUI clients is available through the Help menu item.

Server or storage agent help

The server and storage agent both provide a help facility, which provides descriptions and syntax for server commands, as well as a full description of server messages which includes **Explanation**, **System Action**, and **User Response**.

Accessing server or storage agent help for commands

You must issue the help command to access help for the server or storage agent.

Issue the following command for help on a server command: `HELP commandName` where *commandName* is the server command for which you want information. For example, the `HELP REGISTER NODE` command displays the description of the `REGISTER NODE` command as well as the syntax and information about the command parameters.

Accessing help for messages

You must issue the help command to access help for messages.

Issue the following command for help on a server message: `HELP message number` where *message number* is the message for which you want information. If you specify the message number without including the message prefix, for example `HELP 0445`, it assumes the message prefix `ANR` and reports the help information for `ANR0445W`. If the message number is specified with the prefix, for example `HELP ANR0445`, it will report the help information for that message. Issue `HELP ANR0445` to view the following example output for that message:

```
ANR0445W Protocol error on session session number for node client node name
(client platform) - maximum group transaction size exceeded.
Explanation: The server detects a protocol error on the specified session
because the client has attempted to group more than the maximum database
update operations in a single database transaction.
System Action: The server ends the client session.
User Response: Correct the programming error in the client program if it has
been written by your installation using WDSF verbs. Otherwise, contact your
service representative.
```

Command-line interface help for the server or storage agent

The command-line client interface includes a help facility that provides descriptions and syntax for client commands and options as well as a full description of client messages, including **Explanation**, **System Action**, and **User Response**.

Help information for the GUI and Web GUI clients is available through the **Help** menu item.

Accessing help for commands

The command-line client help facility is accessed with the help command (`dsmc help`).

Perform the following steps to access the help information for commands:

1. Issue the `dsmc help` command. You are presented with a menu of help topics with each topic having a corresponding menu number. You might enter the menu number for a topic or use the “u” (up) and “d” (down) keys to scroll through the menu pages.
2. Use the “q” key to quit the help facility. For example, to locate help for the `restore` command, use the “d” key until the page containing the `RESTORE` topic is displayed:

```
The following help topics are available. Enter the number of the desired
help topic or 'q' to quit, 'd' to scroll down, 'u' to scroll up.
57 - QUERY SESSION
58 - QUERY SYSFILES
59 - QUERY SYSTEMINFO
```

```

60 - QUERY SYSTEMOBJECT
61 - QUERY SYSTEMSERVICES
62 - QUERY SYSTEMSTATE
63 - QUERY SYSVOL
64 - QUERY WAS
65 - QUERY WMI
66 - RESTART RESTORE
67 - RESTORE
68 - RESTORE ACTIVEDIRECTORY
69 - RESTORE ASR
70 - RESTORE BACKUPSET
71 - RESTORE CERTSERVERDB
72 - RESTORE CLUSTERDB
73 - RESTORE COMPLUSDB
74 - RESTORE EVENTLOG
75 - RESTORE FRS

```

In this example, you would enter “67” to view information on the restore command.

3. View information for a message by using the “d” and “u” keys to navigate the menu until you see entries that appear like the following entries:

```

The following help topics are available.
Enter the number of the desired help topic or 'q' to quit,
'd' to scroll down, 'u' to scroll up.
The following help topics are available.
Enter the number of the desired help topic or 'q' to quit,
'd' to scroll down, 'u' to scroll up.
266 - ANS1820 - ANS1839v
267 - ANS1840 - ANS1859
268 - ANS1860 - ANS1879
269 - ANS1880 - ANS1899
270 - ANS1900 - ANS1919
271 - ANS1920 - ANS1939
272 - ANS1940 - ANS1959
273 - ANS1960 - ANS1979
274 - ANS2000 - ANS2019
275 - ANS2020 - ANS2039
276 - ANS2040 - ANS2059
277 - ANS2600 - ANS2619
278 - ANS2620 - ANS2639
279 - ANS3000 - ANS3019
280 - ANS4000 - ANS4019
281 - ANS4020 - ANS4039
282 - ANS4040 - ANS4059
283 - ANS4900 - ANS4919
284 - ANS4980 - ANS4999

```

Notice that each topic covers a range of message numbers. For example, to look up help information for message ANS1895I, you would select menu item 269 because ANS1895I is within the range of messages ANS1880 - ANS1899. Tivoli Storage Manager will display help information for all messages within that range.

4. Use the navigation keys to move forward and backward through the information until you find the following text for message ANS1895I:

```

local filesystem.
-----
ANS1895I Highest macro return code was return code value.
Explanation: This message is issued after all commands in a client macro
have completed. The return code represents the highest return code that
was issued during processing of the macro. In order of increasing
severity, the return code meanings are:
0 - The command completed successfully
4 - One or more files were skipped
8 - One or more warning messages were issued

```

```
12 - One or more error messages (except for skipped files) were
issued
System Action: None.
User Response: For return codes other than 0, the user might want to
verify the results of the client operations and take diagnostic and
repair actions, as necessary.
'u' to scroll up, or 'd' to scroll down: <<
```

Accessing help for the Windows service configuration utility (dsmcutil)

Windows

You must issue the dsmcutil command to obtain help information.

When you issue dsmcutil help, you are prompted to enter C for a basic command summary or F for full help information.

The basic command summary is a listing of available dsmcutil sub-commands and options. This information is most useful if you are already familiar with using dsmcutil.

The full help information will display more comprehensive information within the Windows help utility.

Reporting a problem with a help topic

You must collect certain information before you report a problem with the help system.

1. Record what you clicked on to get the help. For example, if you clicked the question mark for a portal, record the name of the portal.
2. View the source of the help pop-up window. On most browsers, a right mouse-click will show you a menu with a **View Source** option. Select **View Source** and a window is displayed with the HTML source code for that window. Write down the title of that window, which will be the URL or the name of the file that the help system is attempting to display.

Chapter 10. Determining data storage problems

Data storage issues can be resolved through several methods.

Using data storage diagnostic tips

If you are experiencing a problem in storing or retrieving data, review the diagnostic tips to try to isolate or resolve the problem.

Checking the server activity log to resolve data storage issues

Check the server activity log for other messages 30 minutes before and 30 minutes after the time of the error.

Issue the QUERY ACTLOG command to check the activity log. Often, other messages that are issued can offer additional information about the cause of the problem and how to resolve it.

Checking HELP for messages issued for a data storage problem

Check HELP for any messages issued by the Tivoli Storage Manager.

The Tivoli Storage Manager messages provide additional information beyond just the message itself. The **Explanation**, **System Action**, or **User Response** sections of the message might provide additional information about the problem. Often, this supplemental information about the message might provide the necessary steps necessary to resolve the problem.

Recreating the data storage problem

If a problem can be easily or consistently recreated, it might be possible to isolate the cause of the problem to a specific sequence of events.

Data read or write problems might be sequence-related, in terms of the operations being performed, or might be an underlying device error or failure.

Typical problems relating to the sequence of events occur for sequential volumes. One example would be that a volume is in use for a client backup and that volume is preempted by a restore of another client node's data. This situation might surface as an error to the client backup session that was preempted. However, that client backup session might succeed if it was retried or if it was not preempted in the first place.

Resolving data storage errors related to reading or writing to a device

If the problem is an error reading or writing data from a device, many systems and devices record information in a system error log. Examples of the system error log are errpt for AIX, Event Log for Windows, and the System Log for z/OS.

If a device or volume used by the Tivoli Storage Manager is reporting an error to the system error log, it is likely a device issue. The error messages recorded in the system error log might provide enough information to resolve the problem.

Changing the storage hierarchy to resolve data storage problems

The storage hierarchy includes the defined storage pools and the relationships between the storage pools on the server. These storage pool definitions are also used by the storage agent. If attributes of a storage pool were changed, this change might affect data store and retrieve operations.

Review any changes to the storage hierarchy and storage pool definitions. Use QUERY ACTLOG to see the history of commands or changes that might affect storage pools. Also, use the following QUERY commands to determine if any changes were made:

- QUERY STGPOOL F=D

Review the storage pool settings. If a storage pool is UNAVAILABLE, then data in that storage pool cannot be accessed. If a storage pool is READONLY, then data cannot be written to that pool. If either of these is the case, review why these values were set and consider issuing the UPDATE STGPOOL command to set the pool to READWRITE. Another consideration is to review the number of scratch volumes available for a sequential media storage pool.

- QUERY DEVCLASS F=D

The storage pools can be influenced by changes to device classes. Review the device class settings for the storage pools, including checking the library, drive, and path definitions using the QUERY LIBRARY, QUERY DRIVE, and QUERY PATH commands for sequential media storage pools.

Changing the server policies to resolve data storage problems

The server policy attributes that directly relate to data storage are the copy group destinations for backup and archive copy groups. Similarly, the management class, MIGDESTINATION, also impacts where data is stored.

Review any changes to the server storage policies. Issue the QUERY ACTLOG command to view the history of commands or changes that might affect storage policies. Also, use the following QUERY commands to determine if any changes were made:

- QUERY COPYGROUP F=D

Review the DESTINATION settings for the TYPE=BACKUP and TYPE=ARCHIVE copy groups. Also review the "Migration Destination" for management classes used by HSM clients. If storage pool destinations were changed and resulting data read or write operations are now failing, either evaluate the changes made and correct the problem, or revert to the previous settings.

- QUERY NODE F=D

Assigning a node to a different domain might impact data read and write operations for that client. Specifically, the node might now be going to storage pool destinations that are not appropriate, based on the requirements of this node. For example, it might be assigned to a domain that does not have any TYPE=ARCHIVE copy group destinations. If this node tries to archive data, it will fail.

Resolving a data storage backup or copy problem that occurs only with a specific node

If you cannot backup or copy data to a specific node, you might not have an active data pool listed in your active destinations. These are specified in the node's policy domain.

Issue the `QUERY NODE nodeName F=D` command to verify that the node that is storing the data is authorized. The `QUERY NODE` command finds the policy domain name to which the node is assigned. Issue the `QUERY DOMAIN domain_name` where *domain_name* is the output gathered from the previous `QUERY NODE` command. Look in the **ACTIVEDESTINATION** parameter for the list of active data ports. If the active data pool into which you want to store data is not on the list, issue the `UPDATE DOMAIN` command to add the active data pool to the list.

Resolving a data storage problem that occurs only for a specific volume

If problems occur only for a specific storage volume, there might be an error with the volume itself, whether the volume is sequential media or DISK.

If your operation is a data write operation, issue the `UPDATE VOLUME volumeName ACCESS=READONLY` command to set this volume to READONLY, then retry the operation. If the operation succeeds, try setting the original volume back to READWRITE by issuing the `UPDATE VOLUME volumeName ACCESS=READWRITE` command and retrying the operation. If the operation fails only when using this volume, consider issuing the `AUDIT VOLUME` command to evaluate this volume and issue the `MOVE DATA` command to move the data from this volume to other volumes in the storage pool. After the data is moved off of this volume, delete the volume by issuing the `DELETE VOLUME` command.

Resolving SCSI device problems

Tape drives and libraries might report information back to the Tivoli Storage Manager about the error encountered. This information is reported in one or more of the messages.

If messages ANR8300, ANR8301, ANR8302, ANR8303, ANR8943, or ANR98944 were issued, the data that the Tivoli Storage Manager reports from these devices might provide sufficient detail to determine the steps needed to resolve the problem. Generally, when the Tivoli Storage Manager server reports device sense data using these messages, the problem is typically with the device, the connection to the device, or some other related issue outside of the Tivoli Storage Manager.

Using the information reported in Tivoli Storage Manager message ANR8300, ANR8301, ANR8302, ANR8303, ANR8943, or ANR8944, refer to the Tivoli Storage Manager Messages manual. This appendix documents information about standard errors that might be reported by any SCSI device. You can also use this information with documentation provided by the vendor for the hardware to help

determine the cause and resolution for the problem.

Sequential media volume (tape)

You might determine your sequential media volumes problem through error message ANR0542W or ANR8778W.

ANR0542W Retrieve or restore failed for session *sessionNumber* for node *nodeName* - storage media inaccessible

Error message ANR0542W is often related to an issue with the drive or connection to the drive that was selected to read this tape volume. Perform the following steps to verify that the Tivoli Storage Manager can access this volume:

- Issue the `QUERY LIBVOL libraryName volumeName` command.
- For a 349X library, issue the `mtlib -l /dev/lmcp0 -qV volumeName` command. The device is typically `/dev/lmcp0`, but if it is different, then substitute the correct library manager control point device.

The following steps might possibly resolve this problem:

1. If `mtlib` does not report this volume, then it appears that this volume is out of the library. In this case, put the volume back into the library.
2. If the volume is not reported by `QUERY LIBVOL`, then the server does not know about this volume in the library. Issue the `CHECKIN LIBVOL` command to synchronize the library inventory in the server with the volumes that are actually in the tape library.
3. If both commands successfully report this volume, then the cause is likely a permanent or intermittent hardware error. There might be an error with the drive itself or an error with the connection to the drive. In either case, review the system error logs and contact the vendor of the hardware to resolve the problem.

ANR8778W Scratch volume changed to private status to prevent re-access

Review the activity log messages to determine the cause of the problem involving this scratch volume. Also, review the system error logs and device error logs for an indication that there was a problem with the drive used to try to write to this scratch volume.

If this error was caused by a drive requiring cleaning or some other hardware-specific issue that was resolved, any volumes that were set to private status as a result of this might be reset to scratch by issuing the `AUDIT LIBRARY libraryName` command.

Appendix A. Accessibility features for Tivoli Storage Manager

Accessibility features help a user who has a physical disability, such as restricted mobility or limited vision, to use software products successfully. The major accessibility features of Tivoli Storage Manager are described in this topic.

Accessibility features

The following list includes the major accessibility features in Tivoli Storage Manager:

- Keyboard-only operation
- Interfaces that are commonly used by screen readers
- Keys that are discernible by touch but do not activate just by touching them
- Industry-standard devices for ports and connectors
- The attachment of alternative input and output devices
- User documentation provided in HTML and PDF format. Descriptive text is provided for all documentation images.

The Tivoli Storage Manager Information Center, and its related publications, are accessibility-enabled.

Keyboard navigation

Windows The Tivoli Storage Manager for Windows Console follows Microsoft conventions for all keyboard navigation and access. Drag and Drop support is managed using the Microsoft Windows Accessibility option known as MouseKeys. For more information about MouseKeys and other Windows accessibility options, please refer to the Windows Online Help (keyword: MouseKeys).

AIX Tivoli Storage Manager follows AIX operating system conventions for keyboard navigation and access.

HP-UX Tivoli Storage Manager follows HP-UX operating-system conventions for keyboard navigation and access.

Linux Tivoli Storage Manager follows Linux operating-system conventions for keyboard navigation and access.

Tivoli Storage Manager follows Macintosh operating-system conventions for keyboard navigation and access.

Solaris Tivoli Storage Manager follows Sun Solaris operating-system conventions for keyboard navigation and access.

Tivoli Storage Manager follows z/OS operating-system conventions for keyboard navigation and access.

Vendor software

Tivoli Storage Manager includes certain vendor software that is not covered under the IBM license agreement. IBM makes no representation about the accessibility features of these products. Contact the vendor for the accessibility information about its products.

Related accessibility information

You can view the publications for Tivoli Storage Manager in Adobe® Portable Document Format (PDF) using the Adobe Acrobat Reader. You can access these or any of the other documentation PDFs at the IBM Publications Center at <http://www.ibm.com/shop/publications/order/>.

IBM and accessibility

For more information about the commitment that IBM has to accessibility, see the IBM Human Ability and Accessibility Center at <http://www.ibm.com/able>.

Appendix B. Using gt script

You can use the sample gt script shell provided here to get the call stack for each running thread from a core file.

The input parameters are the path/name of the executable file (default ./dsmserv) and the path/name of the core file (default ./dsmcore). The output file is dsm_gdb.info.

Restriction: Files named dsm_gdb.cmd and dsm_gdb.info are overwritten when you run this script.

```
#!/bin/ksh
#
# If you see the following error:
# ./dsm_gdb.cmd:9: Error in source command file:
# No symbol table is loaded. Use the "file" command.
# then comment out the line that prints buildStringP
#
# if you see other errors, you're on your own ...
exe=${1:-"./dsmserv"} # get parm 1 (executable file path/name), set default
core=${2:-"./dsmcore"} # get parm 2 (core file path/name), set default
echo " "
# look for the executable file ... quit if not found
if [[ -f $exe ]]; then
echo "using executable file:" $exe
else
echo "didn't find executable file ("$exe") ... exiting"
exit
fi
# look for the core file, if not found, look for ./core ... quit if not found
if [[ -f $core ]]; then
echo "using core file:" $core
else
if [[ -f ./core ]]; then
echo "didn't find core file ("$core") but found ./core ... renaming to" $core
mv ./core $core
echo "using core file:" $core
else
echo "didn't find core file ("$core") ... exiting"
exit
fi
fi
echo " "
# make gdb command file to get thread info
nl="\0134\0156" # octal codes for \n (so echo won't think it's \n)
echo "# dsm gdb command file" >|dsm_gdb.cmd
echo "define doit" >>dsm_gdb.cmd
echo "info registers" >>dsm_gdb.cmd # show register values
echo "echo" $nl >>dsm_gdb.cmd
echo "where" >>dsm_gdb.cmd # show function traceback
echo "echo" $nl"===== "$nl >>dsm_gdb.cmd
echo "end" >>dsm_gdb.cmd
echo "echo" $nl"===== "$nl$nl >>dsm_gdb.cmd
echo "x/s buildStringP" >>dsm_gdb.cmd
echo "echo" $nl"===== "$nl$nl >>dsm_gdb.cmd
echo "info threads" >>dsm_gdb.cmd # show thread info
echo "echo" $nl"===== "$nl >>dsm_gdb.cmd
echo "thread apply all doit" >>dsm_gdb.cmd
echo "quit" >>dsm_gdb.cmd
echo "invoking gdb to get thread info (watch for errors) ..."
echo "if you see:"
```

```
echo ". warning: The shared libraries were not privately mapped; setting a"
echo ". breakpoint in a shared library will not work until you rerun the program"
echo "that's ok."
echo "if you see:"
echo ". ./dsm_gdb.cmd:x: Error in source command file:"
echo "then type 'quit', edit this script, and read the comments at the top"
gdb -se $exe -c $core -x ./dsm_gdb.cmd >|dsm_gdb.info
rm dsm_gdb.cmd # done with this now
exit
```

Appendix C. Installing and running the tsmdiag utility

The purpose of the Tivoli Storage Manager Diagnostic utility (tsmdiag) is to ease and speed up the process for gathering data that is considered valuable to assist in diagnosing a problem caused by a server component.

The tsmdiag utility collects a set of data by default. This data is specified in a configuration file called `configfile.txt`. If at any point more data is identified as valuable to diagnose any particular problem from a Tivoli Storage Manager component, users are instructed to modify the configuration file used by tsmdiag so that such data is collected by the tsmdiag utility.

A strong suggestion is that users run tsmdiag on the system where the Tivoli Storage Manager component with a problem is installed *before* submitting a problem to Tivoli Storage Manager Support. Submit the data collected by tsmdiag along with the problem report.

Table 20. Supported operating system environments and components

| Operating System Environment | Tivoli Storage Manager Component |
|------------------------------|--|
| AIX | Server Storage Agent Device Driver |
| HP-UX | Server Storage Agent Device Driver |
| Linux | Server Storage Agent Device Driver |
| Solaris | Server Storage Agent Device Driver |
| Windows | Server Storage Agent Device Driver Management Console |

Note: The tsmdiag utility is not installed with the Tivoli Storage Manager device driver, or with the Tivoli Storage Manager Management Console, but if these components are installed on the system where tsmdiag is running, tsmdiag will collect data for these components.

Where to find and how to use the Tivoli Storage Manager diagnostic utility

Tivoli Storage Manager is equipped with the `tsmdia` utility, with supported Tivoli Storage Manager components found under the component's install directory. The `tsmdia` utility can be found in the following locations:

- Windows: `C:\Program Files\Tivoli\TSM\server\tsmdia`
- All other platforms: `/opt/tivoli/tsm/server/bin/tsmdia`

Usage:

`tsmdia [options]`

Where options can be any combination of the following:

| Option | Description | Default Value |
|--|--|-------------------|
| <code>-id adminName</code> | Tivoli Storage Manager server administrator id | admin |
| <code>-pa adminPwd</code> | Tivoli Storage Manager server administrator password | admin |
| <code>-tcpserveraddress ipAddress</code> | Tivoli Storage Manager server TCP/IP name or address | localhost |
| <code>-tcpport portNumber</code> | Tivoli Storage Manager server TCP/IP port | 1500 |
| <code>-results resultsDir</code> | Directory for created files | (\$cwd)/results |
| <code>-v</code> | Verbosely list activity processed | non-verbose |
| <code>-?</code> | Display usage information | N/A |
| <code>-i instanceDir Server</code> | Specifies the Tivoli Storage Manager server instance directory | current directory |

Examples:

```
./tsmdia
./tsmdia -v
./tsmdia -id tsmadmin -pa pwd4u -results /home/tsmdia/results_oct29
```

Where to find the data collected by tsmdia

After the `tsmdia` utility has completed running, go to the either the default results directory, `$CWD/results`, or the directory that you specified through the `-results` command line option. There will be a file there called `tsmdia_results.tar` (for UNIX environments) and `tsmdia_results.zip` (for Windows environments). Submit this file with the PMR.

Default data collected by tsmdia

The default data collected by the `tsmdia` utility is specified in the `configfile.txt` configuration file. More data can be added to this file as needed.

Each line in the configuration file consists of five fields, each separated by comma. A line that begins with an asterisk(*) is considered a comment and is ignored by the tsmdiag utility.

The first field of a line in the configuration file denotes the operating system where tsmdiag will be run. Valid platforms are Linux, AIX, HP, SUN, and Windows. The second field in the line denotes an action. The valid actions are in the following table:

| Action Name | Action Performed |
|-------------|--|
| SYSCOMMAND | Run a command on the system. |
| COPY | Copy a specified file. |
| COMPCOMMAND | Run a command on a specified Tivoli Storage Manager component. |
| REGISTRY | Get the value for a given registry key. (Windows only.) |

The third field denotes the Tivoli Storage Manager component (i.e. component for which tsmdiag will collect data).

Valid components are:

- SERVER
- STAGENT
- BACLIENT (UNIX only)
- MGMTCONSOLE (Windows only)
- DEVDRIVER
- SYSTEM
- CLIENAPI (UNIX only)

The fourth field denotes the data that the action will act upon. The data field can be a file name, a system command, a command for a Tivoli Storage Manager component, a registry key, and so on, depending on the action.

The last field is optional and denotes the location of where the collected data is to be stored.

Appendix D. IBM Global Security Kit return codes

Version 6.1 of the IBM Tivoli Storage Manager uses the IBM Global Security Kit (GSKit) Version 7.0.4.17 on AIX and Windows for Secure Sockets Layer (SSL) processing between the Tivoli Storage Manager server and the backup-archive client. Some messages issued for SSL processing include GSKit return codes.

GSKit is automatically installed or updated during Tivoli Storage Manager installation on AIX and Windows and provides the following libraries:

- GSKit SSL
- GSKit Key Management API
- IBM Crypto for C (ICC)

The tsmdiag utility reports the GSKit level installed on your system, or you can use one of the following methods:

- For Windows, issue the following commands:

```
regedit /e gskitinfo.txt "HKEY_LOCAL_MACHINE\software\ibm\gsk7\"  
notepad gskitinfo.txt
```

CAUTION:

You can damage the system registry if you use regedit incorrectly.

- For the 64-bit AIX server, issue the following from the command line:

```
gsk7ver_64
```

See Table 21 for the GSKit SSL return codes.

The Tivoli Storage Manager server uses the GSKit Key Management API to automatically create the key management database and Tivoli Storage Manager server private and public keys. Some messages issued for this processing might include GSKit Key Management return codes. See Table 22 on page 229 for the key management return codes.

Table 21. IBM Global Security Kit SSL general return codes

| Return code (hex) | Return code (decimal) | Constant | Explanation |
|-------------------|-----------------------|--------------------------|--|
| 0x00000000 | 0 | GSK_OK | The task completed successfully. Issued by every function call that completes successfully. |
| 0x00000001 | 1 | GSK_INVALID_HANDLE | The environment or Secure Sockets Layer (SSL) handle is not valid. The specified handle was not the result of a successful open() function call. |
| 0x00000002 | 2 | GSK_API_NOT_AVAILABLE | The dynamic link library (DLL) was unloaded and is not available. (Occurs on Microsoft Windows systems only.) |
| 0x00000003 | 3 | GSK_INTERNAL_ERROR | Internal error. Report this error to IBM Software Support. |
| 0x00000004 | 4 | GSK_INSUFFICIENT_STORAGE | Insufficient memory is available to perform the operation. |

Table 21. IBM Global Security Kit SSL general return codes (continued)

| Return code (hex) | Return code (decimal) | Constant | Explanation |
|-------------------|-----------------------|------------------------------------|---|
| 0x00000005 | 5 | GSK_INVALID_STATE | The handle is not in a valid state for operation, such as performing an init() operation on a handle twice. |
| 0x00000006 | 6 | GSK_KEY_LABEL_NOT_FOUND | Specified key label not found in key file. |
| 0x00000007 | 7 | GSK_CERTIFICATE_NOT_AVAILABLE | Certificate not received from partner. |
| 0x00000008 | 8 | GSK_ERROR_CERT_VALIDATION | Certificate validation error. |
| 0x00000009 | 9 | GSK_ERROR_CRYPTO | Error processing cryptography. |
| 0x0000000a | 10 | GSK_ERROR_ASN | Error validating ASN fields in certificate. |
| 0x0000000b | 11 | GSK_ERROR_LDAP | Error connecting to user registry. |
| 0x0000000c | 12 | GSK_ERROR_UNKNOWN_ERROR | Internal error. Report this error to IBM Software Support. |
| 0x00000065 | 101 | GSK_OPEN_CIPHER_ERROR | Internal error. Report this error to IBM Software Support. |
| 0x00000066 | 102 | GSK_KEYFILE_IO_ERROR | I/O error reading the key file. |
| 0x00000067 | 103 | GSK_KEYFILE_INVALID_FORMAT | The key file does not have a valid internal format. Recreate key file. |
| 0x00000068 | 104 | GSK_KEYFILE_DUPLICATE_KEY | The key file has two entries with the same key. |
| 0x00000069 | 105 | GSK_KEYFILE_DUPLICATE_LABEL | The key file has two entries with the same label. |
| 0x0000006a | 106 | GSK_BAD_FORMAT_OR_INVALID_PASSWORD | The key file password is used as an integrity check. Either the key file has become corrupted or the password ID is incorrect. |
| 0x0000006b | 107 | GSK_KEYFILE_CERT_EXPIRED | The default key in the key file has an expired certificate. |
| 0x0000006c | 108 | GSK_ERROR_LOAD_GSKLIB | An error occurred loading one of the GSK dynamic link libraries. Be sure GSK was installed correctly. |
| 0x0000006d | 109 | GSK_PENDING_CLOSE_ERROR | Indicates that a connection is trying to be made in a GSK environment after the GSK_ENVIRONMENT_CLOSE_OPTIONS was set to GSK_DELAYED_ENVIRONMENT_CLOSE and gsk_environment_close() function was called. |
| 0x000000c9 | 201 | GSK_NO_KEYFILE_PASSWORD | Neither the password nor the stash-file name was specified, so the key file could not be initialized. |
| 0x000000ca | 202 | GSK_KEYRING_OPEN_ERROR | Unable to open the key file. Either the path was specified incorrectly or the file permissions did not allow the file to be opened. |
| 0x000000cb | 203 | GSK_RSA_TEMP_KEY_PAIR | Unable to generate a temporary key pair. Report this error to IBM Software Support. |
| 0x000000cc | 204 | GSK_ERROR_LDAP_NO_SUCH_OBJECT | A User Name object was specified that is not found. |

Table 21. IBM Global Security Kit SSL general return codes (continued)

| Return code (hex) | Return code (decimal) | Constant | Explanation |
|-------------------|-----------------------|--|---|
| 0x000000cd | 205 | GSK_ERROR_LDAP_INVALID_CREDENTIALS | A Password used for an LDAP query is not correct. |
| 0x000000ce | 206 | GSK_ERROR_BAD_INDEX | An index into the Fail Over list of LDAP servers was not correct |
| 0x000000cf | 207 | GSK_ERROR_FIPS_NOT_SUPPORTED | This installation of GSKit does not support FIPS mode of operation |
| 0x0000012d | 301 | GSK_CLOSE_FAILED | Indicates that the GSK environment close request was not properly managed. Cause is most likely due to a <code>gsk_secure_socket*()</code> command being attempted after a <code>gsk_close_environment()</code> call. |
| 0x00000191 | 401 | GSK_ERROR_BAD_DATE | The system date was not set to a valid value. |
| 0x00000192 | 402 | GSK_ERROR_NO_CIPHERS | Neither SSLv2 nor SSLv3 is enabled. |
| 0x00000193 | 403 | GSK_ERROR_NO_CERTIFICATE | The required certificate was not received from partner. |
| 0x00000194 | 404 | GSK_ERROR_BAD_CERTIFICATE | The received certificate was formatted incorrectly. |
| 0x00000195 | 405 | GSK_ERROR_UNSUPPORTED_CERTIFICATE_TYPE | The received certificate type was not supported. |
| 0x00000196 | 406 | GSK_ERROR_IO | An I/O error occurred on a data read or write operation. |
| 0x00000197 | 407 | GSK_ERROR_BAD_KEYFILE_LABEL | The specified label in the key file could not be found. |
| 0x00000198 | 408 | GSK_ERROR_BAD_KEYFILE_PASSWORD | The specified key file password is incorrect. The key file could not be used. The key file also might be corrupt. |
| 0x00000199 | 409 | GSK_ERROR_BAD_KEY_LEN_FOR_EXPORT | In a restricted cryptography environment, the key size is too long to be supported. |
| 0x0000019a | 410 | GSK_ERROR_BAD_MESSAGE | An incorrectly formatted SSL message was received from the partner. |
| 0x0000019b | 411 | GSK_ERROR_BAD_MAC | The message authentication code (MAC) was not successfully verified. |
| 0x0000019c | 412 | GSK_ERROR_UNSUPPORTED | Unsupported SSL protocol or unsupported certificate type. |
| 0x0000019d | 413 | GSK_ERROR_BAD_CERT_SIG | The received certificate contained an incorrect signature. |
| 0x0000019e | 414 | GSK_ERROR_BAD_CERT | Incorrectly formatted certificate received from partner. |
| 0x0000019f | 415 | GSK_ERROR_BAD_PEER | Did not receive a valid SSL protocol from partner. |
| 0x000001a0 | 416 | GSK_ERROR_PERMISSION_DENIED | Report this error to IBM Software Support. |
| 0x000001a1 | 417 | GSK_ERROR_SELF_SIGNED | The self-signed certificate is not valid. |
| 0x000001a2 | 418 | GSK_ERROR_NO_READ_FUNCTION | The <code>read()</code> failed. Report this error to IBM Software Support. |

Table 21. IBM Global Security Kit SSL general return codes (continued)

| Return code (hex) | Return code (decimal) | Constant | Explanation |
|-------------------|-----------------------|--------------------------------------|--|
| 0x000001a3 | 419 | GSK_ERROR_NO_WRITE_FUNCTION | The write() failed. Report this error to IBM Software Support. |
| 0x000001a4 | 420 | GSK_ERROR_SOCKET_CLOSED | The partner closed the socket before the protocol completed. |
| 0x000001a5 | 421 | GSK_ERROR_BAD_V2_CIPHER | The specified V2 cipher is not valid. |
| 0x000001a6 | 422 | GSK_ERROR_BAD_V3_CIPHER | The specified V3 cipher is not valid. |
| 0x000001a7 | 423 | GSK_ERROR_BAD_SEC_TYPE | Report this error to IBM Software Support. |
| 0x000001a8 | 424 | GSK_ERROR_BAD_SEC_TYPE_COMBINATION | Report this error to IBM Software Support. |
| 0x000001a9 | 425 | GSK_ERROR_HANDLE_CREATION_FAILED | The handle could not be created. Report this error to IBM Software Support. |
| 0x000001aa | 426 | GSK_ERROR_INITIALIZATION_FAILED | Initialization failed. Report this internal error to service. |
| 0x000001ab | 427 | GSK_ERROR_LDAP_NOT_AVAILABLE | When validating a certificate, unable to access the specified user registry. |
| 0x000001ac | 428 | GSK_ERROR_NO_PRIVATE_KEY | The specified key did not contain a private key. |
| 0x000001ad | 429 | GSK_ERROR_PKCS11_LIBRARY_NOTLOADED | A failed attempt was made to load the specified PKCS11 shared library. |
| 0x000001ae | 430 | GSK_ERROR_PKCS11_TOKEN_LABELMISMATCH | The PKCS #11 driver failed to find the token specified by the caller. |
| 0x000001af | 431 | GSK_ERROR_PKCS11_TOKEN_NOTPRESENT | A PKCS #11 token is not present in the slot. |
| 0x000001b0 | 432 | GSK_ERROR_PKCS11_TOKEN_BADPASSWORD | The password/pin to access the PKCS #11 token is not valid. |
| 0x000001b1 | 433 | GSK_ERROR_INVALID_V2_HEADER | The SSL header received was not a properly SSLv2 formatted header. |
| 0x000001b2 | 434 | GSK_CSP_OPEN_ERROR | Could not open the hardware-based cryptographic service provider. Either the CSP name is not specified correctly or a failed attempt was made to access the specified CSP's certificate store. |
| 0x000001b3 | 435 | GSK_CSP_OPEN_ERROR | Some conflicting attributes for SSL operation were defined. |
| 0x000001b4 | 436 | GSK_CSP_OPEN_ERROR | The Microsoft Crypto API is only supported on Microsoft Windows 2000 with Service Pack 2 applied. |
| 0x000001b5 | 437 | GSK_CSP_OPEN_ERROR | System is running in IPv6 mode without setting a PEERID. |
| 0x000001f5 | 501 | GSK_INVALID_BUFFER_SIZE | The buffer size is negative or zero. |
| 0x000001f6 | 502 | GSK_WOULD_BLOCK | Used with nonblocking I/O. Refer to the nonblocking section for usage. |
| 0x00000259 | 601 | GSK_ERROR_NOT_SSLV3 | SSLv3 is required for reset_cipher(), and the connection uses SSLv2. |
| 0x0000025a | 602 | GSK_MISC_INVALID_ID | A valid ID was not specified for the gsk_secure_soc_misc() function call. |

Table 21. IBM Global Security Kit SSL general return codes (continued)

| Return code (hex) | Return code (decimal) | Constant | Explanation |
|-------------------|-----------------------|-------------------------------------|--|
| 0x000002bd | 701 | GSK_ATTRIBUTE_INVALID_ID | The function call does not have a valid ID. This also might be caused by specifying an environment handle when a handle for a SSL connection should be used. |
| 0x000002be | 702 | GSK_ATTRIBUTE_INVALID_LENGTH | The attribute has a negative length, which is not valid. |
| 0x000002bf | 703 | GSK_ATTRIBUTE_INVALID_ENUMERATION | The enumeration value is not valid for the specified enumeration type. |
| 0x000002c0 | 704 | GSK_ATTRIBUTE_INVALID_SID_CACHE | A parameter list that is not valid for replacing the SID cache routines. |
| 0x000002c1 | 705 | GSK_ATTRIBUTE_INVALID_NUMERIC_VALUE | When setting a numeric attribute, the specified value is not valid for the specific attribute being set. |
| 0x000002c2 | 706 | GSK_CONFLICTING_VALIDATION_SETTING | Conflicting parameters were set for additional certificate validation |
| 0x000002c3 | 707 | GSK_AES_UNSUPPORTED | The AES cryptographic algorithm is not supported. |
| 0x000002c4 | 708 | GSK_PEERID_LENGTH_ERROR | The PEERID does not have the correct length. |
| 0x000005dd | 1501 | GSK_SC_OK | |
| 0x000005de | 1502 | GSK_SC_CANCEL | |
| 0x00000641 | 1601 | GSK_TRACE_STARTED | The trace started successfully. |
| 0x00000642 | 1602 | GSK_TRACE_STOPPED | The trace stopped successfully. |
| 0x00000643 | 1603 | GSK_TRACE_NOT_STARTED | No trace file was previously started so it cannot be stopped. |
| 0x00000644 | 1604 | GSK_TRACE_ALREADY_STARTED | Trace file already started so it cannot be started again. |
| 0x00000645 | 1605 | GSK_TRACE_OPEN_FAILED | Trace file cannot be opened. The first parameter of gsk_start_trace() must be a valid full path file name. |

Table 22. IBM Global Security Kit key management return codes

| Return code (hex) | Return code (decimal) | Constant | Explanation |
|-------------------|-----------------------|-----------------------|--|
| 0x00000000 | 0 | GSK_OK | The task completed successfully. Issued by every function call that completes successfully. |
| 0x00000001 | 1 | GSK_INVALID_HANDLE | The environment or Secure Sockets Layer (SSL) handle is not valid. The specified handle was not the result of a successful open() function call. |
| 0x00000002 | 2 | GSK_API_NOT_AVAILABLE | The dynamic link library (DLL) was unloaded and is not available. (Occurs on Microsoft Windows systems only.) |
| 0x00000003 | 3 | GSK_INTERNAL_ERROR | Internal error. Report this error to IBM Software Support. |

Table 22. IBM Global Security Kit key management return codes (continued)

| Return code (hex) | Return code (decimal) | Constant | Explanation |
|-------------------|-----------------------|------------------------------------|---|
| 0x00000004 | 4 | GSK_INSUFFICIENT_STORAGE | Insufficient memory is available to perform the operation. |
| 0x00000005 | 5 | GSK_INVALID_STATE | The handle is in an incorrect state for operation, such as performing an init() operation on a handle twice. |
| 0x00000006 | 6 | GSK_KEY_LABEL_NOT_FOUND | Specified key label not found in key file. |
| 0x00000007 | 7 | GSK_CERTIFICATE_NOT_AVAILABLE | Certificate not received from partner. |
| 0x00000008 | 8 | GSK_ERROR_CERT_VALIDATION | Certificate validation error. |
| 0x00000009 | 9 | GSK_ERROR_CRYPTO | Error processing cryptography. |
| 0x0000000a | 10 | GSK_ERROR_ASN | Error validating ASN fields in certificate. |
| 0x0000000b | 11 | GSK_ERROR_LDAP | Error connecting to user registry. |
| 0x0000000c | 12 | GSK_ERROR_UNKNOWN_ERROR | Internal error. Report this error to IBM Software Support. |
| 0x00000065 | 101 | GSK_OPEN_CIPHER_ERROR | Internal error. Report this error to IBM Software Support. |
| 0x00000066 | 102 | GSK_KEYFILE_IO_ERROR | I/O error reading the key file. |
| 0x00000067 | 103 | GSK_KEYFILE_INVALID_FORMAT | The key file has an internal format that is not valid. Recreate key file. |
| 0x00000068 | 104 | GSK_KEYFILE_DUPLICATE_KEY | The key file has two entries with the same key. |
| 0x00000069 | 105 | GSK_KEYFILE_DUPLICATE_LABEL | The key file has two entries with the same label. |
| 0x0000006a | 106 | GSK_BAD_FORMAT_OR_INVALID_PASSWORD | The key file password is used as an integrity check. Either the key file has become corrupted or the password ID is incorrect. |
| 0x0000006b | 107 | GSK_KEYFILE_CERT_EXPIRED | The default key in the key file has an expired certificate. |
| 0x0000006c | 108 | GSK_ERROR_LOAD_GSKLIB | An error occurred loading one of the GSK dynamic link libraries. Be sure GSK was installed correctly. |
| 0x0000006d | 109 | GSK_PENDING_CLOSE_ERROR | Indicates that a connection is trying to be made in a GSK environment after the GSK_ENVIRONMENT_CLOSE_OPTIONS was set to GSK_DELAYED_ENVIRONMENT_CLOSE and gsk_environment_close() function was called. |
| 0x000000c9 | 201 | GSK_NO_KEYFILE_PASSWORD | Neither the password nor the stash-file name was specified, so the key file could not be initialized. |
| 0x000000ca | 202 | GSK_KEYRING_OPEN_ERROR | Unable to open the key file. Either the path was specified incorrectly or the file permissions did not allow the file to be opened. |

Table 22. IBM Global Security Kit key management return codes (continued)

| Return code (hex) | Return code (decimal) | Constant | Explanation |
|-------------------|-----------------------|--|---|
| 0x000000cb | 203 | GSK_RSA_TEMP_KEY_PAIR | Unable to generate a temporary key pair. Report this error to IBM Software Support. |
| 0x000000cc | 204 | GSK_ERROR_LDAP_NO_SUCH_OBJECT | A User Name object was specified that is not found. |
| 0x000000cd | 205 | GSK_ERROR_LDAP_INVALID_CREDENTIALS | A Password used for an LDAP query is not correct. |
| 0x000000ce | 206 | GSK_ERROR_BAD_INDEX | An index into the Fail Over list of LDAP servers was not correct |
| 0x000000cf | 207 | GSK_ERROR_FIPS_NOT_SUPPORTED | This installation of GSKit does not support FIPS mode of operation |
| 0x0000012d | 301 | GSK_CLOSE_FAILED | Indicates that the GSK environment close request was not properly managed. Cause is most likely due to a <code>gsk_secure_socket*()</code> command being attempted after a <code>gsk_close_environment()</code> call. |
| 0x00000191 | 401 | GSK_ERROR_BAD_DATE | The system date was set to a value that is not valid. |
| 0x00000192 | 402 | GSK_ERROR_NO_CIPHERS | Neither SSLv2 nor SSLv3 is enabled. |
| 0x00000193 | 403 | GSK_ERROR_NO_CERTIFICATE | The required certificate was not received from partner. |
| 0x00000194 | 404 | GSK_ERROR_BAD_CERTIFICATE | The received certificate was formatted incorrectly. |
| 0x00000195 | 405 | GSK_ERROR_UNSUPPORTED_CERTIFICATE_TYPE | The received certificate type was not supported. |
| 0x00000196 | 406 | GSK_ERROR_IO | An I/O error occurred on a data read or write operation. |
| 0x00000197 | 407 | GSK_ERROR_BAD_KEYFILE_LABEL | The specified label in the key file could not be found. |
| 0x00000198 | 408 | GSK_ERROR_BAD_KEYFILE_PASSWORD | The specified key file password is incorrect. The key file could not be used. The key file also might be corrupt. |
| 0x00000199 | 409 | GSK_ERROR_BAD_KEY_LEN_FOR_EXPORT | In a restricted cryptography environment, the key size is too long to be supported. |
| 0x0000019a | 410 | GSK_ERROR_BAD_MESSAGE | An incorrectly formatted SSL message was received from the partner. |
| 0x0000019b | 411 | GSK_ERROR_BAD_MAC | The message authentication code (MAC) was not successfully verified. |
| 0x0000019c | 412 | GSK_ERROR_UNSUPPORTED | Unsupported SSL protocol or unsupported certificate type. |
| 0x0000019d | 413 | GSK_ERROR_BAD_CERT_SIG | The received certificate contained an incorrect signature. |
| 0x0000019e | 414 | GSK_ERROR_BAD_CERT | Incorrectly formatted certificate received from partner. |
| 0x0000019f | 415 | GSK_ERROR_BAD_PEER | An SSL protocol that is not valid received from partner. |

Table 22. IBM Global Security Kit key management return codes (continued)

| Return code (hex) | Return code (decimal) | Constant | Explanation |
|-------------------|-----------------------|--------------------------------------|--|
| 0x000001a0 | 416 | GSK_ERROR_PERMISSION_DENIED | Report this error to IBM Software Support. |
| 0x000001a1 | 417 | GSK_ERROR_SELF_SIGNED | The self-signed certificate is not valid. |
| 0x000001a2 | 418 | GSK_ERROR_NO_READ_FUNCTION | The read() failed. Report this error to IBM Software Support. |
| 0x000001a3 | 419 | GSK_ERROR_NO_WRITE_FUNCTION | The write() failed. Report this error to IBM Software Support. |
| 0x000001a4 | 420 | GSK_ERROR_SOCKET_CLOSED | The partner closed the socket before the protocol completed. |
| 0x000001a5 | 421 | GSK_ERROR_BAD_V2_CIPHER | The specified V2 cipher is not valid. |
| 0x000001a6 | 422 | GSK_ERROR_BAD_V3_CIPHER | The specified V3 cipher is not valid. |
| 0x000001a7 | 423 | GSK_ERROR_BAD_SEC_TYPE | Report this error to IBM Software Support. |
| 0x000001a8 | 424 | GSK_ERROR_BAD_SEC_TYPE_COMBINATION | Report this error to IBM Software Support. |
| 0x000001a9 | 425 | GSK_ERROR_HANDLE_CREATION_FAILED | The handle could not be created. Report this error to IBM Software Support. |
| 0x000001aa | 426 | GSK_ERROR_INITIALIZATION_FAILED | Initialization failed. Report this internal error to service. |
| 0x000001ab | 427 | GSK_ERROR_LDAP_NOT_AVAILABLE | When validating a certificate, unable to access the specified user registry. |
| 0x000001ac | 428 | GSK_ERROR_NO_PRIVATE_KEY | The specified key did not contain a private key. |
| 0x000001ad | 429 | GSK_ERROR_PKCS11_LIBRARY_NOTLOADED | A failed attempt was made to load the specified PKCS11 shared library. |
| 0x000001ae | 430 | GSK_ERROR_PKCS11_TOKEN_LABELMISMATCH | The PKCS #11 driver failed to find the token specified by the caller. |
| 0x000001af | 431 | GSK_ERROR_PKCS11_TOKEN_NOTPRESENT | A PKCS #11 token is not present in the slot. |
| 0x000001b0 | 432 | GSK_ERROR_PKCS11_TOKEN_BADPASSWORD | The password/pin to access the PKCS #11 token is incorrect. |
| 0x000001b1 | 433 | GSK_ERROR_INVALID_V2_HEADER | The SSL header received was not a properly SSLv2 formatted header. |
| 0x000001b2 | 434 | GSK_CSP_OPEN_ERROR | Could not open the hardware-based cryptographic service provider. Either the CSP name is not specified correctly or a failed attempt was made to access the specified CSP's certificate store. |
| 0x000001b3 | 435 | GSK_CSP_OPEN_ERROR | Some conflicting attributes for SSL operation were defined. |
| 0x000001b4 | 436 | GSK_CSP_OPEN_ERROR | The Microsoft Crypto API is only supported on Microsoft Windows 2000 with Service Pack 2 applied. |
| 0x000001b5 | 437 | GSK_CSP_OPEN_ERROR | System is running in IPv6 mode without setting a PEERID. |
| 0x000001f5 | 501 | GSK_INVALID_BUFFER_SIZE | The buffer size is negative or zero. |

Table 22. IBM Global Security Kit key management return codes (continued)

| Return code (hex) | Return code (decimal) | Constant | Explanation |
|-------------------|-----------------------|-------------------------------------|---|
| 0x000001f6 | 502 | GSK_WOULD_BLOCK | Used with nonblocking I/O. Refer to the nonblocking section for usage. |
| 0x00000259 | 601 | GSK_ERROR_NOT_SSLV3 | SSLv3 is required for reset_cipher(), and the connection uses SSLv2. |
| 0x0000025a | 602 | GSK_MISC_INVALID_ID | An ID that is not valid was specified for the gsk_secure_soc_misc() function call. |
| 0x000002bd | 701 | GSK_ATTRIBUTE_INVALID_ID | The function call has an ID that is not valid. This also might be caused by specifying an environment handle when a handle for a SSL connection should be used. |
| 0x000002be | 702 | GSK_ATTRIBUTE_INVALID_LENGTH | The attribute has a negative length, which is not valid. |
| 0x000002bf | 703 | GSK_ATTRIBUTE_INVALID_ENUMERATION | The enumeration value is not valid for the specified enumeration type. |
| 0x000002c0 | 704 | GSK_ATTRIBUTE_INVALID_SID_CACHE | A parameter list that is not valid for replacing the SID cache routines. |
| 0x000002c1 | 705 | GSK_ATTRIBUTE_INVALID_NUMERIC_VALUE | When setting a numeric attribute, the specified value is not valid for the specific attribute being set. |
| 0x000002c2 | 706 | GSK_CONFLICTING_VALIDATION_SETTING | Conflicting parameters were set for additional certificate validation |
| 0x000002c3 | 707 | GSK_AES_UNSUPPORTED | The AES cryptographic algorithm is not supported. |
| 0x000002c4 | 708 | GSK_PEERID_LENGTH_ERROR | The PEERID does not have the correct length. |
| 0x000005dd | 1501 | GSK_SC_OK | |
| 0x000005de | 1502 | GSK_SC_CANCEL | |
| 0x00000641 | 1601 | GSK_TRACE_STARTED | The trace started successfully. |
| 0x00000642 | 1602 | GSK_TRACE_STOPPED | The trace stopped successfully. |
| 0x00000643 | 1603 | GSK_TRACE_NOT_STARTED | No trace file was previously started so it cannot be stopped. |
| 0x00000644 | 1604 | GSK_TRACE_ALREADY_STARTED | Trace file already started so it cannot be started again. |
| 0x00000645 | 1605 | GSK_TRACE_OPEN_FAILED | Trace file cannot be opened. The first parameter of gsk_start_trace() must be a valid full path file name. |

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Glossary

A glossary is available with terms and definitions for the IBM Tivoli Storage Manager server and related products.

The glossary is located in the Tivoli Storage Manager Version 6.1 information center:
<http://publib.boulder.ibm.com/infocenter/tsminfo/v6>

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