IBM Tivoli Storage Manager for SAN
for Oracle Solaris
Version 6.3.3

Storage Agent User's Guide

SC23-9800-03

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Note:
Before using this information and the product it supports, read the information in "Notices" on page 109.

This edition applies to Version 6.3.3 of IBM Tivoli Storage Manager for Storage Area Networks (product number 5608-E07) and to all subsequent releases and modifications until otherwise indicated in new editions or technical newsletters. This edition replaces SC23-9800-02.

Contents

Figures

Tables

Preface

This publication contains installation and operating instructions for the IBM® Tivoli® Storage Manager for Storage Area Networks.

Who should read this guide

This guide is for administrators who install and use the storage agent component of the Tivoli Storage Manager for Storage Area Networks product (referred to as the *storage agent* throughout this publication).

It provides:

- An overview of LAN-free data transfer
- Detailed explanations for installing, configuring, and using the Tivoli Storage Manager client and storage agent, and the Tivoli Storage Manager server)

To use this guide, you must know:

- The operating system on which the server will be installed
- The devices that can use Tivoli Storage Manager
- The workstation operating systems on which the clients reside
- The communication protocols installed on your client and server systems
- Storage area network (SAN) administration

Publications

Publications for the IBM Tivoli Storage Manager family of products are available online. The Tivoli Storage Manager product family includes IBM Tivoli Storage FlashCopy® Manager, IBM Tivoli Storage Manager for Space Management, IBM Tivoli Storage Manager for Databases, and several other storage management products from IBM Tivoli.

To search all publications, go to the Tivoli Storage Manager information center at http://pic.dhe.ibm.com/infocenter/tsminfo/v6r3.

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/.

Go to Tivoli Documentation Central to find information centers that contain official product documentation for current and previous versions of Tivoli products, including the Tivoli Storage Manager product family. You can find Tivoli Documentation Central at https://www.ibm.com/developerworks/wikis/display/tivolidoccentral/Home.

You can also order some related publications from the IBM Publications Center website at http://www.ibm.com/shop/publications/order/. The website provides information about ordering publications from countries other than the United States. In the United States, you can order publications by calling 1-800-879-2755.

Tivoli Storage Manager publications

The following tables list the publications that make up the Tivoli Storage Manager library.

Table 1. Tivoli Storage Manager server publications

Publication title	Order number
IBM Tivoli Storage Manager for AIX Installation Guide	GC23-9781
IBM Tivoli Storage Manager for AIX Administrator's Guide	SC23-9769
IBM Tivoli Storage Manager for AIX Administrator's Reference	SC23-9775
IBM Tivoli Storage Manager for HP-UX Installation Guide	GC23-9782
IBM Tivoli Storage Manager for HP-UX Administrator's Guide	SC23-9770
IBM Tivoli Storage Manager for HP-UX Administrator's Reference	SC23-9776
IBM Tivoli Storage Manager for Linux Installation Guide	GC23-9783
IBM Tivoli Storage Manager for Linux Administrator's Guide	SC23-9771
IBM Tivoli Storage Manager for Linux Administrator's Reference	SC23-9777
IBM Tivoli Storage Manager for Oracle Solaris Installation Guide	GC23-9784
IBM Tivoli Storage Manager for Oracle Solaris Administrator's Guide	SC23-9772
IBM Tivoli Storage Manager for Oracle Solaris Administrator's Reference	SC23-9778
IBM Tivoli Storage Manager for Windows Installation Guide	GC23-9785
IBM Tivoli Storage Manager for Windows Administrator's Guide	SC23-9773
IBM Tivoli Storage Manager for Windows Administrator's Reference	SC23-9779
IBM Tivoli Storage Manager for z/OS Media Installation and User's Guide	SC27-4018
IBM Tivoli Storage Manager Upgrade and Migration Guide for V5 Servers	GC27-4017
IBM Tivoli Storage Manager Integration Guide for Tivoli Storage Manager FastBack®	SC27-2828

Table 2. Tivoli Storage Manager storage agent publications

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

Table 3. Tivoli Storage Manager client publications

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

Table 3. Tivoli Storage Manager client publications (continued)

Publication title	Order number
IBM Tivoli Storage Manager for Windows: Backup-Archive Clients Installation and User's Guide	SC23-9792
IBM Tivoli Storage Manager Using the Application Programming Interface	SC23-9793
IBM Tivoli Storage Manager for Space Management for UNIX and Linux: User's Guide	SC23-9794
IBM Tivoli Storage Manager HSM for Windows Administration Guide	SC23-9795

Table 4. Tivoli Storage Manager data protection publications

Publication title	Order number
IBM Tivoli Storage Manager for Databases: Data Protection for Microsoft SQL Server Installation and User's Guide	GC27-4010
IBM Tivoli Storage Manager for Databases: Data Protection for Oracle for UNIX and Linux Installation and User's Guide	SC27-4019
IBM Tivoli Storage Manager for Databases: Data Protection for Oracle for Windows Installation and User's Guide	SC27-4020
IBM Tivoli Storage Manager for Mail: Data Protection for Microsoft Exchange Server Installation and User's Guide	GC27-4009
IBM Tivoli Storage Manager for Mail: Data Protection for Lotus Domino® UNIX and Linux Installation and User's Guide	SC27-4021
IBM Tivoli Storage Manager for Mail: Data Protection for Lotus Domino for Windows Installation and User's Guide	SC27-4022
IBM Tivoli Storage Manager for Enterprise Resource Planning: Data Protection for SAP Installation and User's Guide for DB2	SC33-6341
IBM Tivoli Storage Manager for Enterprise Resource Planning: Data Protection for SAP Installation and User's Guide for Oracle	SC33-6340
IBM Tivoli Storage Manager for Virtual Environments Installation and User's Guide	SC27-2898
IBM Tivoli Storage Manager for Microsoft SharePoint Guide	N/A

Table 5. IBM Tivoli Storage Manager troubleshooting and tuning publications

Publication title	Order number
IBM Tivoli Storage Manager Problem Determination Guide	GC23-9789
IBM Tivoli Storage Manager Performance Tuning Guide	GC23-9788
IBM Tivoli Storage Manager Client Messages and Application Programming Interface Return Codes	SC27-2878
IBM Tivoli Storage Manager Server Messages and Error Codes	SC27-2877
IBM Tivoli Storage Manager for Mail: Data Protection for Microsoft Exchange Server Messages	GC27-4011
IBM Tivoli Storage Manager for Databases: Data Protection for Microsoft SQL Server Messages	GC27-4012
IBM Tivoli Storage Manager for Databases: Data Protection for Oracle Messages	SC27-4014
IBM Tivoli Storage Manager for Mail: Data Protection for Lotus Domino Messages	SC27-4015

Table 5. IBM Tivoli Storage Manager troubleshooting and tuning publications (continued)

Publication title	Order number
IBM Tivoli Storage Manager for Enterprise Resource Planning: Data Protection for SAP Messages	SC27-4016

Note: You can find information about IBM System Storage® Archive Manager at the Tivoli Storage Manager v6.3.0 information center.

Related software publications

Publication Title	Order Number
IBM TotalStorage SAN File System Administrator's Guide and Reference	GA27–4317
IBM Tivoli SANergy Administrator's Guide	GC26–7389
General Parallel File System: Concepts, Planning, and Installation Guide	GA76-0413

Support information

You can find support information for IBM products from various sources.

Start at the IBM Support Portal: http://www.ibm.com/support/entry/portal/. You can select the products that you are interested in and search for a wide variety of relevant information.

Getting technical training

Information about Tivoli technical training courses is available online.

Go to the following websites to sign up for training, ask questions, and interact with others who use IBM storage products.

Tivoli software training and certification
Choose from instructor led, online classroom training, self-paced Web classes, Tivoli certification preparation, and other training options at http://www.ibm.com/software/tivoli/education/

Tivoli Support Technical Exchange
Technical experts share their knowledge and answer your questions in webcasts at http://www.ibm.com/software/sysmgmt/products/support/supp_tech_exch.html.

Storage Management community
Interact with others who use IBM storage management products at http://www.ibm.com/developerworks/servicemanagement/sm/index.html

Global Tivoli User Community
Share information and learn from other Tivoli users throughout the world at http://www.tivoli-ug.org/.

IBM Education Assistant
View short "how to" recordings designed to help you use IBM software products more effectively at http://publib.boulder.ibm.com/infocenter/ieduasst/tivv1r0/index.jsp

Searching knowledge bases

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

Begin by searching the Tivoli Storage Manager Information Center at http://pic.dhe.ibm.com/infocenter/tsminfo/v6r3. From this website, you can search the current Tivoli Storage Manager documentation.

Searching the Internet

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

To search multiple Internet resources, go to the IBM support website at http://www.ibm.com/support/entry/portal/.

You can search for information without signing in. Sign in using your IBM ID and password if you want to customize the site based on your product usage and information needs. If you do not already have an IBM ID and password, click **Sign in** at the top of the page and follow the instructions to register.

From the support website, you can search various resources including:

- IBM technotes.
- IBM downloads.
- IBM Redbooks® publications.
- IBM Authorized Program Analysis Reports (APARs). Select the product and click **Downloads** to search the APAR list.

If you still cannot find a solution to the problem, you can search forums and newsgroups on the Internet for the latest information that might help you find problem resolution.

An independent user discussion list, ADSM-L, is hosted by Marist College. You can subscribe by sending an email to listserv@vm.marist.edu. The body of the message must contain the following text: `SUBSCRIBE ADSM-L` *your_first_name your_family_name*.

To share your experiences and learn from others in the Tivoli Storage Manager and Tivoli Storage FlashCopy Manager user communities, go to Service Management Connect (http://www.ibm.com/developerworks/servicemanagement/sm/index.html). From there you can find links to product wikis and user communities.

Using IBM Support Assistant

IBM Support Assistant is a complimentary software product that can help you with problem determination. It is available for some Tivoli Storage Manager and Tivoli Storage FlashCopy Manager products.

To learn about which products are supported, go to the IBM Support Assistant download web page at http://www.ibm.com/software/support/isa/download.html.

IBM Support Assistant helps you gather support information when you must 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

You can find more information at the IBM Support Assistant website:

http://www.ibm.com/software/support/isa/

You can also install the stand-alone IBM Support Assistant application on any workstation. You can then enhance the application by installing product-specific plug-in modules for the IBM products that you use. Find add-ons for specific products at http://www.ibm.com/support/docview.wss?uid=swg27012689.

Finding product fixes

A product fix to resolve your problem might be available from the IBM software support website.

You can determine what fixes are available by checking the IBM software support website at http://www.ibm.com/support/entry/portal/.

- If you previously customized the site based on your product usage:
  1. Click the link for your product, or a component for which you want to find a fix.
  2. Click **Downloads**, and then click **Fixes by version**.
- If you have not customized the site based on your product usage, click **Downloads** and search for your product.

Receiving notification of product fixes

You can receive notifications about fixes, flashes, upgrades, and other news about IBM products.

To sign up to receive notifications about IBM products, follow these steps:

1. From the support page at http://www.ibm.com/support/entry/portal/, click **Sign in to create, manage, or view your subscriptions** in the **Notifications** pane.
2. Sign in using your IBM ID and password. If you do not have an ID and password, click **register now** and complete the registration process.
3. Click **Manage all my subscriptions** in the **Notifications** pane.
4. Click the **Subscribe** tab and then click **Tivoli**.
5. Select the products for which you want to receive notifications and click **Continue**.
6. Specify your notification preferences and click **Submit**.

Contacting IBM Software Support

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

To obtain help from IBM Software Support, complete the following steps:

1. Ensure that you have completed the following prerequisites:
   a. Set up a subscription and support contract.
   b. Determine the business impact of your problem.
   c. Describe your problem and gather background information.

2. Follow the instructions in "Submitting the problem to IBM Software Support" on page xvi.

Setting up a subscription and support contract

Set up a subscription and support 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, IBM Tivoli, Lotus®, and Rational® products, as well as IBM DB2® and IBM WebSphere® products that run on Microsoft Windows or on operating systems such as AIX or Linux), enroll in IBM Passport Advantage® in one of the following ways:

- **Online:** Go to the Passport Advantage website at http://www.ibm.com/software/lotus/passportadvantage/, click **How to enroll**, and follow the instructions.
- **By telephone:** You can call 1-800-IBMSERV (1-800-426-7378) in the United States. For the telephone 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**.

Determining the business impact

When you report a problem to IBM, you are asked to supply a severity level. Therefore, you must 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.

Describing the problem and gathering 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 re-created? 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 using a workaround for this problem? If so, be prepared to explain it when you report the problem.

Submitting the problem to IBM Software Support

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

Online

Go to the IBM Software Support website at http://www.ibm.com/support/entry/portal/Open_service_request/Software/Software_support_(general). Sign in to access IBM Service Requests and enter your information into the problem submission tool.

By telephone

For the telephone number to call in your country, go to the IBM Software Support Handbook at http://www14.software.ibm.com/webapp/set2/sas/f/handbook/home.html and click **Contacts**.

Conventions used in this publication

Typographic conventions are used in Storage Agent User's Guide.

Command to be entered on the command line:

```
> dsmadmc
```

Command to be entered on the command line of an administrative client:

```
query devclass
```

Reading syntax diagrams

To read a syntax diagram for entering a command, follow the path of the line. Read from left to right and from top to bottom.

- The ►►— symbol indicates the beginning of a syntax diagram.
- The —► symbol, at the end of a line, indicates that the syntax diagram continues onto the next line.
- The ►— symbol, at the beginning of a line, indicates that a syntax diagram continues from the previous line.
- The —►◄ symbol indicates the end of a syntax diagram.

Abbreviations

The command name can consist of a single action word, such as HALT, or it can consist of an action word and an object for the action, such as DEFINE DOMAIN. You can enter the entire command name or the abbreviation that is specified in the syntax diagram for the command. Uppercase letters denote the shortest acceptable abbreviation. If an item appears entirely in uppercase letters, you cannot abbreviate the item. Enter the command in any column of the input line.

You can enter the item in uppercase letters, lowercase letters, or any combination. In this example, you can enter CMDNA, CMDNAM, or CMDNAME in any combination of uppercase and lowercase letters.

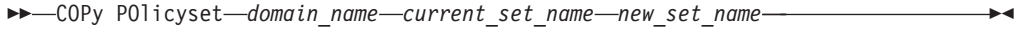
Variables

Highlighted lowercase items (*like this*) denote variables. In this example, *var_name* represents a variable you must specify when you code the CMDNAME command.

Positional parameters

Commands can have required or optional positional parameters. For positional parameters, you do not use an equal sign to specify a value. You must enter positional parameters in the order indicated in the syntax diagram for a command.

For example, to copy a policy set:



1. Enter the name of the policy domain to which the policy set belongs
2. Enter the name of the policy set you want to copy
3. Enter the name you want to assign the copy

```
copy policyset domain1 oldset newset
```

Keyword parameters

Commands can have required or optional keyword parameters. When included in a command, a keyword parameter must follow any positional parameters in the command. You use the equal sign with a keyword to specify its value. A keyword parameter can provide a description of an object, identify an object (such as a storage pool or policy domain), or specify a setting for an option. You can enter either the entire keyword or the abbreviation that is identified in the syntax diagram for the command.

For example, to include a description for a new policy domain, enter:

```
define domain acctg description="accounting"
```

Do not include any blanks immediately before or after the equal sign (=).

Symbols

You must code these symbols exactly as they appear in the syntax diagram.

*	Asterisk
:	Colon
,	Comma
=	Equal Sign
-	Hyphen
( )	Parentheses
.	Period
"	quotation mark
'	single quotation mark

Repetition

An arrow returning to the left means that the item can be repeated. A character within the arrow means that you must separate repeated items with that character.

A footnote (1) by the arrow refers to a limit that tells how many times the item can be repeated.

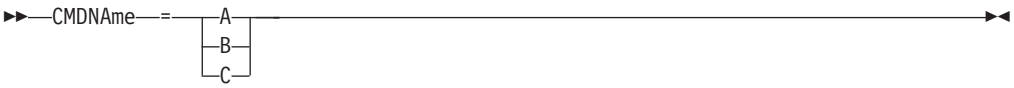
Notes:

1 Specify *repeat* up to 5 times.

Required choices

When two or more items are in a stack and one of them is on the line, you *must* specify one item.

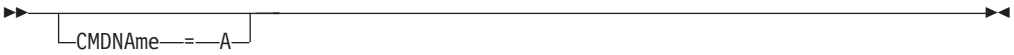
In this example, you must choose CMDNAME=A, CMDNAME=B, or CMDNAME=C.



Do not include any blanks immediately before or after the equal sign (=).

Optional choices

When an item is below the line, the item is optional. In this example, you can choose CMDNAME=A or nothing at all. Do not include any blanks immediately before or after the equal sign (=).



When two or more items are in a stack below the line, all of them are optional. In this example, you can choose CMDNAME=A, CMDNAME=B, CMDNAME=C, or nothing at all. Do not include any blanks immediately before or after the equal sign (=).

Defaults

Defaults are above the line. The system uses the default unless you override it. You can override the default by coding an option from the stack below the line.

In this example, CMDNAME=A is the default. You can also code CMDNAME=A, CMDNAME=B, or CMDNAME=C. Do not include any blanks before or after the equal sign (=).

Repeatable choices

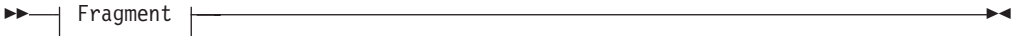
A stack of items followed by an arrow returning to the left means that you can select more than one item or, in some cases, repeat a single item. In this example, you can choose more than one value, with each name delimited with a comma. Do not include any blanks before or after the equal sign (=).

Syntax fragments

Some diagrams, because of their length, must display parts of the syntax with fragments. The fragment name appears between vertical bars in the diagram.

The expanded fragment appears in the diagram after all other parameters or at the bottom of the diagram. A heading with the fragment name identifies the expanded fragment. Commands appearing directly on the line are required.

In this example, the fragment is named “Fragment”.



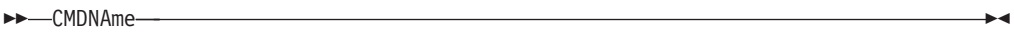
Fragment:

Syntax diagram descriptions

This topic covers syntax diagrams including descriptions and examples:

Abbreviations: Uppercase letters denote the shortest acceptable abbreviation. If an item appears entirely in uppercase letters, you cannot abbreviate the item.

You can type the item in uppercase letters, lowercase letters, or any combination. In this example, you can enter CMDNA, CMDNAM, or CMDNAME in any combination of uppercase and lowercase letters.



Symbols: You must code these symbols exactly as they appear in the syntax diagram.

* Asterisk

: Colon

, Comma

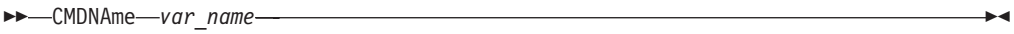
= Equal Sign

- Hyphen

( ) Parentheses

. Period

Variables: Highlighted lowercase items (*like this*) denote variables. In this example, *var_name* represents a variable you must specify when you code the CMDNAME command.



Repetition: An arrow returning to the left means that the item can be repeated. A character within the arrow means that you must separate repeated items with that character.

A footnote (1) by the arrow refers to a limit that tells how many times the item can be repeated.

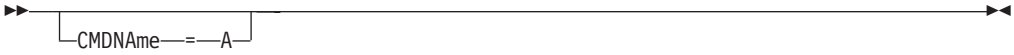
Notes:

1 Specify *repeat* up to 5 times.

Required Choices: When two or more items are in a stack and one of them is on the line, you *must* specify one item.

In this example, you must choose CMDNAME=A, CMDNAME=B, or CMDNAME=C. Do not include any blanks immediately before or after the equal sign (=).

Optional Choices: When an item is below the line, the item is optional. In this example, you can choose CMDNAME=A or nothing at all. Do not include any blanks immediately before or after the equal sign (=).

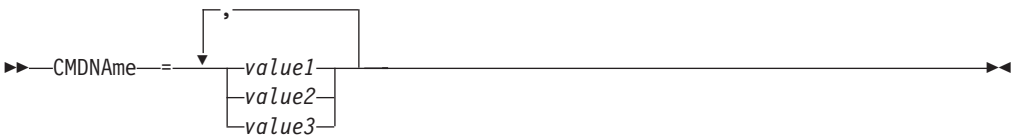


When two or more items are in a stack below the line, all of them are optional. In this example, you can choose CMDNAME=A, CMDNAME=B, CMDNAME=C, or nothing at all. Do not include any blanks immediately before or after the equal sign (=).

Defaults: Defaults are above the line. The system uses the default unless you override it. You can override the default by coding an option from the stack below the line.

In this example, CMDNAME=A is the default. You can also code CMDNAME=A, CMDNAME=B, or CMDNAME=C. Do not include any blanks before or after the equal sign (=).

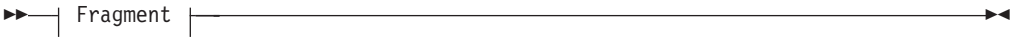
Repeatable Choices: A stack of items followed by an arrow returning to the left means that you can select more than one item or, in some cases, repeat a single item. In this example, you can choose more than one value, with each name delimited with a comma. Do not include any blanks before or after the equal sign (=).



Syntax Fragments: Some diagrams, because of their length, must fragment the syntax. The fragment name appears between vertical bars in the diagram.

The expanded fragment appears in the diagram after all other parameters or at the bottom of the diagram. A heading with the fragment name identifies the expanded fragment. Commands appearing directly on the line are required.

In this example, the fragment is named "Fragment".



Fragment:

New for Tivoli Storage Manager for Storage Area Networks Version 6.3.3

IBM Tivoli Storage Manager for Storage Area Networks is updated for Version 6.3.3.

Secure Sockets Layer communication
There is new syntax in the **DSMSTA SETSTORAGESERVER** command for the setup of the storage agent. A new parameter enables the storage agent to use Secure Sockets Layer (SSL) as a method of communication.

Preventing device driver conflicts
On Oracle Solaris systems, the native generic SCSI tape driver (st driver) automatically claims supported tape drives when the system is started. If these drives are configured by the Tivoli Storage Manager device driver or the IBM tape device driver, there is a possibility that data might be overwritten because more than one driver can access a device using different device names.

You can use the rmstdev utility to delete device special files that are created by the Oracle Solaris driver for any tape drives that are also configured by the Tivoli Storage Manager device driver or the IBM tape device driver. Deleting these files ensures that only one driver has access to a tape drive. The rmstdev utility runs when the storage agent is started automatically. If the system does not automatically start, you must manually run the utility as the root user before starting the Tivoli Storage Manager server.

Any updates that have been made since the previous edition are marked with a vertical bar (|) in the left margin.

Chapter 1. Storage agent overview

IBM Tivoli Storage Manager for Storage Area Networks allows client systems to write data directly to, or read data directly from, storage devices attached to a storage area network (SAN). This is called *LAN-free data movement*.

LAN-free data movement makes LAN bandwidth available for other uses and decreases the load on the Tivoli Storage Manager server, allowing it to support a greater number of concurrent client connections.

The key component of Tivoli Storage Manager for Storage Area Networks is the storage agent. You install the storage agent on a client system that shares storage resources with the Tivoli Storage Manager server, as shown in Figure 1.

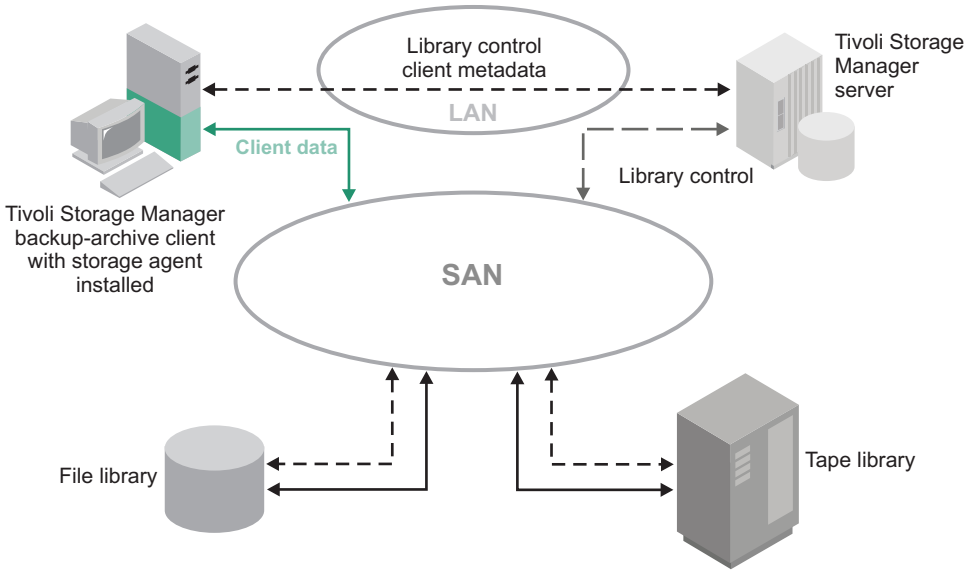


Figure 1. SAN data movement. Solid lines indicate data movement. Broken lines indicate movement of control information and metadata.

As shown in Figure 2 on page 2, the storage agent can support several clients while installed on only one of the clients. You can also install the storage agent on a client system that does not share storage resources with the Tivoli Storage Manager server, but that is connected to a client system that does share storage resources. The LANFREECOMMMETHOD option allows a client system that shares storage resources to communicate with the storage agent. The LANFREECOMMMETHOD option also allows the storage agent to support several clients while the storage agent is installed on only one of the clients.

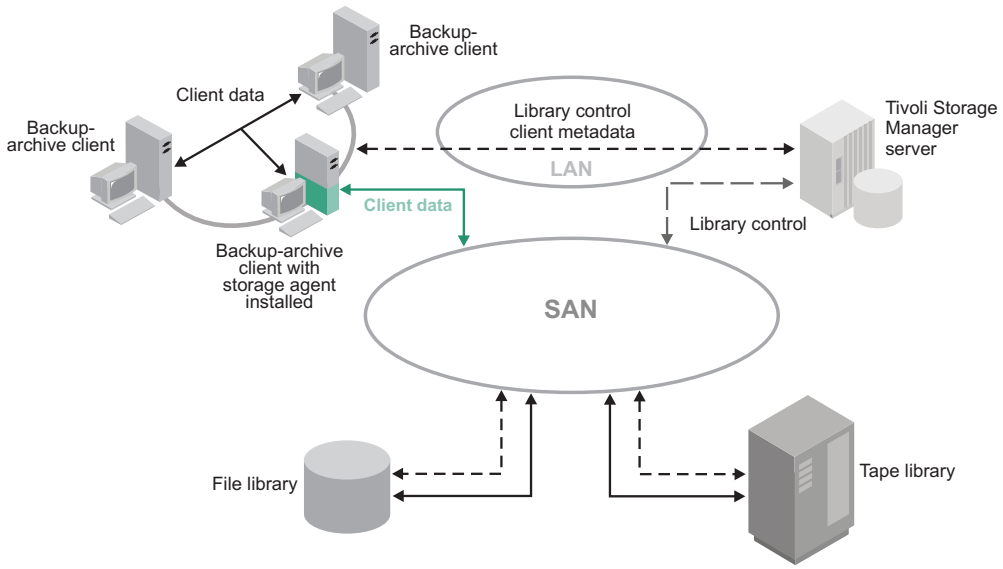


Figure 2. SAN data movement with the LANFREECOMMMETHOD option. Solid® lines indicate data movement. Broken lines indicate movement of control information and metadata.

A Tivoli Storage Manager server, acting as a library manager, controls the storage devices. This server can be the server that is working with the storage agent or another Tivoli Storage Manager server in the enterprise. The Tivoli Storage Manager server tracks the metadata that the client has stored. The metadata, such as policy information, and file name and size, is passed over the LAN connection between the storage agent and server.

The storage agent communicates with the server to obtain and store database information, and to coordinate device and volume access. The server and client coordinate and transfer data access through the SAN. The client uses the storage agent for operations where appropriate. For example, if a SAN path is defined, the client (through the storage agent) transfers data using that path. If a failure occurs on the SAN path, failover occurs and the client uses its LAN connection to the Tivoli Storage Manager server and moves the client data over the LAN.

The storage agent can send the data directly to the server using the paths between the storage agent and the server. An example is a LAN-free storage pool that is updated to read-only after the client connects to the server and obtains its initial policy information. The storage agent, instead of failing the operation, sends the data to the server. If the storage hierarchy is configured so that the next storage pool destination is available, the server performs the operation.

You can also prevent data from being transferred over the LAN by specifying the Tivoli Storage Manager server parameters DATAREADPATH and DATAWRITEPATH with the REGISTER NODE or UPDATE NODE commands for a specific node. To review these settings, issue the following command on the server for the node:

```
query node node_name format=detailed
```

Tivoli Storage Manager supports SAN-attached device sharing in the following environments:

- Tivoli Storage Manager native library management support consisting of an ACSLS, SCSI, or IBM 349*X* library manager and library clients or just a library manager.
- Shared disk storage using a FILE library and the integration of IBM General Parallel File System, IBM Tivoli SANergy®, or IBM TotalStorage SAN File System. General Parallel File System is the preferred option for operating systems on which it is supported.
- External libraries. For a description of external libraries, see the *Administrator's Guide*.

Related concepts:

"ACSLS, SCSI, VTL, and 349*x* tape-library sharing" on page 19

"File device sharing using Tivoli SANergy" on page 21

"External libraries" on page 22

Related information:

IBM General Parallel File System

IBM General Parallel File System Information Center

Tivoli SANergy

TotalStorage SAN File System

LAN-free client-data backup: Scenario

Tape and file media to be used for client backup data resides in a storage pool that uses a device shared on a SAN. A library manager sends the location to a storage agent. Backup data goes directly to the device over a SAN.

A typical scenario for LAN-free data movement consists of the following steps:

1. The backup-archive client begins a backup operation. The server reports policy information to the client, including whether a destination is LAN-free. As the client assigns policy settings for files during backup processing, it sends the data, using LAN-free data movement, when the destination for that policy is LAN-free enabled.

   A storage pool is a LAN-free destination when the storage pool uses a device that is shared on a SAN. That device must also have a defined path to the storage agent.
2. The storage agent receives data for those files that are backed up by the client and assigned to policy settings that use a LAN-free enabled storage pool. The storage agent sends a request for a volume mount to the library manager server. In external libraries, the storage agent contacts the external library manager, using the path to the executable file.
3. A request is made to the storage device to mount the appropriate media.
4. The library manager notifies the storage agent of the location where the mounted media resides. In external libraries, the storage agent is informed of the device location by the external library manager.
5. The client, by means of the storage agent, writes the backup data directly to the device over the SAN.
6. The storage agent sends metadata information to the Tivoli Storage Manager server, and the server stores the information in its database.

Restriction: LAN-free data movement takes precedence over client-side data deduplication. If LAN-free data movement occurs during client-side data

deduplication, client-side data deduplication is turned off, and a message is issued in the error log.

Multi-session no-query restore for LAN-free path: Scenario

When performing a no-query restore, the Tivoli Storage Manager server builds a list of files to restore and sends data to the client while continuing to build the list. This allows the restore to be restarted if interrupted.

Multiple sessions are used for the no-query restore when data for the restore resides on devices with a LAN-free path and devices with a LAN-only path. Some sessions restore data from the server with a LAN-only path. The other sessions use the storage agent to restore data over the LAN-free path.

The number of sessions used for a restore operation is dependent on the value of the client RESOURCEUTILIZATION option and the number of server volumes that contain the client data to be restored.

The following actions outline a typical multi session no-query restore for a LAN-free path:

1. The client requests a file space to be restored. This request is forwarded to the server.
2. The server determines the files to restore and the volume on which those files reside. The server generates a list, sorted by the volume name.
3. The client is informed of the progress and the number of volumes. The client can start more sessions to restore the information.
4. The location of the volume, and whether or not the storage agent can access the volume, will determine how the data is handled. When the volume can be mounted on a shared device that the storage agent can access, the data is read from the volume by the storage agent and sent to the client. When the volume cannot be mounted on a shared device that the storage agent can access, the data is read from the volume by the server and sent directly to the client. The client then begins additional sessions: some to the storage agent for the volumes that are LAN-free enabled and some sessions to the server for those volumes that are not LAN-free enabled.

The process repeats until all files in the list are restored.

Storage agent and z/OS media server overview

IBM Tivoli Storage Manager for z/OS® Media allows client systems, through a storage agent, to communicate with storage devices attached to a z/OS system.

Data movement between the storage agent and the z/OS media server is not a typical LAN-free data transfer. A storage agent installed on a client system communicates with the z/OS media server through a LAN to complete storage agent data transfer.

Tivoli Storage Manager for z/OS Media provides access to storage devices that are attached to a z/OS system for Tivoli Storage Manager servers that run on specific operating systems other than z/OS. Tivoli Storage Manager library support consisting of a **ZOSMEDIA** library type enables access to z/OS attached devices. A storage agent that is installed on a client system communicates with the Tivoli Storage Manager server. The Tivoli Storage Manager for z/OS Media server allows access to z/OS media through the storage agent. The storage agent is configured to

access the z/OS resources that are controlled by the z/OS media server. The Tivoli Storage Manager server stores client metadata, such as file name and size, and also stores volume and library name information that identifies where the data is stored. The z/OS media server stores the data.

Data movement in a z/OS media server environment: Scenario

A storage agent is configured to access z/OS storage resources that are controlled by a z/OS media server. The storage agent is installed on a client system communicates with the z/OS media server over the LAN.

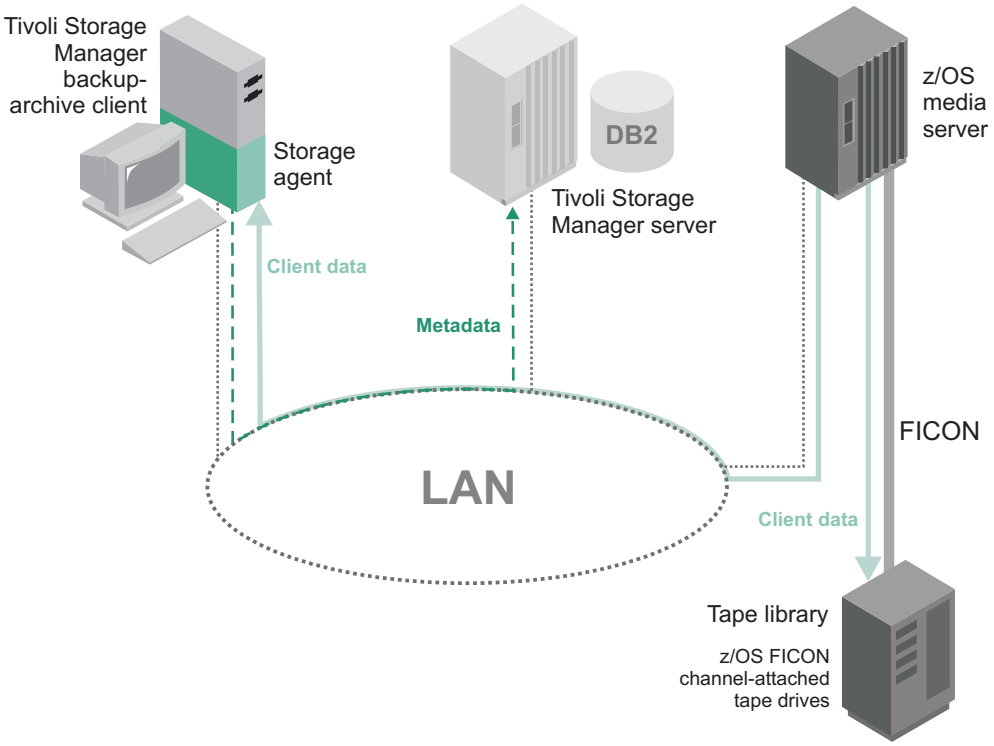


Figure 3. Data movement in a z/OS media server environment. Solid lines indicate data movement. Solid lines with arrows indicate client data. Broken lines indicate movement of control information and metadata.

A typical scenario for storing or retrieving data between a storage agent and z/OS media server storage consists of the following steps:

1. The storage agent initiates a data request with the Tivoli Storage Manager server to determine whether a path exists to the z/OS media server.
2. The Tivoli Storage Manager server determines that a path does exist from the storage agent to the z/OS media server.
3. The Tivoli Storage Manager server provides the storage agent with the z/OS media server name from the library path definition, in addition to a volume and library name. The storage agent uses the server name, volume name (PRIVATE or SCRATCH), and library path definition to establish that it is configured to access the z/OS media server. The storage agent determines the IP address, port, and password for the z/OS media server from the Tivoli Storage Manager server database.
4. The storage agent sends a request for a volume mount to the z/OS media server, using the IP address, port and password.

5. The z/OS media server authenticates the connection, completes the volume open request, and mounts the **FILE** or **TAPE** volume.
6. The client, through the storage agent, sends or receives data to or from the z/OS media server. The Tivoli Storage Manager server manages the storage agent transaction.
7. The storage agent sends metadata information to the Tivoli Storage Manager server, and the server stores the information in its database.

Chapter 2. Planning for storage agent installation and configuration

For optimal results, plan the installation and configuration of your system for LAN-free data movement.

As part of your planning for LAN-free data movement, you must identify the following items:

- Which environment to implement.
- The devices to be used for LAN-free data movement.
- The clients that use LAN-free data movement.
- The server that manages data of a particular client.
- The library used for the LAN-free enabled device. If the library is a Tivoli Storage Manager shared library, you must identify the Tivoli Storage Manager server that is the library manager. If the library is managed by Oracle StorageTek Automated Cartridge System Library Software (ACSLS), you must identify the control point. If the library is an external library, you must identify the external library manager.

If you are planning to move data from a storage agent to a z/OS media server, you must identify:

- The client the storage agent is installed on.
- The Tivoli Storage Manager server that manages access to the z/OS media server.
- The z/OS media server and the devices on the z/OS system.
- The library paths from each storage agent to facilitate connectivity with the z/OS media server.

Software requirements

IBM Tivoli Storage Manager for Storage Area Networks requires specific levels of software.

You can find the most current information about the hardware and software requirements for Tivoli Storage Manager for Storage Area Networks at https://www.ibm.com/support/docview.wss?uid=swg21243309.

Related information:

IBM General Parallel File System

IBM General Parallel File System Information Center

Tivoli SANergy

TotalStorage SAN File System

Supported operating systems

You can use Tivoli Storage Manager for Storage Area Networks on IBM AIX®, HP-UX, Linux, Oracle Solaris, and Microsoft Windows.

When you use a shared Automated Cartridge System Library Software (ACSLS) library, the library manager must be a Tivoli Storage Manager server on AIX, HP-UX, Linux, Solaris, or Windows.

In a z/OS media server environment, you can move data from a storage agent to a z/OS media server only on the following platforms: AIX, Linux, Solaris, and Windows.

AIX operating system: The storage agent is available on 64-bit systems only.

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

File sharing software

If you are sharing disk storage, IBM General Parallel File System (GPFS™), IBM Tivoli SANergy, or IBM TotalStorage SAN File System must be installed. Tivoli SANergy is included with the storage-agent media.

Use of the Tivoli SANergy components that are included with the IBM Tivoli Storage Manager media is limited. You can use Tivoli SANergy components only for LAN-free backup and restore-to-disk operations in conjunction with your licensed use of the IBM Tivoli Storage Manager for Storage Area Networks product.

If you are sharing only tape devices, file-sharing software is not required.

Related information:

IBM General Parallel File System

IBM General Parallel File System Information Center

Tivoli SANergy

TotalStorage SAN File System

Network requirements

You must ensure that your system meets the network requirements when using Tivoli Storage Manager for Storage Area Networks so that you can establish communications between the client, storage agent, and Tivoli Storage Manager. Through the storage agent, the Tivoli Storage Manager server can send and receive data through LAN-free data movement.

Communications between the client, storage agent, and Tivoli Storage Manager server

When you configure the storage agent, you establish communications between the storage agent, the client, and the Tivoli Storage Manager server.

When configuring the client, storage agent, and server, keep in mind the following rules:

- Client nodes that are eligible for LAN-free data movement must be registered on the server. To register client nodes, use the **REGISTER NODE** command. The default parameter is **TYPE=CLIENT**.
- The client must point to the server and storage agent. Ensure that the following options are configured correctly in the client system-options file:

Table 6. Options in the client system-options file

Option name	Description
LANFREETCPSERVERADDRESS	Specifies the TCP/IP address for the storage agent.
LANFREETCPPORT	Specifies the port on which the storage agent listens.
LANFREECOMMMETHOD	Specifies the communications protocol between the Tivoli Storage Manager client and storage agent.
LANFREESHMPORT	You can use the LANFREESHMPORT option when lanfreecommmethod=SHAREdmem is specified for communication between the Tivoli Storage Manager client and storage agent.
LANFREESSL	Specifies that the Tivoli Storage Manager client enables Secure Sockets Layer (SSL) when communicating with the storage agent.
TCPSERVERADDRESS	Specifies the TCP/IP address for a Tivoli Storage Manager server.
TCPPORT	Specifies a TCP/IP port address for a Tivoli Storage Manager server.
SSL	Specifies that Secure Sockets Layer (SSL) is enabled, to provide secure communication between the storage agent, client, and server.
SSLRequired	Specifies whether the client must use SSL.

  Restriction: When a LAN-free path is enabled, the storage agent settings override the client TCPSERVERADDRESS, TCPPORT, and SSL options. This override action occurs to ensure that both the client and the storage agent use the same server communication options.
- The server and the storage agent must point to each other:
  - To point the server to the storage agent, use the **DEFINE SERVER** or **UPDATE SERVER** command on the Tivoli Storage Manager.
  - To point the storage agent to the Tivoli Storage Manager server, you must configure the storage agent device configuration file and options file with the name of Tivoli Storage Manager server. To configure, you can edit each of the files manually or you can use the **DSMSTA SETSTORAGESERVER** command.

When setting up communication between the storage agent and the Tivoli Storage Manager server, ensure that you are using the correct server name. Issue the **QUERY STATUS** command to display the server name.

- Tivoli Storage Manager servers, clients, and storage agents, might be subject to rules when you authenticate passwords with the Lightweight Directory Access Protocol (LDAP) directory server. If nodes communicate with the storage agent and authenticate through an LDAP directory server, the storage agent can be configured to use Secure Sockets Layer (SSL). Passwords that are authenticated with the LDAP directory server can provide enhanced system security. When SSL is enabled, the Tivoli Storage Manager server and the storage agent communicate with each other using SSL. SSL is the default method of communication when LDAP authentication is in use and is optional.

  Important: Do not change the `Tivoli Storage Manager Server SelfSigned SHA Key` and `Tivoli Storage Manager Server SelfSigned Key` label names when using storage agents. The label is the name of the certificate that is stored in the Global Security Kit (GSKit) key database file. After you set up the storage agent for SSL, do not alter the certificate label names.

Figure 4 shows how configuration connects the storage agent, client, and the Tivoli Storage Manager server. Use this figure as a reference point while installing software on client systems, and while defining the storage agent and configuring devices.

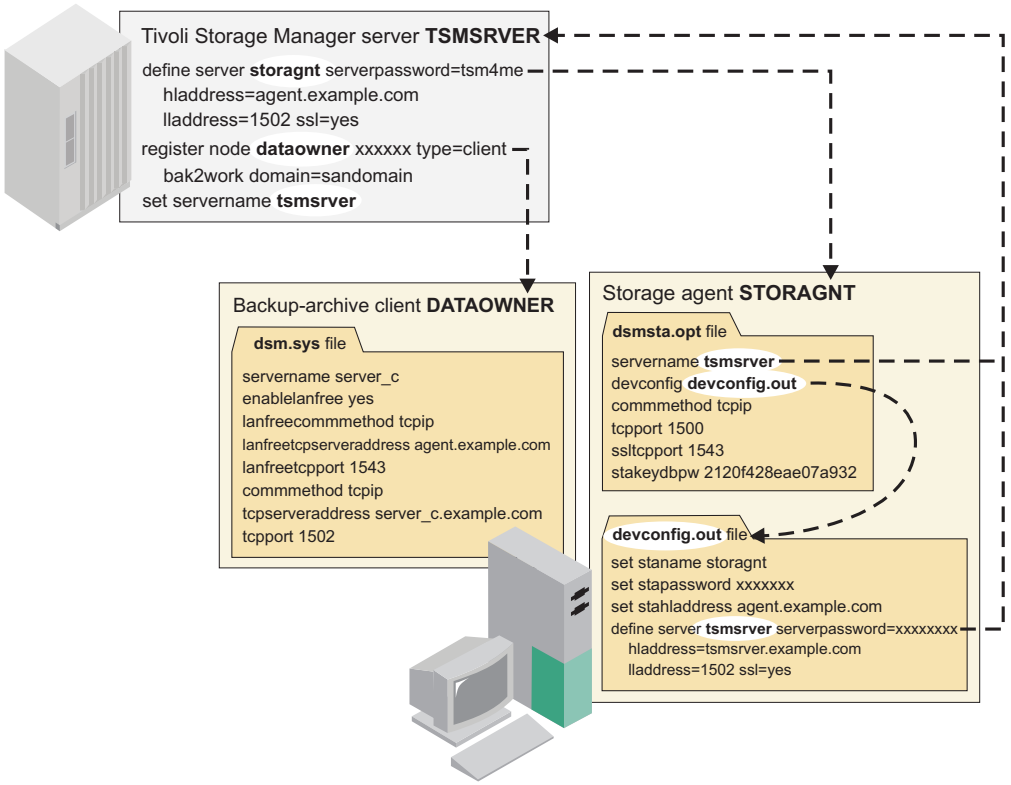


Figure 4. Connections between the client, storage agent, and server. The passwords are shown as *xxxxxxx* because they are encrypted in the file.

Requirement:

- The `SERVERNAME` option in the `dsm.sys` file, the client system-options file, must match the `SERVERNAME` option in the `dsm.opt` file, the client user-options file.

However, the option is unrelated to and does not need to match the SERVERNAME option that is defined for the storage agent in the storage-agent options file, dsmsta.opt.

Related tasks:

"Verifying and updating client node information" on page 52
"Verifying and updating client node information" on page 30
"Verifying and updating client node information" on page 74
"Configuring a storage agent and server to use SSL" on page 60
"Configuring a storage agent and server to use SSL" on page 38

Related reference:

"The storage agent options file" on page 98
"The device configuration file for the storage agent" on page 97
"DSMSTA SETSTORAGESERVER command" on page 103

Connecting the server, client, and storage agent with TCP/IP

TCP/IP is required for communication among the Tivoli Storage Manager server, the client, and the storage agent. You can use Secure Sockets Layer (SSL) with TCP/IP to ensure that passwords authenticated with the LDAP directory server are secure between the Tivoli Storage Manager server and the storage agent.

The Tivoli Storage Manager storage agent can use TCP/IP Version 6 (IPv6) as its communications protocol. IPv6 is interoperable with TCP/IP Version 4. You can specify either IPv4 or both IPv4 and IPv6 as the value of the COMMMETHOD option before starting the server, the backup-archive client, or the storage agent. The same port numbers are used by the server, the backup-archive client, and storage agent for both IPv4 and IPv6.

The server and storage agent use the COMMMETHOD V6TCPIP option to specify support for both IPv4 and IPv6 simultaneously, depending on the protocols configured on the system, which the server or storage agent are running. As in prior releases, COMMMETHOD TCPIP specifies that only IPv4 is used. When configuring the storage agent using the **DSMSTA SETSTORAGESERVER** command, use addresses that correspond to the communications method used by the backup-archive client. The backup-archive client supports either IPv4 or IPv6, but not both at the same time. Other client components, such as CAD and web client, use COMMMETHOD V6TCPIP to support both IPv4 and IPv6 simultaneously.

IPv6 address formats are acceptable for all functions that support IPv6. However, if you use IPv6 addresses for the Shared Memory Protocol function, which does not support IPv6, communications will fail. Continue to use IPv4 for Shared Memory Protocol.

Interoperability between the Tivoli Storage Manager server, client, and storage agent

You can use the Tivoli Storage Manager server and storage agent at different releases. However, a Tivoli Storage Manager server must be at a level equal to or higher than a storage agent level. For example, you can use a V6.3 Tivoli Storage Manager server with a V6.2 storage agent. Tivoli Storage Manager provides

interoperability between the backup-archive client and the client application programming interface (API). You can also an HSM client with a storage agent for LAN-free data movement.

For more information about storage agent compatibility with different versions of Tivoli Storage Manager, see http://www.ibm.com/support/docview.wss?uid=swg21053218.

Clients and API

To enable LAN-free data movement, you must install a Tivoli Storage Manager backup-archive client or a Tivoli Storage Manager Data Protection application client on client systems.

- For information about LAN-free requirements for data-protection clients, see the Tivoli Storage Manager Data Protection documentation.
- For information about supported versions of the backup-archive client and client API, see http://www.ibm.com/support/docview.wss?uid=swg21053218 .
- You can download the latest software levels from the Tivoli Storage Manager for Storage Area Networks support website at http://www.ibm.com/support/entry/portal/Overview/Software/Tivoli/Tivoli_Storage_Manager_for_Storage_Area_Networks. The client API is packaged with the backup-archive client.

Tivoli Storage Manager for Space Management

The HSM client on AIX GPFS, AIX JFS2, and Linux GPFS clients supports LAN-free data transfer.

The SAN provides a path that allows migration and recall of data to and from a SAN-attached storage device. Client data moves over the SAN to the storage device via the Tivoli Storage Manager storage agent. The Tivoli Storage Manager storage agent must be installed on the same system as the client.

Server licensing and compatibility

To use LAN-free operations, you need a Tivoli Storage Manager server license. If you use large libraries, you need a Tivoli Storage Manager Extended Edition license.

To ensure compatibility between the storage agent and the server, check the website for Tivoli Storage Manager storage agent and server compatibility at http://www.ibm.com/support/docview.wss?uid=swg21302789.

To download the latest interim fix, see the IBM Tivoli Storage Manager for Storage Area Networks support website at http://www.ibm.com/support/entry/portal/Overview/Software/Tivoli/Tivoli_Storage_Manager_for_Storage_Area_Networks.

Planning for configuration

Planning the system configuration provides a smooth transition through system setup and production.

Configuration work sheets for storage agent configuration

To be more efficient, obtain client- and server-system information before installing and configuring the storage agent.

Client-system and server-system configuration work sheets

Work sheets help organize the information that you need to configure the storage agent for LAN-free data movement.

Client-system information:

Client-system information includes information about storage agents, client communication protocols and ports, and devices.

Storage agent properties

Type of information	Description	Use this column to record the values for your environment
Storage agent name	The name for the storage agent (for example, storagnt)	
Storage agent password	The password for the storage agent (for example, fun4me)	
TCP/IP address	The TCP/IP address of the storage agent (for example, agent.example.com)	
TCP/IP port	The TCP/IP port of the storage agent	
SSL port	The SSL port for the storage agent	
SSL key database password	The password for the key database file, if SSL is used	

Client properties

Type of information	Description	Use this column to record the values for your environment
LAN-free communications protocol	The communications protocol between the client and the storage agent. The following protocols are available. Use the value in parentheses as the value of the client `LANFREECOMMMETHOD` option. • TCP/IP Version 4 (`TCPIP`) • TCP/IP Version 4 or Version 6 (`V6TCPIP`) • Shared Memory (`SHAREDMEM`))	
LAN-free port	The TCP/IP or SSL port that is used for LAN-free data movement. The type of communication must match the configuration of the storage agent. Use this value as the value of the client `LANFREETCPPORT` option.	

Type of information	Description	Use this column to record the values for your environment
LANFREESSL option	The option that specifies that the Tivoli Storage Manager client enables Secure Sockets Layer (SSL) when communicating with the storage agent.	
SSLRequired option	The option that specifies whether the client must use SSL when communicating with the storage agent.	
Tip: For details about the `LANFREECOMMMETHOD` option, see the *Backup-Archive Clients Installation and User's Guide*.		

Device information

Table 7. External library environment

Type of information	Description	Use this column to record the values for your environment
Executable file location	The fully qualified path to the external-library-manager executable file for each storage agent to which Tivoli Storage Manager sends media-access requests.	
Library name	A 1- through 32-character name of your choosing.	

Table 8. ACSLS, 3494, or SCSI tape-library sharing environment

Type of information	Description	Use this column to record the value or values for your environment
Device name	The name of each tape drive for which you will define a path	

Table 9. Shared disk environment

Type of information	Description	Use this column to record the value for your environment
Local path name	The name of the local path to the network-mounted file system (for example, `/shareddisk`)	

Related tasks:

"Obtaining device information" on page 18

Server-system information:

Server-system information includes information that the storage agent needs to communicate with the Tivoli Storage Manager server. You also need information about devices and client nodes.

To verify server information, use the **QUERY STATUS** command. You can issue the command from a Tivoli Storage Manager administrative command-line client.

Server properties

Type of information	Description	Use this column to record the values for your environment
Name	The name of the server (for example, tsmsrver)	
Password	The password for the server (for example, not4u)	
TCP/IP address	The TCP/IP address for the server. (for example, tsmsrver.example.com)	
TCP/IP port	The TCP/IP port for the server (for example, 1502)	
SSL port	The SSL port for the server	

Device information

Table 10. External library environment

Type of information	Description	Use this column to record the values for your environment
Executable file location	The fully qualified path to the external-library-manager executable file for each storage agent to which Tivoli Storage Manager can send media access requests	
Library name	A 1- through 32-character name of your choosing	

Table 11. ACSLS, 3494, or SCSI library environment

Type of information	Description	Use this column to record the values for your environment
Library name	The name of an ACSLS, 3494, or SCSI library	
Library device name	The device name for an ACSLS, 3494, or SCSI library, which you use when you define the path	
Device name	The name of each tape drive for which you will define a path	

Table 12. Shared disk environment

Type of information	Description	Use this column to record the value for your environment
Local path name	The name of the local path to the network-mounted file system (for example, `/shareddisk`)	

Client node information

Type of information	Description	Use this column to record the values for your environment
Client node names	The names of the client nodes on which you will install and configure the storage agent. You need this information when you register the nodes, set the policy for them, and place any needed restrictions on them.	

Related tasks:

"Obtaining device information" on page 18

"Verifying and updating client node information" on page 52

"Verifying and updating client node information" on page 30

Client-system and server-system configuration worksheets for z/OS Media

Work sheets help organize the information that you need to configure the storage agent for moving data to a z/OS media server.

Client-system information:

Client-system information includes information about storage agents, client communication protocols and ports, and the z/OS media server.

Storage agent properties

Type of information	Description	Use this column to record the values for your environment
Storage agent name	The name for the storage agent (for example, storagnt)	
Storage agent password	The password for the storage agent (for example, fun4me)	
TCP/IP address	The TCP/IP address of the storage agent (for example, agent.example.com)	
TCP/IP port	The TCP/IP port of the storage agent	

Client properties

Type of information	Description	Use this column to record the values for your environment
LAN-free communications protocol	The communications protocol between the client and the storage agent. The following protocols are available. Use the value in parentheses as the value of the client `LANFREECOMMMETHOD` option. • TCP/IP Version 4 (`TCPIP`) • TCP/IP Version 4 or Version 6 (`V6TCPIP`) • Shared Memory (`SHAREDMEM`))	

Type of information	Description	Use this column to record the values for your environment
LAN-free port	The TCP/IP port that is used for LAN-free data movement. Use this value as the value of the client `LANFREETCPPORT` option.	
Tip: For details about the `LANFREECOMMMETHOD` option, see the *Backup-Archive Clients Installation and User's Guide*.		

z/OS media server information

Type of information	Description	Use this column to record the values for your environment
z/OS media server Name	The name of each z/OS media server server (for example, zos1srvr)	
z/OS media server Password	The password for the z/OS media server server (for example, fun4me)	
TCP/IP address	The TCP/IP address for the z/OS media server. (for example, zos1srvr.example.com)	
TCP/IP port	The TCP/IP port for the z/OS media server (for example, 1502)	

Related tasks:

"Obtaining device information" on page 18

Server-system information:

Server-system information includes information that the storage agent needs to communicate with the Tivoli Storage Manager server and the z/OS media server.

To verify server information, use the **`QUERY STATUS`** command. You can issue the command from a Tivoli Storage Manager administrative command-line client.

Server properties

Type of information	Description	Use this column to record the values for your environment
Name	The name of the server (for example, tsmsrver)	
Password	The password for the server (for example, not4u)	
TCP/IP address	The TCP/IP address for the server. (for example, tsmsrver.example.com)	
TCP/IP port	The TCP/IP port for the server (for example, 1502)	

z/OS media server information

Type of information	Description	Use this column to record the values for your environment
z/OS media server Name	The name of each z/OS media server server (for example, zos1srvr)	
z/OS media server Password	The password for the z/OS media server server (for example, fun4me)	
TCP/IP address	The TCP/IP address for the z/OS media server (for example, zos1srvr.example.com)	
TCP/IP port	The TCP/IP port for the z/OS media server (for example, 1502)	

Related tasks:

"Obtaining device information"

"Verifying and updating client node information" on page 74

Obtaining device information

You use the device information when defining paths for the server that functions as the library manager. Device information is obtained from the system on which the storage agent is installed. If you are configuring a FILE Library, you do not need device information.

The method that you use to obtain tape device information in a Oracle Solaris environment depends on whether your environment supports IBM devices or non-IBM devices.

Related tasks:

"Preventing tape label overwrites" on page 44

Obtaining special file names of IBM tape devices:

After installing device drivers for your IBM tape drives, a set of special file names is available for each device.

To obtain special file names, enter the following command:

```
ls /dev/rmt/*st
```

A name typically has the form `/dev/rmt/`*x*`st`, where *x* is a number.

Obtaining special file names of non-IBM tape devices:

Special file names are available for non-IBM devices.

To determine the special file names:

1. Verify that the device is connected to your system and active.
2. Ensure the Tivoli Storage Manager device driver package (TIVsmSdev) is installed.
3. Edit the `/usr/kernel/drv/mt.conf` file. Add one stanza (as shown in the example at the top of the file) for each SCSI target ID and LUN combination that you want the device driver to probe for supported tape drives.
4. To configure the drives, enter the following command:

   ```
   /usr/sbin/add_drv -m '* 0666 bin bin' /usr/kernel/drv/mt
   ```

5. Determine the special file names for the tape drives. The device special files for the tape drives display in the `/dev/rmt` directory. Their names have the form `/dev/rmt/xmt`, where *x* is a number.
6. Optional: To determine the relationship between a physical device and the special file that was created for it, enter the following command:

   ```
   ls  /dev/rmt/*mt
   ```

   The special file name typically has the form `/dev/rmt/xmt`, where *x* is a number.

Storage devices and the configuration of your environment

The type of storage device you use for LAN-free data storage determines how to configure your environment.

As part of the configuration of your environment, you must identify one of the following types of storage device you use:

- ACSLS, SCSI, virtual tape library (VTL), and 349*x* tape-library sharing
- File device sharing using Tivoli SANergy
- External libraries
- Tivoli Storage Manager for z/OS Media storage

Related tasks:

"Preventing tape label overwrites" on page 44

ACSLS, SCSI, VTL, and 349*x* tape-library sharing

When Tivoli Storage Manager servers share an ACSLS, SCSI tape, virtual tape library (VTL), or 349*x* tape library device, one server, the *library manager*, owns and controls the device.

Operations performed by the library manager include checking volumes into and out of the library, labeling volumes, mounting and dismounting volumes, auditing volumes, and tracking an inventory of library contents. The storage agents, along with other Tivoli Storage Manager servers that share this library are *library clients*. As a library client, the storage agent stores data and requests drives, tapes, and volumes.

When the Tivoli Storage Manager server is also the library manager for the devices where data is stored by the storage agent, the storage agent communicates requests to this Tivoli Storage Manager server. When the Tivoli Storage Manager server is another library client, the storage agent communicates requests for itself or the metadata server directly to the library manager. The library manager operations include checking volumes into and out of the library, labeling volumes, mounting and dismounting volumes, auditing volumes, and tracking an inventory of library contents.

The library manager server can support library clients that are at the same or lower version as the library manager. Library clients at a higher version than the library manager are not supported. When using a shared ACSLS library, the library manager must be a Tivoli Storage Manager server on a AIX, HP-UX, Linux, Solaris, or Windows operating system.

A library client requests shared library resources, such as drives or media, from the library manager, but uses the resources independently. The library manager coordinates the access to these resources. Data moves over the SAN between the storage device and either the library manager or the library client. Either the

library manager or any library client can manage the LAN-free movement of client data as long as the client system includes a storage agent.

In this library-sharing environment, the most important relationship is the one between the server and the storage agent. The server, working with the storage agent, manages the storage hierarchy. The server could be a library client or library manager. The server is responsible for the following:

- Migrations
- Expiration of files based on policy information
- Reclamation of free space on volumes and consolidation of the volumes
- Disaster recovery

The storage agent contributes information to the storage hierarchy through various operations, but this role is independent of the library sharing role.

The following library manager and library client configurations are represented in Figure 5:

- A Tivoli Storage Manager server library manager manages data of a client, which is stored in a tape library.
- A Tivoli Storage Manager server library client manages data of a client, which is stored in a tape library.

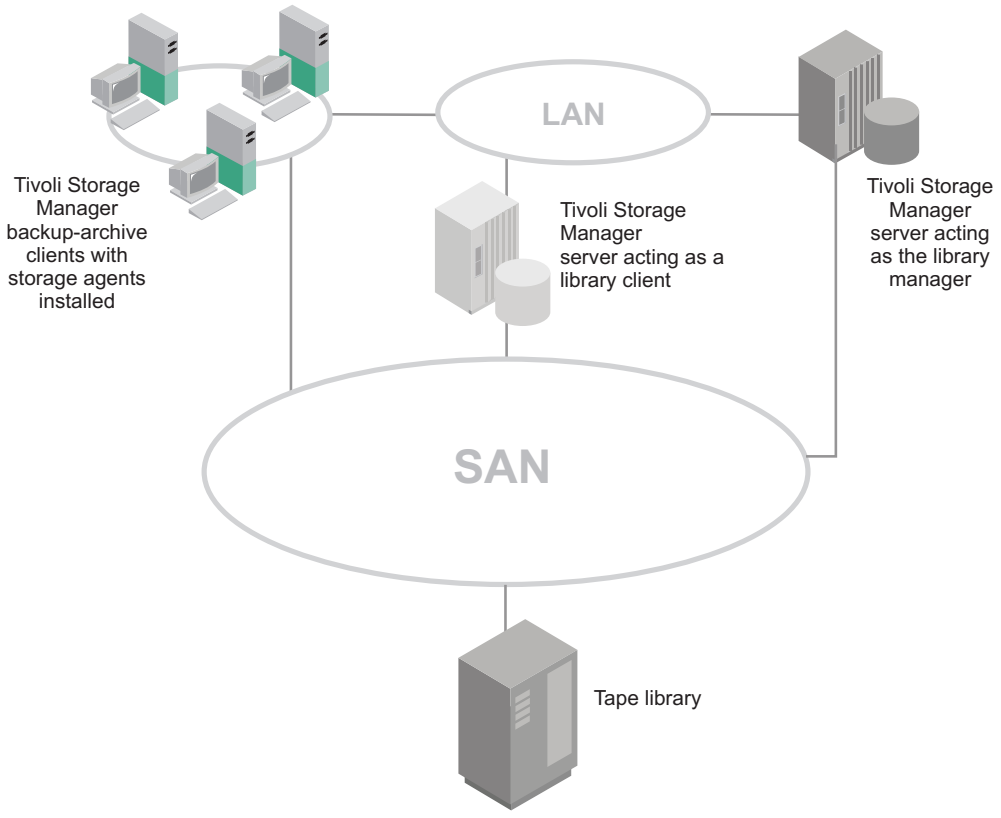


Figure 5. Library manager and client LAN-free configuration

Tips:

- An environment can have a library manager without a library client.

- In an environment where ACSLS library support is required, the library client and library manager can reside on a Tivoli Storage Manager server on AIX, HP-UX, Linux, Solaris, or Windows.

File device sharing using Tivoli SANergy

When Tivoli Storage Manager servers share access to disk storage, the environment contains a shared FILE device class and uses file-sharing software such as Tivoli SANergy.

Note: SANergy is just one option for file-sharing software. IBM General Parallel File System is the preferred option for the operating systems on which it is supported. All servers and storage agents must have access to the same General Parallel File System storage. Enable the instance user IDs for the server and the user ID for the storage agents to access the General Parallel File System storage. For more information about setting up user ID mapping in a mixed Windows or UNIX environment, see General Parallel File System documentation.

SANergy provides a file-sharing accelerator. Because you are using a FILE library, you must determine the location in which to install the Tivoli SANergy client and the Tivoli SANergy Metadata Controller (MDC). On operating systems such as AIX or Linux, Common Internet File System (CIFS) or a Network File System (NFS) are required software.

Restriction: The Tivoli SANergy license, which is included with the storage agent media, is provided with Tivoli Storage Manager only for supporting LAN-free backup to disk.

Figure 6 on page 22 shows ways in which you configure Tivoli SANergy.

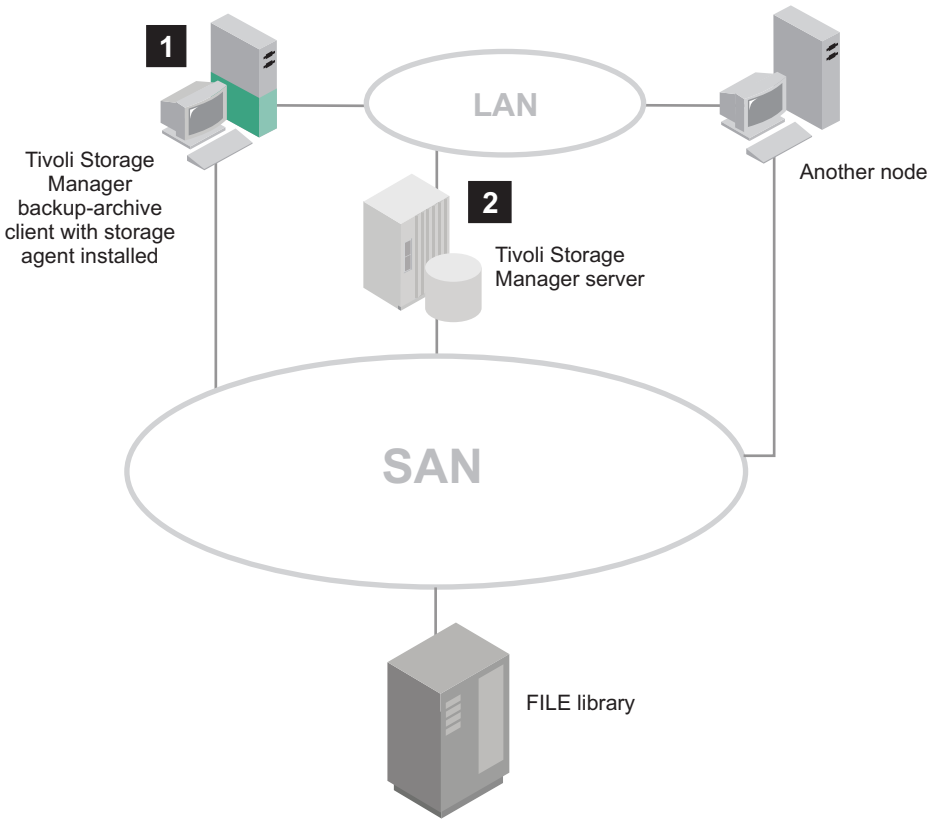


Figure 6. Tivoli SANergy configurations

One way to configure SANergy is to install the Tivoli SANergy client on the Tivoli Storage Manager client system (1) and to install the Tivoli SANergy MDC on the Tivoli Storage Manager server (2). Configurations can also consist of multiple operating systems. For example, an environment can consist of a SANergy MDC working with clients on Windows and AIX operating systems.

Related information:

IBM General Parallel File System

IBM General Parallel File System Information Center

Tivoli SANergy

TotalStorage SAN File System

External libraries

If you cannot use a Tivoli Storage Manager native library (SCSI, 349*x*, and ACSLS), configure external library support.

A typical external library configuration includes an external library manager such as the IBM Enterprise Removable Media Manager.

The Oracle StorageTek Automated Cartridge System Library Software (ACSLS) server or LibraryStation on z/OS manages the physical aspects of tape cartridge storage and retrieval. See Figure 7 on page 23. The external library manager communicates with the ACSLS server or LibraryStation on z/OS to access tape cartridges in an automated Oracle StorageTek library. The storage agent is installed on a system that contains the external library manager and a Tivoli Storage Manager backup-archive client or a Tivoli Storage Manager data protection

application client. This configuration provides access to SAN-attached storage devices using LAN-free data movement. The continued connection to the LAN provides a metadata (control information) path. If the storage agent is not available, the SAN provides a failover path for data backup and recovery.

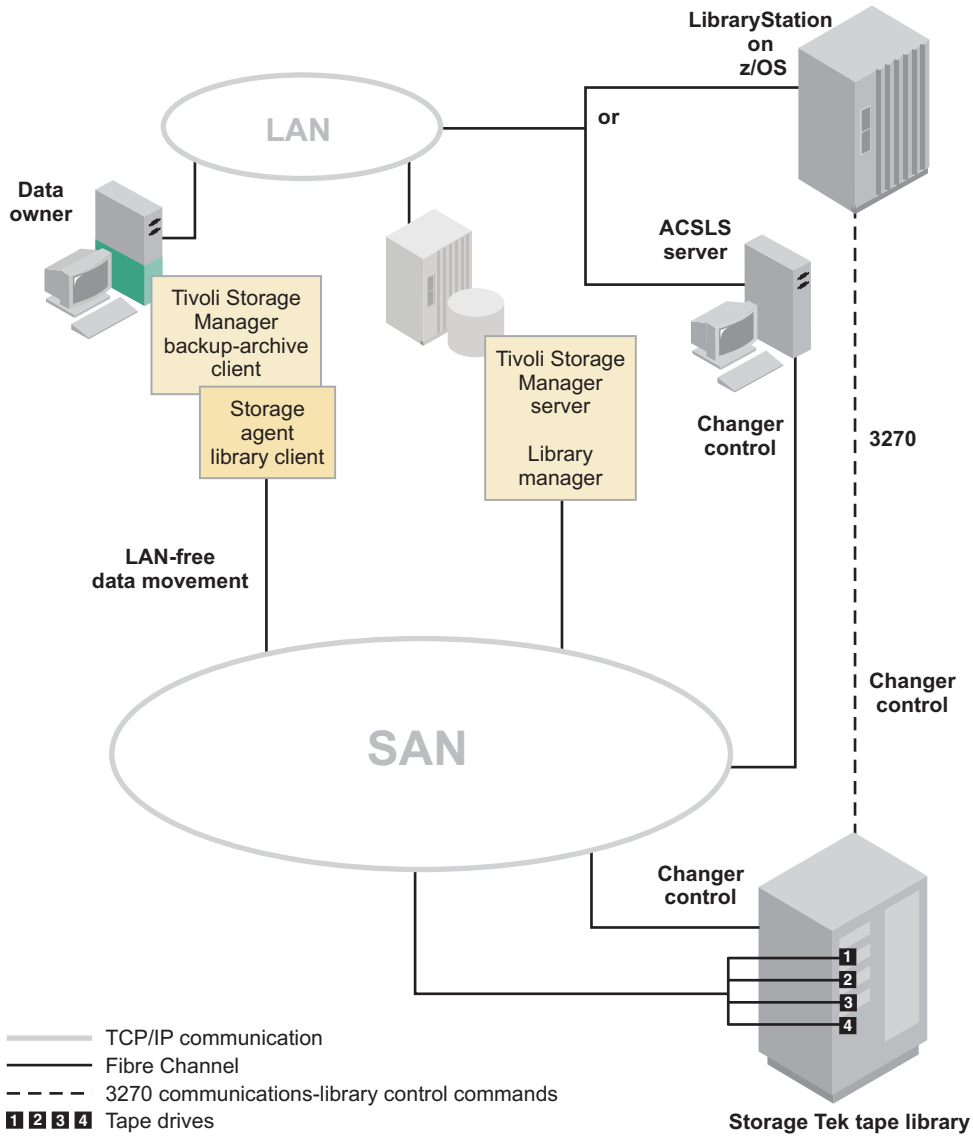


Figure 7. ACSLS library environment

If you have data associated with the Tivoli Storage Manager ACSLS library type and want to take advantage of LAN-free data movement, you must consider coexistence and migration issues.

If you stored data using external library support for ACSLS library access and plan to migrate to a native Tivoli Storage Manager library sharing environment, see the *Administrator's Guide*.

Related concepts:

"ACSLS legacy data migration and coexistence" on page 91

Tivoli Storage Manager for z/OS Media storage devices

Tivoli Storage Manager for z/OS Media provides access to storage devices, such as tape device types and FILE device types, that are attached to a z/OS media server.

The following table lists the supported devices and examples of Tivoli Storage Manager device types:

Table 13. Device types

Device	Device Type
Tape (real and virtual)	3590, 3592, CARTRIDGE, ECARTRIDGE
VSAM (Virtual Sequential Access Method) Linear Data Set (LDS)	FILE

If a Virtual Tape Library (VTL) has device characteristics of IBM 3490 recording technology, it can be accessed through the z/OS media server by the CARTRIDGE device type. If a VTL has device characteristics of IBM 3590 recording technology, the storage resources can be accessed through the z/OS media server by the 3590 device type.

Encryption support

Encryption provides security and protects sensitive data on tape media.

With Tivoli Storage Manager for Storage Area Networks, you can use encryption with the following drives:

- IBM and HP LTO-4 or later
- IBM 3592 generation 2 and later
- IBM TS1120 generation and later
- Oracle StorageTek T10000B
- Oracle StorageTek T10000C

You can also use client-side encryption and the Tivoli Storage Manager automatically-generated password.

When LTO-4 encryption is enabled, Tivoli Storage Manager manages data encryption and decryption according to specifications set when defining the LTO device class. To enable drive encryption with IBM LTO-4, you must have the IBM RMSS Ultrium device driver installed. IBM LTO-4 SCSI drives do not support encryption.

Validation of data during tape read/write operations

To validate data and identify data that is corrupted, you can use *logical block protection*. With logical block protection, you can identify errors that occur while data is being written to tape and while data is transferred from the tape drive to the Tivoli Storage Manager server through the storage area network.

Logical block protection is supported only with the following types of drives and media:

- LTO5-drives and later
- IBM 3592 generation 2 and later
- IBM TS1120 generation and later
- Oracle StorageTek T10000C drives

For more information about logical block protection, see the *Administrator's Guide*.

Concurrent access to volumes in storage pools associated with the FILE device type

Concurrent access improves restore performance. Two or more client sessions, two or more storage agents, or a combination of client sessions and storage agents can access the same volume at the same time.

Multiple client sessions and storage agents can read a FILE volume concurrently. In addition, one client session or storage agent can write to the volume while it is being read. FILE volumes provide the following benefits:

- You can reduce the potential for performance degradation when you back up or archive to FILE volumes.
- You can control the size of FILE volumes by specifying a maximum capacity.
- You can control the number of concurrently open file volumes.

Access to client-side deduplicated data using LAN-free data movement

Only V6.2 or later storage agents can use LAN-free data movement to access storage pools that contain data that was deduplicated by clients. V6.1 or earlier storage agents cannot use LAN-free data movement to access these storage pools.

Using a V6.1 storage agent or earlier to access a storage pool that contains client-side deduplicated data causes restore operations and retrieve operations to use the LAN. See Table 14.

Table 14. Paths for data movement

	Storage pool contains only client-side deduplicated data	**Storage pool contains a mixture of client-side and server-side deduplicated data**	**Storage pool contains only server-side deduplicated data**
V6.1 or earlier storage agent	Over the LAN	Over the LAN	LAN-free
V6.2 or later storage agent	LAN-free	LAN-free	LAN-free

V6.2 or later backup-archive clients are compatible with V6.2 or later storage agents, and provide LAN-free access to storage pools that contain client-side deduplicated data.

As part of the planning process, decide whether you want to use LAN-free data movement and whether you want to use client-side data deduplication, server-side deduplication, or both. If you decide to use LAN-free data movement and both client-side and server-side data deduplication, complete one of the following steps:

- For V6.1 or earlier storage agents, store client-side deduplicated data in a separate storage pool. Restore and retrieve deduplicated data from this storage pool over the LAN. Use LAN-free data movement to restore and retrieve data from storage pools that contain data that was deduplicated only by the server.
- Upgrade to V6.2 or later storage agents. Upgrading to V6.2 or later storage agents provides LAN-free access to any storage pool that contains client-side deduplicated data, server-side deduplicated data, or both.

Chapter 3. Installing and configuring tape-library and file-device-sharing environments

The destination for LAN-free data can be tape media or sequential-access disk media. Configuration requirements vary depending upon the type of environment.

Before beginning this procedure:

- Make sure that you understand the overall installation and configuration process, which takes place on different systems at different times.
- Be sure that you have the information recorded in the configuration-information work sheets.

The major installation and configuration steps are:

1. "Establishing network connections"
2. "Installing and configuring software on client systems" on page 28
3. "Defining the storage agent and configuring devices on the server" on page 37
4. "Defining paths from the storage agent to drives" on page 42
5. "Verifying the LAN-free configuration" on page 45
6. "Determining whether the data movement was LAN-free" on page 46

Related tasks:

"Setting up LAN-free data movement using the Administration Center wizard" on page 47

Related reference:

"Configuration work sheets for storage agent configuration" on page 13

Establishing network connections

Tivoli Storage Manager for Storage Area Networks requires specific levels and models of hardware and software. You must ensure that your system meets these requirements.

To establish network connections:

1. Attach the server system and the client systems to the LAN and to the SAN along with appropriate storage devices.
2. Optional: If you are planning to use a storage agent with disk media, install IBM General Parallel File System, Tivoli SANergy, or IBM TotalStorage SAN File System on the applicable systems. Tivoli SANergy is included with the storage agent media.

   Restriction: Use of the Tivoli SANergy components that are included with the IBM Tivoli Storage Manager media is limited. You can use Tivoli SANergy components only for LAN-free backup and restore-to-disk operations in conjunction with your licensed use of the IBM Tivoli Storage Manager for Storage Area Networks product.

   For details about TivoliSANergy, see the *IBM Tivoli SANergy Administrator's Guide*. For details levels and models of hardware and software, see http://www.ibm.com/software/sysmgmt/products/support/IBMTivoliStorageManager.html.

Related concepts:

"File device sharing using Tivoli SANergy" on page 21

Related information:

Tivoli Storage Manager for Storage Area Networks support

IBM General Parallel File System

IBM General Parallel File System Information Center

Tivoli SANergy

TotalStorage SAN File System

Installing and configuring software on client systems

You install storage agents and backup-archive or Tivoli Storage Manager Data Protection clients on client systems. If you install a Data Protection application client, you must also install the Tivoli Storage Manager API.

Complete the following tasks to install and configure the software:

1. "Installing and configuring the client"
2. "Installing the storage agent" on page 31
3. "Configuring the storage agent" on page 36

Related concepts:

"Communications between the client, storage agent, and Tivoli Storage Manager server" on page 9

Related tasks:

"Verifying and updating client node information" on page 52

"Verifying and updating client node information" on page 30

"Verifying and updating client node information" on page 74

Installing and configuring the client

The client can be a Tivoli Storage Manager backup-archive client or a Tivoli Storage Manager Data Protection application client.

Before beginning this procedure, you must complete the following steps:

- Verify that the client system meets the prerequisites for client software. To ensure software compatibility, check the website for Tivoli Storage Manager storage agent and backup-archive client compatibility. You can download the latest software levels from http://www.ibm.com/support/entry/portal/Overview/Software/Tivoli/Tivoli_Storage_Manager.

  For details about installing a backup-archive client, see the *Backup-Archive Clients Installation and User's Guide*. For details about installing a Data Protection application client, see the *Data Protection Installation and Users Guides*.
- Ensure that you completed the configuration work sheets.
- Ensure that client nodes are registered and configured on the server. To register client nodes, use the **REGISTER NODE** or **UPDATE NODE** command.

Requirement: If multiple clients are using LAN-free data movement, install or upgrade the client software on each client system.

To install and configure the client, complete the following steps:

1. Install or upgrade the backup-archive client software or Data Protection application-client software.
2. Using the information that you collected in the configuration work sheets, modify the following file:
   - `dsm.sys` client system-options file

   Tip: The file can be located in one of several places, such as the installation directory, or in a location pointed to by an environment variable.

   Specify the communication method to be used between the client and server.

Table 15. Communications methods

To use this communication method	Install this software	To connect to these Tivoli Storage Manager servers
TCP/IP	TCP/IP (standard with supported operating systems)	AIX, HP-UX, Linux x86_64, Linux on System z, POWER®, Solaris, Windows Server 2008, Windows Server 2008 R2
Shared memory	TCP/IP (standard with platforms)	Solaris

   For example:

```
commmethod tcpip
tcpserveraddress server_c.example.com
tcpport 1502
```

   The preceding example uses a TCPPORT of 1502. However, the default TCPPORT is 1500.

   Do not close the file.

   Remember: The backup-archive client `SERVERNAME` option is not related to the storage agent SERVERNAME option. For details, see the *Backup-Archive Clients Installation and User's Guide*.
3. Add the following options to the same stanza in the same file that you edited in step 2. These options specify that the client uses SAN-attached devices, when the path is available, during backup, restore, archive, and retrieve processing.

```
enablelanfree yes
lanfreecommmethod tcpip
lanfreetcpserveraddress agent.example.com
lanfreetcpport 1500
```

   or

```
enablelanfree yes
lanfreecommmethod SharedMem
lanfreeshmport 1510
```

Related concepts:

"Communications between the client, storage agent, and Tivoli Storage Manager server" on page 9

Related tasks:

"Verifying and updating client node information" on page 52

"Verifying and updating client node information"

"Verifying and updating client node information" on page 74

Related reference:

"Client-system and server-system configuration work sheets" on page 13

Related information:

Tivoli Storage Manager for Storage Area Networks support

Storage agent and client compatibility with Tivoli Storage Manager servers

Tivoli Storage Manager support

Verifying and updating client node information

When you configure LAN-free data movement you must register client nodes and provide policy information about client nodes. You can also restrict when a client node uses a LAN-free path.

To verify client node information, complete the following steps:

1. Identify the client node or nodes that will use the storage agent. In a typical environment, a storage agent is used only by the client node residing on the same system as the storage agent. However, you can configure two or more client nodes to use the same storage agent.
2. Verify that the nodes are registered. If they are not registered, you need to register them. For details, see the *Administrator's Guide*.
3. Verify the policy information for the nodes. The copy group for backup and archive must point to a storage pool that has a LAN-free path for a particular storage agent. You define drive LAN-free paths and make them available for the storage pool. To view the destinations that are capable of LAN-free data movement, you can issue the **VALIDATE LANFREE** command on the server. For details about this command, see the *Administrator's Reference*.
4. After you verify the registration and policy information for the nodes, you can place restrictions on when a node can use the LAN-free path. The node attributes **DATAWRITEPATH** and **DATAREADPATH** determine the restriction placed on the node:
   - To use only the LAN-free path on backup and archive operations, specify **DATAWRITEPATH**.

     Important: Backup and archive operations can fail if the LAN-free path is unavailable.
   - To use the LAN path on restore and retrieve operations, specify **DATAREADPATH**.

   For more information about commands and their attributes, see the *Administrator's Reference*.

Related tasks:

"Configuring multiple clients to use the same storage agent" on page 94

"Using LAN and LAN-free paths in the same backup operation" on page 95

Installing the storage agent

The storage agent must be installed on a client system that has connections to storage resources on the SAN. To install the storage agent, you can use the GUI installation wizard, the console wizard, or the command line in silent mode.

You can install the storage agent in a Solaris global or local zone. The Solaris Zone feature is available with Solaris Version 10.

Related tasks:

"Installing the storage agent to a Solaris Zone" on page 92

Related reference:

"DSMSTA SETSTORAGESERVER command" on page 103

Installing the storage agent using the GUI installation wizard

You can use the GUI installation wizard to install the storage agent.

Before beginning this procedure, you must:

- Verify that your system meets the hardware and software requirements.
- Ensure that you completed the configuration work sheets.
- Close all active Tivoli Storage Manager products. Installation stops if an active Tivoli Storage Manager process is detected. If the installation stops, close all active Tivoli Storage Manager products and try installing the storage agent again.
- Log in with the root user ID. If you do not log in with the root user ID, certain key Tivoli Storage Manager functions do not work correctly.
- Before installing any Tivoli Storage Manager components, ensure that the **LD_LIBRARY_PATH_64** environment variable is *not* set.

Tip: To reduce workload and processing time, and to optimize LAN-free performance, do not install the storage agent and the Tivoli Storage Manager server on the same system.

To install the storage agent:

1. Access the installation files by using one of the following methods:
   - If you are installing the storage agent by using the Tivoli Storage Manager DVD, insert the Tivoli Storage Manager DVD into a DVD drive. Ensure that the DVD is mounted on directory `/dvdrom` and change to that directory.
   - If you downloaded the program from Passport Advantage as an executable file, complete these steps:
     a. Verify that you have enough space to store the installation files when they are extracted from the product package. For space requirements, see the Passport Advantage download document.

        Tip: In the next step, the files are extracted to the current directory. Ensure that the executable file is in the directory where you want the extracted files to be located.

     b. Change to the directory where you placed the executable file.
        1) Change the file permissions by entering the following command:
           ```
           chmod a+x package_name.bin
           ```
        2) Extract the installation files:
           ```
           ./package_name.bin
           ```

The value for *package_name* is the name of the installation package. The value is typically a name such as `CZ1JLML.tar.gz`. The package is large, so the extraction process can take some time.

2. Select a method to start the installation wizard:
   - To start the wizard and save your responses, enter the **./install.bin -r /response.rsp** command, and specify the -r option.
   - To start the wizard without saving your responses, enter the **./install.bin** command:
3. Follow the wizard directions, clicking **Next** to step through the wizard.

   In the component list, select the storage agent component. There is no default, so you must make a selection. Otherwise, you receive an error message and are returned to the components page.

At the end of the installation, a summary is provided. If there were any errors during the installation, another summary page lists the errors and directs you to an error log file. The installation log is stored in the following location:

```
/var/tivoli/tsm
```

The default installation directory is:

```
/opt/tivoli/tsm/StorageAgent/bin
```

The Global Security Kit (GSKit) is automatically installed when you install the storage agent component.

After you install the storage agent and before you customize it for your use, go to the Tivoli Storage Manager support website: http://www.ibm.com/support/entry/portal/Overview/Software/Tivoli/Tivoli_Storage_Manager. Click **Downloads** and apply any applicable fixes.

Related concepts:

"Software requirements" on page 7

Related information:

Tivoli Storage Manager for Storage Area Networks support

Passport Advantage download document

Installing the storage agent using the console installation wizard

You can use the console installation wizard to install the storage agent.

Before beginning this procedure, you must:

- Verify that your system meets the hardware and software requirements.
- Ensure that you completed the configuration work sheets.
- Close all active Tivoli Storage Manager products. Installation stops if an active Tivoli Storage Manager process is detected. If the installation stops, close all active Tivoli Storage Manager products and try installing the storage agent again.
- Log in with the root user ID. If you do not log in with the root user ID, certain key Tivoli Storage Manager functions do not work correctly.
- Before installing any Tivoli Storage Manager components, ensure that the **LD_LIBRARY_PATH_64** environment variable is *not* set.

Tip: To reduce workload and processing time, and to optimize LAN-free performance, do not install the storage agent and the Tivoli Storage Manager server on the same system.

To install the storage agent:

1. Access the installation files by using one of the following methods:
   - If you are installing the storage agent by using the Tivoli Storage Manager DVD, insert the Tivoli Storage Manager DVD into a DVD drive. Ensure that the DVD is mounted on directory `/dvdrom` and change to that directory.
   - If you downloaded the program from Passport Advantage as an executable file, complete these steps:
     a. Verify that you have enough space to store the installation files when they are extracted from the product package. For space requirements, see the Passport Advantage download document.

        Tip: In the next step, the files are extracted to the current directory. Ensure that the executable file is in the directory where you want the extracted files to be located.

     b. Change to the directory where you placed the executable file.
        1) Change the file permissions by entering the following command:
           ```
           chmod a+x package_name.bin
           ```
        2) Extract the installation files:
           ```
           ./package_name.bin
           ```

           The value for *package_name* is the name of the installation package. The value is typically a name such as `CZ1JLML.tar.gz`. The package is large, so the extraction process can take some time.
2. Start the wizard:
   - To start the wizard and save your responses:
     – Enter the following command and specify the -r option:
       ```
       ./install.bin -i console -r /response.rsp
       ```
   - To start the wizard without saving your responses, enter the following command:
     – `./install.bin -i console`
3. Follow the wizard directions, clicking **Next** to step through the wizard.

   In the component list, select the storage agent component. There is no default, so you must make a selection. Otherwise, you receive an error message and are returned to the components page.

At the end of the installation, a summary is provided. If there were any errors during the installation, another summary page lists the errors and directs you to an error log file. The installation log is stored in the following location:

```
/var/tivoli/tsm
```

The default installation directory is:

```
/opt/tivoli/tsm/StorageAgent/bin
```

The Global Security Kit (GSKit) is automatically installed when you install the storage agent component.

After you install the storage agent and before you customize it for your use, go to the Tivoli Storage Manager support website: http://www.ibm.com/support/entry/portal/Overview/Software/Tivoli/Tivoli_Storage_Manager. Click **Downloads** and apply any applicable fixes.

Related concepts:

"Software requirements" on page 7

Related information:

Tivoli Storage Manager for Storage Area Networks support

Passport Advantage download document

Installing the storage agent in silent mode

You can install the storage agent in silent mode.

Before beginning this procedure, you must:

- Verify that your system meets the hardware and software requirements.
- Ensure that you completed the configuration work sheets.
- Close all active Tivoli Storage Manager products. Installation stops if an active Tivoli Storage Manager process is detected. If the installation stops, close all active Tivoli Storage Manager products and try installing the storage agent again.
- Log in with the root user ID. If you do not log in with the root user ID, certain key Tivoli Storage Manager functions do not work correctly.
- Before installing any Tivoli Storage Manager components, ensure that the **LD_LIBRARY_PATH_64** environment variable is *not* set.

Tip: To reduce workload and processing time, and to optimize LAN-free performance, do not install the storage agent and the Tivoli Storage Manager server on the same system.

To install the storage agent:

1. Access the installation files by using one of the following methods:
   - If you are installing the storage agent by using the Tivoli Storage Manager DVD, insert the Tivoli Storage Manager DVD into a DVD drive. Ensure that the DVD is mounted on directory `/dvdrom` and change to that directory.
   - If you downloaded the program from Passport Advantage as an executable file, complete these steps:
     a. Verify that you have enough space to store the installation files when they are extracted from the product package. For space requirements, see the Passport Advantage download document.

        Tip: In the next step, the files are extracted to the current directory. Ensure that the executable file is in the directory where you want the extracted files to be located.

     b. Change to the directory where you placed the executable file.
        1) Change the file permissions by entering the following command:
           `chmod a+x package_name.bin`
        2) Extract the installation files:
           `./package_name.bin`

The value for *package_name* is the name of the installation package. The value is typically a name such as `CZ1JLML.tar.gz`. The package is large, so the extraction process can take some time.

2. Using silent mode is one method of installing the storage agent.
   - To start the silent installation and include the storage agent, licenses, and device driver, enter the following command on a single line:

     ```
     ./install.bin -i silent
     -DIBM_TSM_LICENSE_ACCEPTED=true
     -DINSTALL_STAGENT=1
     -DINSTALL_DEVICES=1
     ```

     To define the silent installation, specify the variables in this file:

     ```
     ./install.bin
     ```

Table 16. Variables for the silent installation

Variable	Description
• `-DIBM_TSM_LICENSE_ACCEPTED=true` • `-DIBM_TSMEE_LICENSE_ACCEPTED=true` • `-DIBM_SSAM_LICENSE_ACCEPTED=true` • `-DIBM_TSMSAN_LICENSE_ACCEPTED=true` (required)	Specify one or two variables or the installation stops. It also stops if you specify more than two variables. The wizard installs the license agreement for the Tivoli Storage Manager product that is selected. **Tip:** If two products are specified, the wizard checks that one of them is the Tivoli Storage Manager for Storage Area Networks license: IBM_TSMSAN_LICENSE_ACCEPTED=true. If one variable is not, the wizard stops.
`-DINSTALL_DEVICES=1` (optional)	Install the Tivoli Storage Manager device driver.
`-DINSTALL_STAGENT=1` (optional)	Install the Tivoli Storage Manager storage agent.

Restrictions:

– You must include IBM_TSMSAN_LICENSE_ACCEPTED=true or the installation fails.

– Do not change the installation directory (the *USER_INSTALL_DIR* variable).

   - A response file contains variables that you selected during a prior installation, using the GUI or console wizard. To use an existing response file, issue the following command:

     ```
     ./install.bin -i silent -DIBM_TSM_LICENSE_ACCEPTED=true -f response_file
     ```

     where the *response_file* is the full directory path to a file that you previously created in the Tivoli Storage Manager installation process.

     If you include IBM_TSMSAN_LICENSE_ACCEPTED=true in the response file manually, issue the following command:

     ```
     ./install.bin -i silent -f response_file
     ```

     You might see a difference between response files, depending on which installation mode you used (GUI or console).

At the end of the installation, a summary is provided. If there were any errors during the installation, another summary page lists the errors and directs you to an error log file. The installation log is stored in the following location:

```
/var/tivoli/tsm
```

The default installation directory is:

```
/opt/tivoli/tsm/StorageAgent/bin
```

The Global Security Kit (GSKit) is automatically installed when you install the storage agent component.

After you install the storage agent and before you customize it for your use, go to the Tivoli Storage Manager support website: http://www.ibm.com/support/entry/portal/Overview/Software/Tivoli/Tivoli_Storage_Manager. Click **Downloads** and apply any applicable fixes.

Related concepts:

"Software requirements" on page 7

Related information:

Tivoli Storage Manager for Storage Area Networks support

Passport Advantage download document

Configuring the storage agent

After the installation is completed, you must configure the storage agent to ensure communication with the backup-archive client and the Tivoli Storage Manager server.

To configure the storage agent, complete the following steps:

1. Point the server to the storage agent by issuing the **DEFINE SERVER** command on the Tivoli Storage Manager server.
2. Complete the steps in "Defining storage agents to the Tivoli Storage Manager server" on page 39.
3. Ensure that the DEVCONFIG option is specified in the storage agent options file dsmsta.opt.

   For example, for a device configuration file named devconfig.out, edit the dsmsta.opt file by typing the following line:

   ```
   DEVCONFIG devconfig.out
   ```

   The device configuration file can be located in the following directory:

   ```
   /opt/tivoli/tsm/StorageAgent/bin
   ```

4. Use the information that you collected in the configuration work sheets to issue the **DSMSTA SETSTORAGESERVER** command. For example:

   ```
   dsmsta setstorageserver myname=storagnt mypassword=fun4me
   myhladdress=agent.example.com
   servername=tsmsrver serverpassword=not4u
   hladdress=tsmsrver.example.com lladdress=1502
   ```

   Requirement:

   - The SERVERNAME option in the dsm.sys file, which is the client system options file, must match the SERVERNAME option in the dsm.opt file, which is the client user-options file. However, the option is unrelated to and does not need to match the SERVERNAME option that is defined for the storage agent in the storage-agent options file, dsmsta.opt.
   - The HLADDRESS option must match the TCPSERVERADDRESS option that is in the dsm.sys file on the Tivoli Storage Manager client. When configuring the storage agent by using the **DSMSTA SETSTORAGESERVER** command, use addresses that correspond to the communications method used by the backup-archive client. With the backup-archive client, you can use either IPv4 (**COMMMETHOD TCPIP**) or IPv6 (**COMMMETHOD V6TCPIP**), but not both at the same

time. To secure communication between the storage agent and the Tivoli Storage Manager server, ensure that your data is protected by Secure Sockets Layer (SSL).

The **DSMSTA SETSTORAGESERVER** command generates the following output in the storage agent device configuration file:

```
set staname storagnt
set stapassword xxxxxxx
set stakeydbpw xxxxxxx
set stahladdress agent.example.com
define server tsmsrver serverpassword=xxxxxxxxxxx
 hladdress=tsmsrver.example.com lladdress=1502
```

The passwords are encrypted in the file.

The command also generates the following line in the `dsmsta.opt` file:

```
SERVERNAME tsmsrver
```

Related reference:

"Client-system and server-system configuration work sheets" on page 13

"The storage agent options file" on page 98

"DSMSTA SETSTORAGESERVER command" on page 103

"The device configuration file for the storage agent" on page 97

Related information:

Tivoli Storage Manager for Storage Area Networks support

Storage agent and client compatibility with Tivoli Storage Manager servers

Tivoli Storage Manager support

Defining the storage agent and configuring devices on the server

To set up LAN-free communications on the Tivoli Storage Manager server, you must set up server-to-server communication, define storage agents to the server, configure SAN drives, set the LAN-free destination storage pool, and confirm node registration and configuration.

Before beginning this procedure, be sure that you have the information recorded in the configuration-information work sheets.

Complete these tasks to define the storage agent and configure devices on the server:

1. "Setting up server-to-server communication" on page 38
2. "Defining storage agents to the Tivoli Storage Manager server" on page 39
3. "Configuring SAN drives" on page 40
4. "Setting the LAN-free destination" on page 41
5. "Confirming client node registration and configuration" on page 41

When you complete all the steps that are required to define the storage agent and configure devices on the server, you can configure the storage agent to communicate with the backup-archive client and the Tivoli Storage Manager server. For more information, see "Defining the storage agent and configuring devices on the server"

Related reference:

"Configuration work sheets for storage agent configuration" on page 13

Setting up server-to-server communication

Server-to-server communication is required for Tivoli Storage Manager servers and storage agents to share library devices on a SAN.

To set up server-to-server communication, issue the following commands on the Tivoli Storage Manager server. Replace the example values with values from the configuration-information work sheet.

```
set servername tsmsrver
set serverpassword not4u
set serverhladdress tsmsrver.example.com
set serverlladdress 1502
```

These commands establish the server's name, password, TCP/IP address, and port.

Verify that the password has been set for the server by issuing the **QUERY STATUS** command from a Tivoli Storage Manager administrative command line. The value of the Server Password Set field in the command output must equal YES.

Configuring a storage agent and server to use SSL

You can set up a storage agent and the Tivoli Storage Manager server to use the SSL communication method. SSL is set up independently on both the storage agent and the Tivoli Storage Manager server.

To set up the storage agent to use SSL communication with the Tivoli Storage Manager server and client, complete the following steps:

1. On the storage agent, issue the **DSMSTA SETSTORAGESERVER** command to initialize the storage agent and add communication information to the device configuration file and the storage agent options file dsmsta.opt:

   Hint: The following command is entered on one line, but is displayed here on multiple lines to make it easier to read.

   ```
   dsmsta setstorageserver myname=sta
   mypa=sta_password
   myhla=ip_address
   servername=server_name
   serverpa=server_password
   hla=ip_address
   lla=ssl_port
   STAKEYDBPW=password
   ssl=yes
   ```

   Requirement:

   - When you set the **SSL=YES** and **STAKEYDBPW=password** parameters, a key database file is set up in the storage agent options file, dsmsta.opt. All passwords are obfuscated in dsmsta.opt.
   - To enable SSL communication, ensure that the Tivoli Storage Manager **LLA** parameter specifies the server SSLTCPADMIN port and set the **SSL** parameter to YES.

2. Import the Tivoli Storage Manager server certificate, `cert256.arm`, to the key database file for the storage agent. Ensure that the required SSL certificates are in the key database file that belongs to each storage agent that uses SSL communication. To import the SSL certificate, switch to the storage agent directory and issue the following command:

   ```
   gskcapicmd_64 -cert -add -label server_example_name
   -db cert.kdb -stashed -file cert256.arm -format ascii
   ```

3. Specify the SSLTCPPORT and the SSLTCPADMINPORT options in the dsmsta.opt options file.
4. Create the key database certificate and default certificates by starting the storage agent.

   Tip: To provide the new password to the storage agent, specify the **STAKEYDBPW=newpassword** parameter with the **DSMSTA SETSTORAGESERVER** command. Rerun the **DSMSTA SETSTORAGESERVER** command.
5. On the Tivoli Storage Manager server, issue the following command:

   ```
   define server sta
   hla=ip_address
   lla=ssl_port
   serverpa=password
   ssl=yes
   ```
6. Stop the storage agent.
7. Stop the Tivoli Storage Manager server.
8. Import the cert256.arm certificate from the storage agent to the key database file for the Tivoli Storage Manager server. Ensure that the required SSL certificates are in the key database file that belongs to each server that uses SSL communication before you restart the server. To import the SSL certificate from the storage agent, issue the following command:

   ```
   gskcapicmd_64 -cert -add -label server_example_name
   -db cert.kdb -stashed -file cert256.arm -format ascii
   ```
9. Stop and restart the Tivoli Storage Manager server.
10. Restart the storage agent.

When the Tivoli Storage Manager server and storage agent initiate communication, SSL certificate information is displayed to indicate that SSL is in use.

Defining storage agents to the Tivoli Storage Manager server

For each client that will use LAN-free data transfer, you must define the client's storage agent to the server as if the storage agent is another server.

To define the storage agent, issue the **DEFINE SERVER** command from the Tivoli Storage Manager server (library manager or library client) that will manage the client's data. Use the same name and password that you specified for the storage agent when you installed it on the client system.

```
define server storagnt serverpassword=fun4me
hladdress=agent.tucson.ibm.com lladdress=1500 ssl=yes
```

The **SSL** parameter in the example is optional. This parameter specifies that SSL communication is used. If you specify SSL as the communication method, you must import SSL certificates from the server to the storage agent, and from the storage agent to the server. Import SSL certificates before you start the storage agent or the server.

If the library to be used for LAN-free data movement is a Tivoli Storage Manager shared library and the data manager server is a library client, then you must define the storage agent to the library manager as well as the library client. The storage agent needs to be able to contact the library manager directly when making mount requests. If the storage agent is only defined to the library client, it will attempt to use information from the library client to define itself to the library

manager. If the storage agent is unable to define itself to the library manager, then you must define the storage agent manually using the **DEFINE SERVER** command issued from the library manager.

To verify that the storage agent is defined to the library manager, issue the following command from the library manager server:

```
query server server_name format=detailed
```

Important: If the library manager server is different than the library client server that hosts the storage agent, define the storage agent as a server on both the library manager server and the library client server.

When the storage agent is defined to the server, you can complete the steps in "Configuring the storage agent" on page 36.

Configuring SAN drives

Drive-configuration requirements vary depending on whether you are using tape devices or disk devices.

Configuring tape drives

Configuration requirements vary depending on whether you are connecting the storage agent to a library manager or to a library client.

- To connect the storage agent to a library manager:
  1. Define a shared ACSLS, SCSI, VTL, or 3494 library using the SHARED=YES option.
  2. Define paths to the library using the DEFINE PATH command on the server.
  3. Define drives that are associated with the library.
  4. Define paths to the drives using the DEFINE PATH command on the server.
  5. Define the device class.
  6. Define the storage pool.

  When using a shared ACSLS library, the library manager must be a Tivoli Storage Manager server on AIX, HP-UX, Linux, Solaris, or Windows.
- To connect the storage agent to a library client:
  1. On the library manager, complete step 1 through step 5.
  2. On the library client:
     a. Define a shared ACSLS, SCSI, VTL, or 3494 library using a library type of shared (LIBTYPE=SHARED).
     b. Define the device class.
     c. Define the storage pool.

Configuring disk drives

A FILE (sequential-access disk) device class is required for disk drives.

To configure disk drives:

1. Configure server-to-server communication.
2. Define a device class of DEVTYPE=FILE and SHARED=YES. Tivoli Storage Manager automatically defines a new FILE library and also defines drives corresponding to the mount limit for the FILE device class. The FILE library name is the same as the device class name. Each drive uses the library name with a numeric suffix. If the mount limit is changed, the number of drives also changes.

Each session gets exclusive access to a file volume. To optimize performance, match the mount limit to the number of volumes.

Setting the LAN-free destination

The destination for data must be a LAN-free capable storage pool.

To set a LAN-free destination:

1. Define a copy group with its destination being the LAN-free capable storage pool that you created when you configured the SAN drives. For example:

   ```
   define copygroup sandirect sandirectpolicy sandirectdefmft
   type=backup destination=storage_pool_name
   ```

   Note: If you are using a hierarchical storage management (HSM) client configured for LAN-free data movement, set the management class (not the copy group) to a LAN-free capable storage pool.
2. Activate the policy set. For example:

   ```
   activate policyset sandirect sandirectpolicy
   ```

For details about changing policy for clients that can use SAN drives, see the *Administrator's Guide*. For details about commands, see the *Administrator's Reference*.

Remember: If you decide not to use the default management class for the SAN drives, you need to create a new management class. Clients that use SAN drives need an include statement to bind their files to the new management class. For details about the include-exclude list, see the *Backup-Archive Clients Installation and User's Guide*.

Confirming client node registration and configuration

Client nodes must be registered and configured for LAN-free backups.

To verify that node settings are correct, issue the following command:

```
query node node_name format=detailed
```

If node settings are not correct, issue the **UPDATE NODE** command to adjust the settings. If the node was not registered and configured for LAN-free backups, register the node with the **REGISTER NODE** command.

To improve performance of your LAN and SAN resources for LAN-free data movement, you can control the path that data transfers take for each LAN-free capable client. Use the **REGISTER NODE** and **UPDATE NODE** commands to specify whether data read/write operations use the LAN path only, the LAN-free path only, or either path.

If the node belongs to a multi-threaded client and there are drives available, the **MAXNUMMP** parameter might restrict the number of drives that are available for the storage agent to use on behalf of the client. Specify the **MAXNUMMP** parameter on the **REGISTER NODE** or **UPDATE NODE** command.

For more information about commands, see the *Administrator's Reference*.

Defining paths from the storage agent to drives

Paths allow a client, by means of a storage agent, access to the library drives that are available to the Tivoli Storage Manager server. Path-definition requirements depend on the type of device that you are using.

Before you begin defining paths to your SAN drives, consider the following guidelines:

- If you have not already done so, obtain the names of your tape or disk devices. If you are configuring tape devices, review the device names. The name of a tape device as known to the server will probably not match the name of the same tape device as known to the storage agent.
- You must define paths on the library manager for the storage agent to each drive that the storage agent will access. In addition, you must define a path for the library manager to each drive so that the storage agent can use the drive.

Related tasks:

"Obtaining device information" on page 18

Defining paths for tape devices

You must define paths on the Tivoli Storage Manager server using the device names as identified by the storage agent on each client system.

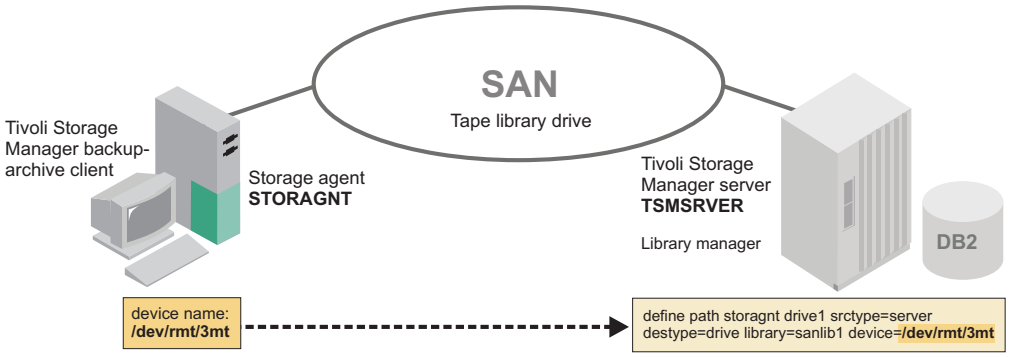


Figure 8. Device information

To define paths, issue the **DEFINE PATH** command on the Tivoli Storage Manager server designated as the library manager. For example:

```
define path storagnt drive1 srctype=server desttype=drive
 library=sanlib1 device=/dev/rmt/3mt
```

Be sure that the device names are what the storage agent identifies on each client system. For the same tape device, the device name as known to the server will probably not match the device name as known to the storage agent. Failures can occur if incorrect device information is provided in the **DEFINE PATH** command. For details about this command, see the *Administrator's Reference*.

Depending on the operating system of the Tivoli Storage Manager server, there might not be a quick way to confirm which device names on the storage agent correspond to device names on the Tivoli Storage Manager server without using a trial-and-error method.

To confirm device names, work with one online drive at a time, and cycle through the storage agent device names until you can run a successful backup. The server cannot validate path information that is provided on the server for use by the storage agent.

When defining paths on the server, you can specify `AUTODETECT=YES` to automatically update the serial number for a drive or library in the database. The updated serial number is the same serial number that the drive reports to Tivoli Storage Manager. After completing a backup to verify LAN-free configuration, you can issue the **QUERY DRIVE** command to determine the device name from the storage agent.

Related tasks:

"Verifying the LAN-free configuration" on page 45

Defining paths for disk devices

You must define paths on the Tivoli Storage Manager server using the disk device names as seen by the storage agent on each client system.

For example, suppose the directory `d:\tsmdata\server1` is exported on the NFS server running on the Tivoli Storage Manager server. On the storage agent, the directory is NFS mounted as `/tsmdata/server1`.

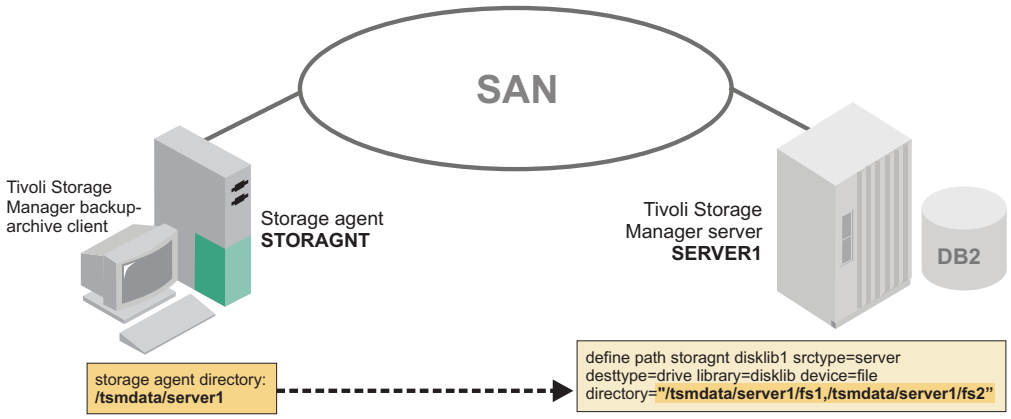


Figure 9. Device information

Issue the **DEFINE PATH** command to create the path for this scenario.

In the following example, `disklib1` represents the destination file drive in the disk library named `disklib`:

```
define path storagnt disklib1 srctype=server desttype=drive library=disklib
device=file directory="/tsmdata/server1/fs1,/tsmdata/server1/fs2"
```

Recommendation: Make each directory correspond to a file system on a separate physical drive. The server cannot validate PATH information that is provided on the server for use by the storage agent. Failures can occur if incorrect device information is provided in the DEFINE PATH command.

If you specify multiple directories for the device class associated with the FILE library, you must specify the same number of directories for each path to the FILE library. To keep the device class and path synchronized, do not change or move existing directories on the server that the storage agent is using. Adding directories

is permitted. Specifying a mismatched number of directories can cause a runtime failure. For more information, see the *Administrator's Guide*.

For details about the **DEFINE PATH** command, see the *Administrator's Reference*.

Preventing tape label overwrites

Tivoli Storage Manager tape labels can be overwritten by an application that uses a generic or native driver. If tape labels are overwritten, data can be lost.

Preventing tape labels from being overwritten

Tivoli Storage Manager tape labels can be overwritten by an application that uses a generic or native device driver. If tape labels are overwritten, data can be lost.

The Tivoli Storage Manager device driver and the Oracle Solaris generic SCSI tape driver (st driver) can reside in the kernel at the same time. They can also control and operate the same tape device attached on the system which can cause conflicts over how the device is managed.

If the Oracle Solaris generic SCSI tape driver (st driver) controls devices that are used by the Tivoli Storage Manager Tivoli Storage Manager device driver or the IBMtape device driver, Tivoli Storage Manager internal tape labels can be overwritten and data can be lost. By default, the st driver rewinds tapes at the end of an operation unless the non-rewind option is specified in the device special file name.

The auto rewind operation relocates the tape header position to the beginning of the tape. If the tape remains loaded in the drive, the next non-Tivoli Storage Manager write operation overwrites the Tivoli Storage Manager tape label because the label is at the beginning of the tape.

To prevent Tivoli Storage Manager data from being overwritten, the rmstdev utility locates and deletes all device special files that are created by the st driver and that correspond to devices configured by either the Tivoli Storage Manager device driver or the IBMtape device driver. This utility runs at startup when the server or storage agent is started automatically. If you do not start the Tivoli Storage Manager server or storage agent automatically, run rmstdev -d as the root user before starting the server or storage agent.

If rmstdev does not run when the server is started and st device special files are detected for any Tivoli Storage Manager tape drives, the drives are put into the polling state and an error message is issued every 10 minutes. After one hour, the drive is taken offline if the problem still exists.

Error messages are also displayed when the **DEFINE PATH** command is issued and Tivoli Storage Manager detects st device special files. The operation fails and the drive is not defined. To prevent any conflict that can occur, log on as the root user and run `/opt/tivoli/tsm/StorageAgent/bin/rmstdev -d` to delete the st special files. You do not have to halt the storage agent to run the rmstdev utility. You can then redefine a path to the drive.

Related reference:

"rmstdev (Detect and delete device special files)" on page 105

Verifying the LAN-free configuration

To ensure LAN-free data movement, you must verify that the hardware and software components are configured correctly.

Before you begin this procedure, verify that the server is online and running.

To verify LAN-free configuration, complete the following steps:

1. Start the storage agent:
   a. Reboot the client system.
   b. Change to the storage agent directory and issue the **DSMSTA** command.

   When the storage agent starts, it contacts all available shared libraries, including those libraries that do not have a defined path. As a result, a delay might occur during startup processing. The storage agent also determines if the Tivoli Storage Manager server is a library client or library manager. If the server is a library client, the storage agent attempts to define itself to the library manager if it is not known to the library manager. When the storage agent communicates with the Tivoli Storage Manager server, Secure Sockets Layer (SSL) information is displayed to indicate when SSL is in use.
2. Specify the `DISPLAYLFINFO=YES` option in your server options file. Doing so allows the accounting records and summary table entries to report the storage agent name.

   Important: This option might cause existing outboard automation that relies on the summary table or accounting records to fail to recognize some activities for a given client. Before setting this option, consider how this outcome might affect your environment.
3. To determine which destinations for a node are capable of LAN-free data movement, issue the **VALIDATE LANFREE** command. The output of this command also provides explanations about destinations that are not LAN-free capable. Use this information to correct your configuration before proceeding to the next step.
4. Run a backup operation from the client.
5. If you receive a message indicating that the backup failed, verify the following:
   - The Tivoli Storage Manager server is running. If the Tivoli Storage Manager server is not running, the storage agent will not start.
   - The client, storage agent, and server are communicating with each other as expected.
   - The paths to the drives are correctly defined.
   - All drives in a library have defined paths from the server.

   If you retry the backup operation after the first failure, the client attempts to use the LAN connection for data movement. To force LAN-free data movement, stop and restart the client.

Determining whether the data movement was LAN-free

Messages and backup reports can indicate whether LAN-free operations are successful. You can also use the **QUERY SESSION** and **QUERY ACTLOG** commands to verify LAN-free operations.

Use one or more of the following methods to determine whether the data movement was LAN-free:

- When data transfers on a LAN-free path, the following message displays informing you that the client is starting a session with the storage agent and that LAN-free data movement occurred:

  ANR0415I Session *session_number* proxied by *storage_agent_name* for node *your_node_name*

- View the backup report issued when backup processing completes. If LAN-free data movement occurred, the number of LAN-free bytes that are transferred is greater than zero.
- Verify that the proper sessions have been established and that LAN-free data movement is occurring:
  1. Using a Tivoli Storage Manager administrative command-line client, log in to the storage agent and the Tivoli Storage Manager server.
  2. Issue the **QUERY SESSION** command for the node that is running the LAN-free backup. In the command output, look for information about bytes sent and bytes received. If LAN-free data movement is occurring:
     - Querying a session on the storage agent shows bytes received for the node increasing to the total amount of data being backed up.
     - Querying a session on the Tivoli Storage Manager server shows a very small number of bytes of metadata received for the same node.

     If the node's session has these characteristics, the data movement is LAN-free.

  Tip: During a failover when the storage agent is sending data directly to the server by proxy because it cannot store the data directly, the session statistics on the server show a much higher byte count.
- Issue either of the following **QUERY ACTLOG** commands on the server to which the client is connected:
  - query actlog search=*storage_agent_name* msgno=8337
  - query actlog search=*storage_agent_name*

  If the query locates entries in the activity log that relate to the storage agent, the client is using LAN-free data transfer.

Related information:

Connecting to a Tivoli Storage Manager storage agent by using an administrative command-line client

Setting up LAN-free data movement using the Administration Center wizard

To set up LAN-free data movement on the server in tape-library and file-device-sharing environments, you can use the Enable LAN-free Data Movement wizard in the Administration Center.

1. Install or upgrade the client: "Installing and configuring the client" on page 28
2. Specify the `DEVCONFIG` option in the storage agent options file and issue the **`DSMSTA SETSTORAGESERVER`** command to initialize the storage agent and to update the device configuration file and the storage agent options file. For details, see "Configuring the storage agent" on page 36.
3. "Verifying the LAN-free configuration" on page 45
4. "Determining whether the data movement was LAN-free" on page 46

Chapter 4. Installing and configuring external-library environments

An external library is controlled by software, such as IBM Enterprise Removable Media Manager or Oracle StorageTek ACSLS software. To use the drives in the external library, the Tivoli Storage Manager server and the storage agent act independently as a client application to the software.

Before you begin this procedure, you need to:

- Ensure that you understand the overall installation and configuration process because it takes place on different systems at different times.
- Ensure that you have the information recorded in the configuration-information worksheets.
- Obtain an external library manager capable of exploiting the external library interface, for example, IBM Enterprise Removable Media Manager. For details about interfaces, see the *Administrator's Guide*.
- You can use the Oracle StorageTek LibraryStation to manage the environment instead of ACSLS.

The major installation and configuration steps are:

1. "Establishing network connections"
2. "Installing and configuring software on client systems" on page 50
3. "Defining the storage agent and configuring devices on the server" on page 59
4. "Verifying the LAN-free configuration" on page 64
5. "Determining whether the data movement was LAN-free" on page 65

Related concepts:

"External libraries" on page 22

Related reference:

"Configuration work sheets for storage agent configuration" on page 13

Establishing network connections

Tivoli Storage Manager for Storage Area Networks requires specific levels and models of hardware and software. You must ensure that your system meets these requirements.

To establish network connections, attach the server system and the client systems to the LAN and to the SAN along with appropriate storage devices. For details levels and models of hardware and software, see http://www.ibm.com/software/sysmgmt/products/support/IBMTivoliStorageManager.html.

Installing and configuring software on client systems

You install storage agents and backup-archive or Tivoli Storage Manager Data Protection clients on client systems. If you install a Data Protection application client, you must also install the Tivoli Storage Manager API.

Complete the following tasks to install and configure the software:

1. "Installing and configuring the client"
2. "Installing the storage agent" on page 52
3. "Configuring the storage agent" on page 58

Related concepts:

"Communications between the client, storage agent, and Tivoli Storage Manager server" on page 9

Related tasks:

"Verifying and updating client node information" on page 52

"Verifying and updating client node information" on page 30

"Verifying and updating client node information" on page 74

Installing and configuring the client

The client can be a Tivoli Storage Manager backup-archive client or a Tivoli Storage Manager Data Protection application client.

Before beginning this procedure, you must complete the following steps:

- Verify that the client system meets the prerequisites for client software. To ensure software compatibility, check the website for Tivoli Storage Manager storage agent and backup-archive client compatibility. You can download the latest software levels from http://www.ibm.com/support/entry/portal/Overview/Software/Tivoli/Tivoli_Storage_Manager.

  For details about installing a backup-archive client, see the *Backup-Archive Clients Installation and User's Guide*. For details about installing a Data Protection application client, see the *Data Protection Installation and Users Guides*.
- Ensure that you completed the configuration work sheets.
- Ensure that client nodes are registered and configured on the server. To register client nodes, use the **REGISTER NODE** or **UPDATE NODE** command.

Requirement: If multiple clients are using LAN-free data movement, install or upgrade the client software on each client system.

To install and configure the client, complete the following steps:

1. Install or upgrade the backup-archive client software or Data Protection application-client software.
2. Using the information that you collected in the configuration work sheets, modify the following file:
   - `dsm.sys` client system-options file

   Tip: The file can be located in one of several places, such as the installation directory, or in a location pointed to by an environment variable.

   Specify the communication method to be used between the client and server.

Table 17. Communications methods

To use this communication method	Install this software	To connect to these Tivoli Storage Manager servers
TCP/IP	TCP/IP (standard with supported operating systems)	AIX, HP-UX, Linux x86_64, Linux on System z, Linux on Power Systems, Solaris, Windows Server 2008, Windows Server 2008 R2
Shared memory	TCP/IP (standard with platforms)	Solaris

For example:

```
commmethod tcpip
tcpserveraddress server_c.example.com
tcpport 1502
```

The preceding example uses a TCPPORT of 1502. However, the default TCPPORT is 1500.

Do not close the file.

Remember: The backup-archive client `SERVERNAME` option is not related to the storage agent SERVERNAME option. For details, see the *Backup-Archive Clients Installation and User's Guide*.

3. Add the following options to the same stanza in the same file that you edited in step 2 on page 50. These options specify that the client uses SAN-attached devices, when the path is available, during backup, restore, archive, and retrieve processing.

```
enablelanfree yes
lanfreecommmethod tcpip
lanfreetcpserveraddress agent.example.com
lanfreetcpport 1500
```

or

```
enablelanfree yes
lanfreecommmethod SharedMem
lanfreeshmport 1510
```

Related concepts:

"Communications between the client, storage agent, and Tivoli Storage Manager server" on page 9

Related tasks:

"Verifying and updating client node information" on page 52

"Verifying and updating client node information" on page 30

"Verifying and updating client node information" on page 74

Related reference:

"Client-system and server-system configuration work sheets" on page 13

Related information:

Tivoli Storage Manager for Storage Area Networks support

Storage agent and client compatibility with Tivoli Storage Manager servers

Tivoli Storage Manager support

Verifying and updating client node information

When you configure LAN-free data movement you must register client nodes and provide policy information about client nodes. You can also restrict when a client node uses a LAN-free path.

To verify client node information, complete the following steps:

1. Identify the client node or nodes that will use the storage agent. In a typical environment, a storage agent is used only by the client node residing on the same system as the storage agent. However, you can configure two or more client nodes to use the same storage agent.
2. Verify that the nodes are registered. If they are not registered, you need to register them. For details, see the *Administrator's Guide*.
3. Verify the policy information for the nodes. The copy group for backup and archive must point to a storage pool that has a LAN-free path for a particular storage agent. You define drive LAN-free paths and make them available for the storage pool. To view the destinations that are capable of LAN-free data movement, you can issue the **VALIDATE LANFREE** command on the server. For details about this command, see the *Administrator's Reference*.
4. After you verify the registration and policy information for the nodes, you can place restrictions on when a node can use the LAN-free path. The node attributes **DATAWRITEPATH** and **DATAREADPATH** determine the restriction placed on the node:
   - To use only the LAN-free path on backup and archive operations, specify **DATAWRITEPATH**.

     Important: Backup and archive operations can fail if the LAN-free path is unavailable.
   - To use the LAN path on restore and retrieve operations, specify **DATAREADPATH**.

   For more information about commands and their attributes, see the *Administrator's Reference*.

Related tasks:

"Configuring multiple clients to use the same storage agent" on page 94

"Using LAN and LAN-free paths in the same backup operation" on page 95

Installing the storage agent

The storage agent must be installed on a client system that has connections to storage resources on the SAN. To install the storage agent, you can use the GUI installation wizard, the console wizard, or the command line in silent mode.

You can install the storage agent in a Solaris global or local zone. The Solaris Zone feature is available with Solaris Version 10.

Related tasks:

"Installing the storage agent to a Solaris Zone" on page 92

Related reference:

"DSMSTA SETSTORAGESERVER command" on page 103

Installing the storage agent using the GUI installation wizard

You can use the GUI installation wizard to install the storage agent.

Before beginning this procedure, you must:

- Verify that your system meets the hardware and software requirements.
- Ensure that you completed the configuration work sheets.
- Close all active Tivoli Storage Manager products. Installation stops if an active Tivoli Storage Manager process is detected. If the installation stops, close all active Tivoli Storage Manager products and try installing the storage agent again.
- Log in with the root user ID. If you do not log in with the root user ID, certain key Tivoli Storage Manager functions do not work correctly.
- Before installing any Tivoli Storage Manager components, ensure that the **LD_LIBRARY_PATH_64** environment variable is *not* set.

Tip: To reduce workload and processing time, and to optimize LAN-free performance, do not install the storage agent and the Tivoli Storage Manager server on the same system.

To install the storage agent:

1. Access the installation files by using one of the following methods:
   - If you are installing the storage agent by using the Tivoli Storage Manager DVD, insert the Tivoli Storage Manager DVD into a DVD drive. Ensure that the DVD is mounted on directory `/dvdrom` and change to that directory.
   - If you downloaded the program from Passport Advantage as an executable file, complete these steps:
     a. Verify that you have enough space to store the installation files when they are extracted from the product package. For space requirements, see the Passport Advantage download document.

        Tip: In the next step, the files are extracted to the current directory. Ensure that the executable file is in the directory where you want the extracted files to be located.
     b. Change to the directory where you placed the executable file.
        1) Change the file permissions by entering the following command:
           ```
           chmod a+x package_name.bin
           ```
        2) Extract the installation files:
           ```
           ./package_name.bin
           ```

           The value for *package_name* is the name of the installation package. The value is typically a name such as `CZ1JLML.tar.gz`. The package is large, so the extraction process can take some time.
2. Select a method to start the installation wizard:
   - To start the wizard and save your responses, enter the **./install.bin -r /response.rsp** command, and specify the -r option.
   - To start the wizard without saving your responses, enter the **./install.bin** command:
3. Follow the wizard directions, clicking **Next** to step through the wizard.

   In the component list, select the storage agent component. There is no default, so you must make a selection. Otherwise, you receive an error message and are returned to the components page.

At the end of the installation, a summary is provided. If there were any errors during the installation, another summary page lists the errors and directs you to an error log file. The installation log is stored in the following location:

```
/var/tivoli/tsm
```

The default installation directory is:

```
/opt/tivoli/tsm/StorageAgent/bin
```

The Global Security Kit (GSKit) is automatically installed when you install the storage agent component.

After you install the storage agent and before you customize it for your use, go to the Tivoli Storage Manager support website: http://www.ibm.com/support/entry/portal/Overview/Software/Tivoli/Tivoli_Storage_Manager. Click **Downloads** and apply any applicable fixes.

Related concepts:

"Software requirements" on page 7

Related information:

Tivoli Storage Manager for Storage Area Networks support

Passport Advantage download document

Installing the storage agent using the console installation wizard

You can use the console installation wizard to install the storage agent.

Before beginning this procedure, you must:

- Verify that your system meets the hardware and software requirements.
- Ensure that you completed the configuration work sheets.
- Close all active Tivoli Storage Manager products. Installation stops if an active Tivoli Storage Manager process is detected. If the installation stops, close all active Tivoli Storage Manager products and try installing the storage agent again.
- Log in with the root user ID. If you do not log in with the root user ID, certain key Tivoli Storage Manager functions do not work correctly.
- Before installing any Tivoli Storage Manager components, ensure that the **LD_LIBRARY_PATH_64** environment variable is *not* set.

Tip: To reduce workload and processing time, and to optimize LAN-free performance, do not install the storage agent and the Tivoli Storage Manager server on the same system.

To install the storage agent:

1. Access the installation files by using one of the following methods:
   - If you are installing the storage agent by using the Tivoli Storage Manager DVD, insert the Tivoli Storage Manager DVD into a DVD drive. Ensure that the DVD is mounted on directory `/dvdrom` and change to that directory.
   - If you downloaded the program from Passport Advantage as an executable file, complete these steps:
     a. Verify that you have enough space to store the installation files when they are extracted from the product package. For space requirements, see the Passport Advantage download document.

Tip: In the next step, the files are extracted to the current directory. Ensure that the executable file is in the directory where you want the extracted files to be located.

b. Change to the directory where you placed the executable file.

1) Change the file permissions by entering the following command:

```
chmod a+x package_name.bin
```

2) Extract the installation files:

```
./package_name.bin
```

The value for *package_name* is the name of the installation package. The value is typically a name such as `CZ1JLML.tar.gz`. The package is large, so the extraction process can take some time.

2. Start the wizard:
   - To start the wizard and save your responses:
     – Enter the following command and specify the -r option:

```
./install.bin -i console -r /response.rsp
```

   - To start the wizard without saving your responses, enter the following command:
     – `./install.bin -i console`
3. Follow the wizard directions, clicking **Next** to step through the wizard.

   In the component list, select the storage agent component. There is no default, so you must make a selection. Otherwise, you receive an error message and are returned to the components page.

At the end of the installation, a summary is provided. If there were any errors during the installation, another summary page lists the errors and directs you to an error log file. The installation log is stored in the following location:

```
/var/tivoli/tsm
```

The default installation directory is:

```
/opt/tivoli/tsm/StorageAgent/bin
```

The Global Security Kit (GSKit) is automatically installed when you install the storage agent component.

After you install the storage agent and before you customize it for your use, go to the Tivoli Storage Manager support website: http://www.ibm.com/support/entry/portal/Overview/Software/Tivoli/Tivoli_Storage_Manager. Click **Downloads** and apply any applicable fixes.

Related concepts:

"Software requirements" on page 7

Related information:

Tivoli Storage Manager for Storage Area Networks support

Passport Advantage download document

Installing the storage agent in silent mode

You can install the storage agent in silent mode.

Before beginning this procedure, you must:

- Verify that your system meets the hardware and software requirements.
- Ensure that you completed the configuration work sheets.
- Close all active Tivoli Storage Manager products. Installation stops if an active Tivoli Storage Manager process is detected. If the installation stops, close all active Tivoli Storage Manager products and try installing the storage agent again.
- Log in with the root user ID. If you do not log in with the root user ID, certain key Tivoli Storage Manager functions do not work correctly.
- Before installing any Tivoli Storage Manager components, ensure that the **LD_LIBRARY_PATH_64** environment variable is *not* set.

Tip: To reduce workload and processing time, and to optimize LAN-free performance, do not install the storage agent and the Tivoli Storage Manager server on the same system.

To install the storage agent:

1. Access the installation files by using one of the following methods:
   - If you are installing the storage agent by using the Tivoli Storage Manager DVD, insert the Tivoli Storage Manager DVD into a DVD drive. Ensure that the DVD is mounted on directory `/dvdrom` and change to that directory.
   - If you downloaded the program from Passport Advantage as an executable file, complete these steps:
     a. Verify that you have enough space to store the installation files when they are extracted from the product package. For space requirements, see the Passport Advantage download document.

        Tip: In the next step, the files are extracted to the current directory. Ensure that the executable file is in the directory where you want the extracted files to be located.

     b. Change to the directory where you placed the executable file.
        1) Change the file permissions by entering the following command:

           ```
           chmod a+x package_name.bin
           ```

        2) Extract the installation files:

           ```
           ./package_name.bin
           ```

           The value for *package_name* is the name of the installation package. The value is typically a name such as `CZ1JLML.tar.gz`. The package is large, so the extraction process can take some time.
2. Using silent mode is one method of installing the storage agent.
   - To start the silent installation and include the storage agent, licenses, and device driver, enter the following command on a single line:

     ```
     ./install.bin -i silent
     -DIBM_TSM_LICENSE_ACCEPTED=true
     -DINSTALL_STAGENT=1
     -DINSTALL_DEVICES=1
     ```

     To define the silent installation, specify the variables in this file:

     ```
     ./install.bin
     ```

Table 18. Variables for the silent installation

Variable	Description
• -DIBM_TSM_LICENSE_ACCEPTED=true • -DIBM_TSMEE_LICENSE_ACCEPTED=true • -DIBM_SSAM_LICENSE_ACCEPTED=true • -DIBM_TSMSAN_LICENSE_ACCEPTED=true (required)	Specify one or two variables or the installation stops. It also stops if you specify more than two variables. The wizard installs the license agreement for the Tivoli Storage Manager product that is selected. **Tip:** If two products are specified, the wizard checks that one of them is the Tivoli Storage Manager for Storage Area Networks license: IBM_TSMSAN_LICENSE_ACCEPTED=true. If one variable is not, the wizard stops.
-DINSTALL_DEVICES=1 (optional)	Install the Tivoli Storage Manager device driver.
-DINSTALL_STAGENT=1 (optional)	Install the Tivoli Storage Manager storage agent.

Restrictions:

- You must include IBM_TSMSAN_LICENSE_ACCEPTED=true or the installation fails.
- Do not change the installation directory (the *USER_INSTALL_DIR* variable).

- A response file contains variables that you selected during a prior installation, using the GUI or console wizard. To use an existing response file, issue the following command:

  ```
  ./install.bin -i silent -DIBM_TSM_LICENSE_ACCEPTED=true -f response_file
  ```

  where the *response_file* is the full directory path to a file that you previously created in the Tivoli Storage Manager installation process.

  If you include IBM_TSMSAN_LICENSE_ACCEPTED=true in the response file manually, issue the following command:

  ```
  ./install.bin -i silent -f response_file
  ```

  You might see a difference between response files, depending on which installation mode you used (GUI or console).

At the end of the installation, a summary is provided. If there were any errors during the installation, another summary page lists the errors and directs you to an error log file. The installation log is stored in the following location:

```
/var/tivoli/tsm
```

The default installation directory is:

```
/opt/tivoli/tsm/StorageAgent/bin
```

The Global Security Kit (GSKit) is automatically installed when you install the storage agent component.

After you install the storage agent and before you customize it for your use, go to the Tivoli Storage Manager support website: http://www.ibm.com/support/entry/portal/Overview/Software/Tivoli/Tivoli_Storage_Manager. Click **Downloads** and apply any applicable fixes.

Related concepts:

"Software requirements" on page 7

Related information:

Tivoli Storage Manager for Storage Area Networks support

Passport Advantage download document

Configuring the storage agent

After the installation is completed, you must configure the storage agent to ensure communication with the backup-archive client and the Tivoli Storage Manager server.

To configure the storage agent, complete the following steps:

1. Point the server to the storage agent by issuing the **DEFINE SERVER** command on the Tivoli Storage Manager server.
2. Complete the steps in "Defining storage agents to the Tivoli Storage Manager server" on page 61.
3. Ensure that the DEVCONFIG option is specified in the storage agent options file dsmsta.opt.

   For example, for a device configuration file named devconfig.out, edit the dsmsta.opt file by typing the following line:

   ```
   DEVCONFIG devconfig.out
   ```

   The device configuration file can be located in the following directory:

   ```
   /opt/tivoli/tsm/StorageAgent/bin
   ```

4. Use the information that you collected in the configuration work sheets to issue the **DSMSTA SETSTORAGESERVER** command. For example:

   ```
   dsmsta setstorageserver myname=storagnt mypassword=fun4me
   myhladdress=agent.example.com
   servername=tsmsrver serverpassword=not4u
   hladdress=tsmsrver.example.com lladdress=1502
   ```

   Requirement:

   - The SERVERNAME option in the dsm.sys file, which is the client system options file, must match the SERVERNAME option in the dsm.opt file, which is the client user-options file. However, the option is unrelated to and does not need to match the SERVERNAME option that is defined for the storage agent in the storage-agent options file, dsmsta.opt.
   - The HLADDRESS option must match the TCPSERVERADDRESS option that is in the dsm.sys file on the Tivoli Storage Manager client. When configuring the storage agent by using the **DSMSTA SETSTORAGESERVER** command, use addresses that correspond to the communications method used by the backup-archive client. With the backup-archive client, you can use either IPv4 (**COMMMETHOD TCPIP**) or IPv6 (**COMMMETHOD V6TCPIP**), but not both at the same time. To secure communication between the storage agent and the Tivoli Storage Manager server, ensure that your data is protected by Secure Sockets Layer (SSL).

   The **DSMSTA SETSTORAGESERVER** command generates the following output in the storage agent device configuration file:

   ```
   set staname storagnt
   set stapassword xxxxxxx
   set stakeydbpw xxxxxxx
   ```

```
set stahladdress agent.example.com
define server tsmsrver serverpassword=xxxxxxxxxxx
 hladdress=tsmsrver.example.com lladdress=1502
```

The passwords are encrypted in the file.

The command also generates the following line in the `dsmsta.opt` file:

```
SERVERNAME tsmsrver
```

Related reference:

"Client-system and server-system configuration work sheets" on page 13

"The storage agent options file" on page 98

"DSMSTA SETSTORAGESERVER command" on page 103

"The device configuration file for the storage agent" on page 97

Related information:

Tivoli Storage Manager for Storage Area Networks support

Storage agent and client compatibility with Tivoli Storage Manager servers

Tivoli Storage Manager support

Defining the storage agent and configuring devices on the server

To set up LAN-free communications on the Tivoli Storage Manager server, you need to set up server-to-server communication, define the client's storage agent to the server, and configure the paths to the library.

Before beginning this procedure, be sure that you have the information recorded in the configuration-information work sheets.

Perform these tasks to define the storage agent and configure devices on the server:

1. "Setting up server-to-server communication"
2. "Installing an external media manager" on page 61
3. "Defining storage agents to the Tivoli Storage Manager server" on page 61
4. "Configuring a path to the library manager" on page 62
5. "Defining paths for ACSLS" on page 63
6. "Setting the LAN-free destination" on page 63
7. "Confirming client node registration and configuration" on page 64

Setting up server-to-server communication

Server-to-server communication is required for Tivoli Storage Manager servers and storage agents to share library devices on a SAN.

To set up server-to-server communication, issue the following commands on the Tivoli Storage Manager server. Replace the values in the example with values from the configuration-information work sheet.

```
set servername tsmsrver
set serverpassword not4u
set serverhladdress tsmsrver.example.com
set serverlladdress 1502
set crossdefine on
```

These commands establish the server's name, password, TCP/IP address, and port. They also allow other servers to define a connection on this server.

Verify that the password has been set for the server by issuing the **QUERY STATUS** command from a Tivoli Storage Manager administrative command line. The value of the Server Password Set field in the command output must be YES.

For details about server-to-server communication, see the *Administrator's Guide*.

Configuring a storage agent and server to use SSL

You can set up a storage agent and the Tivoli Storage Manager server to use the SSL communication method. SSL is set up independently on both the storage agent and the Tivoli Storage Manager server.

To set up the storage agent to use SSL communication with the Tivoli Storage Manager server and client, complete the following steps:

1. On the storage agent, issue the **DSMSTA SETSTORAGESERVER** command to initialize the storage agent and add communication information to the device configuration file and the storage agent options file dsmsta.opt:

   Hint: The following command is entered on one line, but is displayed here on multiple lines to make it easier to read.

   ```
   dsmsta setstorageserver myname=sta
   mypa=sta_password
   myhla=ip_address
   servername=server_name
   serverpa=server_password
   hla=ip_address
   lla=ssl_port
   STAKEYDBPW=password
   ssl=yes
   ```

   Requirement:

   - When you set the **SSL=YES** and **STAKEYDBPW=password** parameters, a key database file is set up in the storage agent options file, dsmsta.opt. All passwords are obfuscated in dsmsta.opt.
   - To enable SSL communication, ensure that the Tivoli Storage Manager **LLA** parameter specifies the server SSLTCPADMIN port and set the **SSL** parameter to YES.
2. Import the Tivoli Storage Manager server certificate, `cert256.arm`, to the key database file for the storage agent. Ensure that the required SSL certificates are in the key database file that belongs to each storage agent that uses SSL communication. To import the SSL certificate, switch to the storage agent directory and issue the following command:

   ```
   gskcapicmd_64 -cert -add -label server_example_name
   -db cert.kdb -stashed -file cert256.arm -format ascii
   ```
3. Specify the `SSLTCPPORT` and the `SSLTCPADMINPORT` options in the `dsmsta.opt` options file.
4. Create the key database certificate and default certificates by starting the storage agent.

   Tip: To provide the new password to the storage agent, specify the **STAKEYDBPW=newpassword** parameter with the **DSMSTA SETSTORAGESERVER** command. Rerun the **DSMSTA SETSTORAGESERVER** command.
5. On the Tivoli Storage Manager server, issue the following command:

```
define server sta
hla=ip_address
lla=ssl_port
serverpa=password
ssl=yes
```

6. Stop the storage agent.
7. Stop the Tivoli Storage Manager server.
8. Import the `cert256.arm` certificate from the storage agent to the key database file for the Tivoli Storage Manager server. Ensure that the required SSL certificates are in the key database file that belongs to each server that uses SSL communication before you restart the server. To import the SSL certificate from the storage agent, issue the following command:

   ```
   gskcapicmd_64 -cert -add -label server_example_name
   -db cert.kdb -stashed -file cert256.arm -format ascii
   ```

9. Stop and restart the Tivoli Storage Manager server.
10. Restart the storage agent.

When the Tivoli Storage Manager server and storage agent initiate communication, SSL certificate information is displayed to indicate that SSL is in use.

Installing an external media manager

If you are using an ACSLS-managed external library, install middleware (for example, IBM Enterprise Removable Media Manager) that enables an external library. For installation information, see the product's documentation.

Defining storage agents to the Tivoli Storage Manager server

For each client the will use LAN-free data transfer, define a storage agent to the server as if the storage agent is another server.

To define the storage agent, issue the **DEFINE SERVER** command from the Tivoli Storage Manager server that will manage the client's data. Use the same name and password that you specified for the storage agent when you installed it on the client system, for example,

```
define server storagnt serverpassword=fun4me
   hladdress=agent.tucson.ibm.com lladdress=1500 validateprotocol=all
```

The **VALIDATEPROTOCOL** parameter in the example is optional. This parameter specifies whether a cyclic redundancy check will be performed to validate data on all metadata transferred between the storage agent and the Tivoli Storage Manager server.
For details about data validation, see the *Administrator's Guide*. For details about the **DEFINE SERVER** command, see the *Administrator's Reference*.

You must also define the storage agent to the library manager. The storage agent needs to be able to contact the library manager directly when making mount requests. If the storage agent is only defined to the library client, it will attempt to use information from the client to define itself to the library manager. If the storage agent is unable to define itself to the library manager, then you must define the storage agent manually using the **DEFINE SERVER** command issued from the library manager, for example,

```
define server storagnt serverpassword=fun4me
   hladdress=agent.tucson.ibm.com lladdress=1500 ssl=yes
```

The **SSL** parameter in the example is optional. This parameter specifies that SSL communication is used. If you specify SSL as the communication method, you must import SSL certificates from the server to the storage agent, and from the storage agent to the server. Import SSL certificates before you start the storage agent or the server.

When the storage agent is defined to the server, you can complete the steps in "Configuring the storage agent" on page 58.

Configuring a path to the library manager

Configure a path to the library manager.

The procedure for configuring a path to the library manager depends on whether you are using a shared ACSLS library manager or an ACSLS-managed external library.

- If you are using a shared ACSLS library manager, configure a path to the library manager:
  1. Define a library type of ACSLS. For example:
     ```
     define library libmgr1 libtype=ACSLS shared=YES
     primarymanager=tsmsrvr
     ```
  2. Define a path from the server to the library manager. For example:
     ```
     define path tsmsrver libmgr1 srctype=server desttype=library
     ```
  3. Define a device class with a device type of SERVER. For example:
     ```
     define devclass device_class_name library=libmgr1
      devtype=server servername=tsmsrvr
     ```
  4. Define the storage pool. For example:
     ```
     define stgpool pool_name device_class_name pooltype=primary
     ```
- If you are using an ACSLS-managed external library, configure a path to the external library manager.
  1. Define a library type of EXTERNAL. For example:
     ```
     define library stk-lib libtype=external
     ```

     If a library name remains constant but the library type changes from EXTERNAL to shared ACSLS, stop and restart the storage agent to register this change.
  2. Define a path from the server to the external media manager. For example:
     ```
     define path tsmsrver stk-lib srctype=server desttype=library
      externalmanager=path_name
     ```

     In the example, the path provided for the external manager depends on the operating system on which Tivoli Storage Manager server runs.
  3. Define a device class with a device type of ECARTRIDGE. For example:
     ```
     define devclass device_class_name library=library_name
      devtype=ecartridge format=drive
     ```
  4. Define the storage pool. For example:
     ```
     define stgpool pool_name device_class_name pooltype=primary
     ```

Defining paths for ACSLS

If you are using a shared ACSLS library manager, you must define a path from the storage agent to the library manager. If you are using an ACSLS-managed external library, you must define a path from the storage agent to the external manager.

- To define a path for a shared ACSLS library manager, use the DEFINE PATH command. For example:

  ```
  define path storagnt libmgr1 srctype=server desttype=library
  ```

- To define a path for an ACSLS-managed external library, use the DEFINE PATH command and define a path to the external media manager. For example:

  ```
  define path storagnt stk-lib srctype=server desttype=library
    externalmediamanager=path_name
  ```

For details about the **DEFINE PATH** command, see the *Administrator's Reference*.

Setting the LAN-free destination

The destination for data must be a LAN-free capable storage pool.

To set a LAN-free destination:

1. Define a copy group with its destination being the LAN-free capable storage pool (You created this storage pool as part of the procedure of configuring a path to the library manager.) For example,

   ```
   define copygroup sandirect sandirectpolicy sandirectdefmft
      type=backup destination=storage_pool_name
   ```

2. Activate the policy set, for example,

   ```
   activate policyset sandirect sandirectpolicy
   ```

For details about changing policy for clients that can use SAN drives, see the *Administrator's Guide*. For details about the commands, see the *Administrator's Reference*.

Remember:

- If you decide not to use the default management class for the SAN drives, create a new management class. Clients that use the SAN drives need an include statement to bind their files to this new management class.

  For details about the include-exclude list, see the *Backup-Archive Clients Installation and User's Guide*.

- With a hierarchical storage management (HSM) client configured for LAN-free data movement, the management class (not the copy group) is set to a LAN-free capable storage pool.

Related tasks:

"Configuring a path to the library manager" on page 62

Confirming client node registration and configuration

Client nodes must be registered and configured for LAN-free backups.

To verify that node settings are correct, issue the following command:

```
query node node_name format=detailed
```

If node settings are not correct, issue the **UPDATE NODE** command to adjust settings for the node. If the node has not been registered and configured for LAN-free backups, register the node with the **REGISTER NODE** command.

To help tune the use of your LAN and SAN resources for LAN-free data movement, you can control the path that data transfers take for clients that have LAN-free data movement capability. For each client, you can select whether data read/write operations use the LAN path, the LAN-free path, or either path. You can specify these settings with the **REGISTER NODE** and **UPDATE NODE** commands.

If the node belongs to a multi-threaded client and there are drives available, the MAXNUMMP parameter might restrict the number of drives that are available for the storage agent to use on behalf of the client. Specify the MAXNUMMP parameter on the **REGISTER NODE** or **UPDATE NODE** command.

For details about commands, see the *Administrator's Reference*.

Verifying the LAN-free configuration

To ensure LAN-free data movement, you must verify that the hardware and software components are configured correctly.

Verifying the LAN-free configuration

To verify the LAN-free configuration:

1. Start the storage agent:
   a. Restart the client system.
   b. Change to the storage agent directory and issue the **DSMSTA** command.
2. Run a backup operation from the client.
3. Log on to the Tivoli Storage Manager server and storage agent by using a Tivoli Storage Manager administrative command-line client.
4. To verify that the backup is LAN-free and the proper sessions have been established, issue the **QUERY SESSION** command. In the command output, look for information about bytes sent and bytes received. If LAN-free data movement is occurring:
   - Querying a session on the storage agent shows bytes received for the node increasing to the total amount of data being backed up.
   - Querying a session on the Tivoli Storage Manager server shows a very small number of bytes (metadata) received for the same node.

   If the node's session has these characteristics, and you receive a message stating that the backup was successful, you configured your system correctly.

   There are several ways to use the **QUERY SESSION** command. If the storage agent is running in the foreground, it is started in the command-line window. The window is the storage agent console, and you can issue the command on the console. Alternatively, you can use a command-line client to connect to the storage agent on the administration port of the storage agent. Use the same administrator ID and password for this command that you use on the server.

5. If you receive a message saying that the backup has failed, ensure the following:
   - The Tivoli Storage Manager server is running. If the Tivoli Storage Manager server is not running, the storage agent will not start.
   - The client, storage agent, and server are communicating with each other as expected.
   - The mount and message is displayed on the storage agent console.

   If you retry the backup operation after the first failure, the client attempts to use the LAN connection for data movement. To force LAN-free data movement, stop and restart the client.

Determining whether the data movement was LAN-free

Messages and backup reports can indicate whether LAN-free operations are successful. You can also use the **QUERY SESSION** and **QUERY ACTLOG** commands to verify LAN-free operations.

Related information:

Connecting to a Tivoli Storage Manager storage agent by using an administrative command-line client

Determining whether the data movement was LAN-free

To determine whether data movement is LAN-free, use one or both of the following methods:

- Monitor the **QUERY SESSION** output against the node that is running the LAN-free backup. Verify that the proper sessions have been established:
  1. Log in to the Tivoli Storage Manager server and storage agent using a Tivoli Storage Manager administrative command-line client.
  2. To verify that the backup is LAN-free and the proper sessions have been established, issue the **QUERY SESSION** command. In the command output, look for information about bytes sent and bytes received. If LAN-free data movement is occurring:
     - Querying a session on the storage agent shows bytes received for the node increasing to the total amount of data being backed up.
     - Querying a session on the Tivoli Storage Manager server shows a very small number of bytes (metadata) received for the same node.

  If the node's session shows these characteristics, the data movement is LAN-free.

  Remember: During a failover where the storage agent is sending data directly to the server by proxy because it cannot store the data directly, the **QUERY SESSION** statistics on the server show a much higher byte count.
- Issue either of the following **QUERY ACTLOG** commands on the server to which the client is connected:

  ```
  query actlog search=storage_agent_name msgno=8337
  query actlog search=storage_agent_name
  ```

  If the query locates entries in the activity log that relate to the storage agent, the client is using LAN-free data transfer.

Chapter 5. Installing and configuring the storage agent for data movement to a z/OS media server

Tivoli Storage Manager for z/OS Media provides access to z/OS media library resources. The storage agent is configured to access z/OS resources that are controlled by the z/OS media server.

Before you begin this procedure:

- Ensure that you understand the overall installation and configuration process because it takes place on different systems at different times.
- Ensure that you completed the "Client-system and server-system configuration worksheets for z/OS Media" on page 16.
- Install and configure Tivoli Storage Manager by using the instructions in the *Installation Guide*.
- Configure the Tivoli Storage Manager server to use z/OS media server storage by using the instructions in the *Administrator's Guide*.
- Install and configure Tivoli Storage Manager for z/OS Media on your operating system by using the instructions in the *Tivoli Storage Manager for z/OS Media Installation and Configuration Guide*.

The main installation and configuration steps are:

1. "Establishing network connections" on page 70
2. "Installing and configuring software on client systems" on page 71
3. "Setting up storage agent data transfer on the Tivoli Storage Manager server" on page 82
4. "Configuring the storage agent" on page 80
5. "Verifying the storage agent configuration" on page 84

Related concepts:

"External libraries" on page 22

Related reference:

"Configuration work sheets for storage agent configuration" on page 13

Tivoli Storage Manager for z/OS Media overview

Tivoli Storage Manager for z/OS Media enables client systems to write data to, or read data from, storage devices that are attached to a z/OS system.

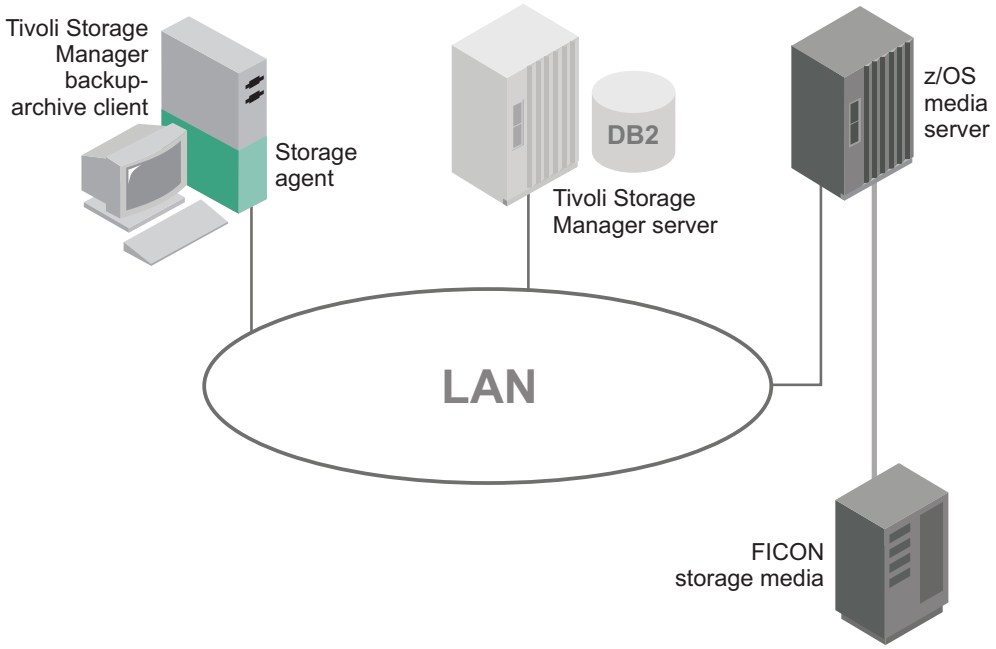


Figure 10. A z/OS media server environment

Data movement between the storage agent and the z/OS media server is not a typical LAN-free data transfer. The storage agent moves data to the z/OS media server in the following way:

1. The storage agent installed on a client system communicates with the Tivoli Storage Manager server, through a LAN, to obtain and store database information and to coordinate device and volume selection. The storage agent is configured to access the z/OS resources that are controlled by the z/OS media server.
2. The z/OS media server mounts the FILE or tape volumes. The client (through a storage agent) accesses volumes that are managed by the z/OS media server.
3. The storage agent sends client data to the z/OS media server to be written on FILE or tape. The Tivoli Storage Manager server stores the metadata, such as policy information and file name and size, that the client provided.

z/OS FILE volumes do not have to be formatted for storage agent data transfer from Tivoli Storage Manager storage agents. The Tivoli Storage Manager server formats the file volume when data is written to it.

The z/OS media server is a Tivoli Storage Manager library resource. A library type of ZOSMEDIA represents FILE or tape storage volumes in a FICON® attached

library. Tivoli Storage Manager for z/OS Media maintains access to the storage resources and handles mount requests from the Tivoli Storage Manager server. The Tivoli Storage Manager server communicates with the storage agent to provide volume, library, and authentication details to the storage agent.

The z/OS media server can be used for scratch and private FILE volume mount requests for storing and retrieving new data.

Data flow from a Tivoli Storage Manager backup-archive client to the z/OS media server

When using z/OS media server storage for backup-archive client data, the Tivoli Storage Manager server directs data flow over the LAN.

A typical backup operation to z/OS media server storage consists of the steps outlined in Figure 11:

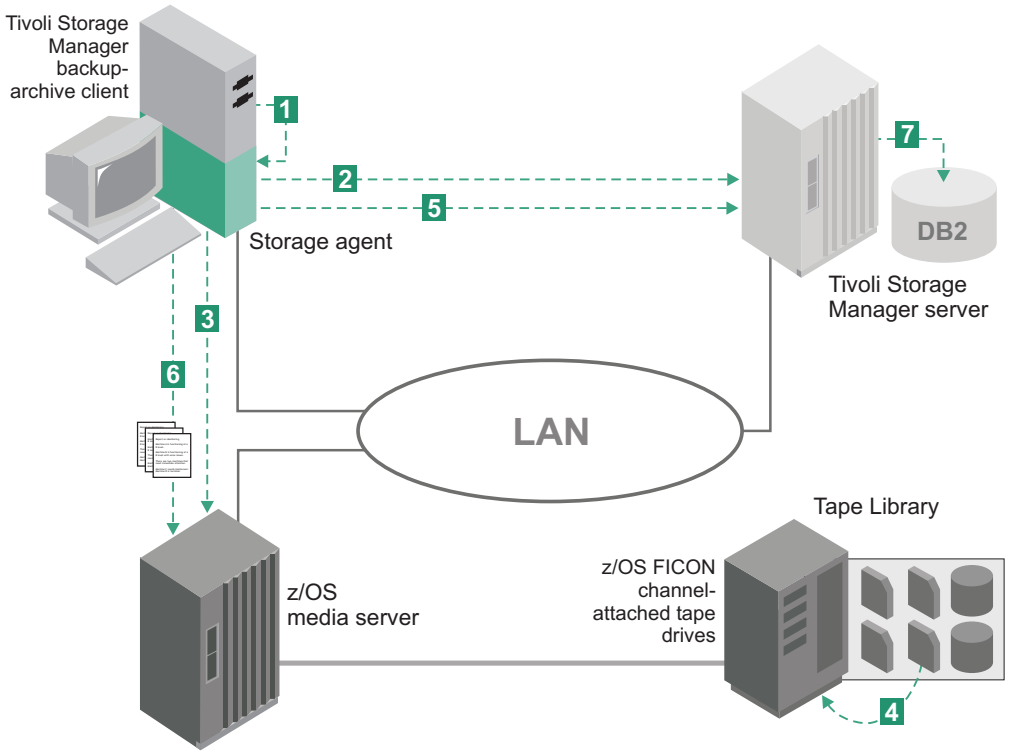


Figure 11. Data flow from the backup-archive client to z/OS media server storage

1. The backup-archive client contacts the storage agent.
2. The storage agent contacts the Tivoli Storage Manager server for a volume selection.
3. The storage agent sends a mount request to the z/OS media server.
4. The z/OS media server loads the FICON attached drive.
5. The storage agent notifies the Tivoli Storage Manager server and provides the volume name (if this is a scratch volume).
6. The storage agent sends the data to the z/OS media server.
7. The Tivoli Storage Manager stores metadata from the storage agent.

Establishing network connections

You must establish network connections from the client, with the storage agent installed, to the z/OS system where the Tivoli Storage Manager for z/OS Media is installed.

For details, levels, and models of hardware and software, see http://www.ibm.com/support/entry/portal/Overview/Software/Tivoli/Tivoli_Storage_Manager.

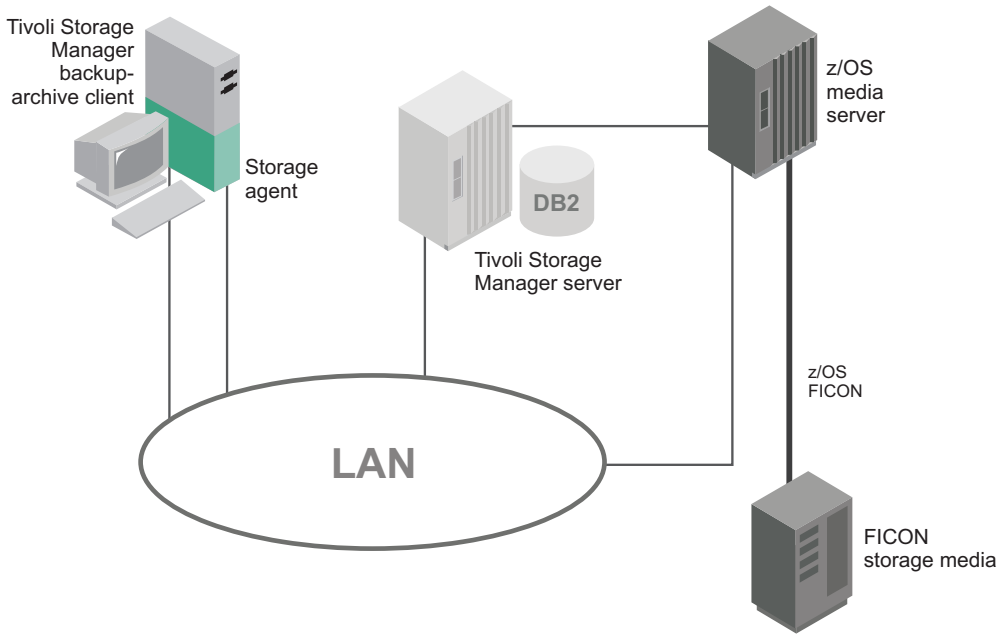


Figure 12. Network connection between a storage agent, a Tivoli Storage Manager server, and a z/OS media server. Client data is transferred between the storage agent and the z/OS media server.

The Tivoli Storage Manager server system, the z/OS media server system, and the client systems along with appropriate storage devices are all attached to a LAN. You must define the following paths to establish network connections:

- Storage agent to the z/OS media server
- Backup archive client to the Tivoli Storage Manager server
- Tivoli Storage Manager server to the z/OS media server

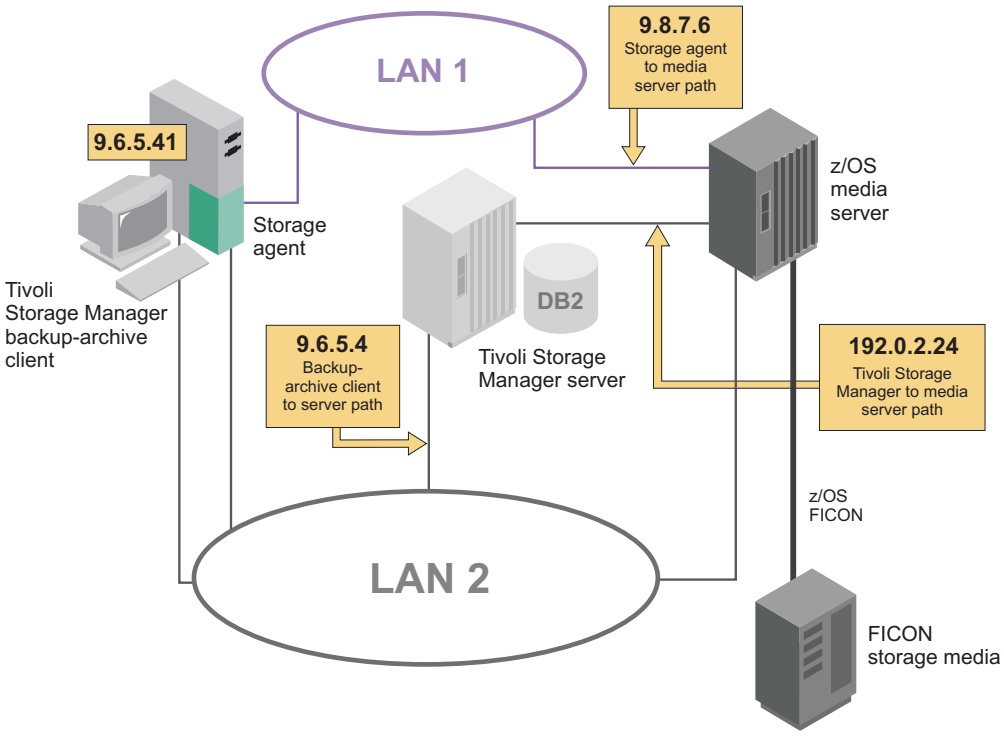


Figure 13. Network connection between a storage agent, a Tivoli Storage Manager server, and a z/OS media server, using two LANs.

You can use multiple network connections to establish a connection to a z/OS media server. For example, if you use a high bandwidth connection, you can use multiple network connections to access a z/OS media server.

Client data is transferred between the storage agent and the z/OS media server server through LAN 1. Metadata is transferred from the storage agent to the Tivoli Storage Manager server, through LAN 2.

Installing and configuring software on client systems

You install storage agents and backup-archive or Tivoli Storage Manager Data Protection clients on client systems. If you install a Data Protection application client, you must also install the Tivoli Storage Manager API.

Complete the following tasks to install and configure the software:

1. "Installing and configuring the client" on page 72
2. "Installing the storage agent" on page 75
3. "Configuring the storage agent" on page 80

Related concepts:

"Communications between the client, storage agent, and Tivoli Storage Manager server" on page 9

Related tasks:

"Verifying and updating client node information" on page 52

"Verifying and updating client node information" on page 30

"Verifying and updating client node information" on page 74

Installing and configuring the client

The client can be a Tivoli Storage Manager backup-archive client or a Tivoli Storage Manager Data Protection application client.

Before beginning this procedure, you must complete the following steps:

- Verify that the client system meets the prerequisites for client software. To ensure software compatibility, check the website for Tivoli Storage Manager storage agent and backup-archive client compatibility. You can download the latest software levels from http://www.ibm.com/support/entry/portal/Overview/Software/Tivoli/Tivoli_Storage_Manager.

  For details about installing a backup-archive client, see the *Backup-Archive Clients Installation and User's Guide*. For details about installing a Data Protection application client, see the *Data Protection Installation and User's Guides*.
- Ensure that you completed the configuration work sheets.
- Ensure that client nodes are registered and configured on the server. To register client nodes, use the **REGISTER NODE** or **UPDATE NODE** command.

Requirement: If multiple clients are moving data from a storage agent to a z/OS media server, install or upgrade the client software on each client system.

To install and configure the client, complete the following steps:

1. Using the LAN-free communications protocol and LAN-free port information that you collected in the configuration work sheets, modify the following file:
   - `dsm.sys` client system-options file

   Tip: The file can be located in one of several places, such as the installation directory, or in a location pointed to by an environment variable.

   Select a communication method that you want the client and server to use. The methods are described in Table 19, Table 20, and Table 21 on page 73.

Table 19. Communications methods for a Tivoli Storage Manager server connecting to a z/OS media server

To use this communication method	Configuration requirements	To connect to these Tivoli Storage Manager servers
TCP/IP	Install TCP/IP (standard with supported operating systems)	AIX, Linux on System z®
HiperSockets™	For details about configuring HiperSocket connectivity between Linux on System z and z/OS, see the IBM Redbooks publication *IBM HiperSockets Implementation Guide*. This document is available online at http://www.redbooks.ibm.com/abstracts/sg246816.html	Linux on System z

Table 20. Communications methods from a storage agent to a z/OS media server

To use this communication method	Configuration requirements	To connect to these Tivoli Storage Manager servers
TCP/IP	Install TCP/IP (standard with supported operating systems)	AIX, Linux x86_64, Linux on System z, Linux on Power Systems™, Solaris, Windows Server 2008, Windows Server 2008 R2

Table 20. Communications methods from a storage agent to a z/OS media server (continued)

To use this communication method	Configuration requirements	To connect to these Tivoli Storage Manager servers
HiperSockets	For details about configuring HiperSocket connectivity between Linux on System z and z/OS, see the IBM Redbooks publication *IBM HiperSockets Implementation Guide*. This document is available online at http://www.redbooks.ibm.com/abstracts/sg246816.html	Linux on System z

Table 21. Communications methods for the Tivoli Storage Manager client

To use this communication method	Install this software	To connect to these Tivoli Storage Manager servers
TCP/IP	TCP/IP (standard with supported operating systems)	AIX, Linux x86_64, Linux on System z, Linux on Power Systems, Solaris, Windows Server 2008, Windows Server 2008 R2
Shared memory	TCP/IP (standard with platforms)	Solaris

For example:

```
commmethod tcpip
tcpserveraddress server_c.example.com
tcpport 1502
```

The preceding example uses a TCPPORT of 1502. However, the default TCPPORT is 1500.

Restriction: The backup-archive client `SERVERNAME` option is not related to the storage agent SERVERNAME option. For details, see the *Backup-Archive Clients Installation and User's Guide*.

2. Install or upgrade the backup-archive client software or Data Protection application-client software.
3. Add the following options to the same stanza in the same file that you edited in step 1 on page 72. These options specify that the client uses SAN-attached devices, when the path is available, during backup, restore, archive, and retrieve processing.

   TCP/IP Communications:

   ```
   enablelanfree yes
   lanfreecommmethod tcpip
   lanfreetcpserveraddress agent.example.com
   lanfreetcpport 1500
   ```

   Shared memory:

   ```
   enablelanfree yes
   lanfreecommmethod SharedMem
   lanfreeshmport 1510
   ```

Related reference:

"Client-system and server-system configuration work sheets" on page 13

"Client-system and server-system configuration worksheets for z/OS Media" on page 16

Related information:

Tivoli Storage Manager for Storage Area Networks support

Storage agent and client compatibility with Tivoli Storage Manager servers

Tivoli Storage Manager support

Verifying and updating client node information

When you configure LAN-free data movement you must register client nodes and provide policy information about client nodes. You can also restrict when a client node uses a LAN-free path.

To verify client node information, complete the following steps:

1. Identify the client node or nodes that will use the storage agent. In a typical environment, a storage agent is used only by the client node residing on the same system as the storage agent. However, you can configure two or more client nodes to use the same storage agent.
2. Verify that the nodes are registered. If they are not registered, you need to register them. For details, see the *Administrator's Guide*.
3. Verify the policy information for the nodes. The copy group for backup and archive must point to a storage pool that has a LAN-free path for a particular storage agent. You define drive LAN-free paths and make them available for the storage pool. To view the destinations that are capable of LAN-free data movement, you can issue the **VALIDATE LANFREE** command on the server. For details about this command, see the *Administrator's Reference*.
4. After you verify the registration and policy information for the nodes, you can place restrictions on when a node can use the LAN-free path. The node attributes **DATAWRITEPATH** and **DATAREADPATH** determine the restriction placed on the node:
   - To use only the LAN-free path on backup and archive operations, specify **DATAWRITEPATH**.

     Important: Backup and archive operations can fail if the LAN-free path is unavailable.
   - To use the LAN path on restore and retrieve operations, specify **DATAREADPATH**.

   For more information about commands and their attributes, see the *Administrator's Reference*.

Related tasks:

"Configuring multiple clients to use the same storage agent" on page 94

"Using LAN and LAN-free paths in the same backup operation" on page 95

Installing the storage agent

The storage agent must be installed on a client system that has connectivity to the z/OS system where Tivoli Storage Manager for z/OS Media is installed. To install the storage agent, you can use the GUI installation wizard, the console wizard, or the command line in silent mode.

Restriction: The storage agent can only be installed on AIX, Linux, Solaris, or Windows operating systems when used with the z/OS media server.

You can install the storage agent in a Solaris global or local zone. The Solaris Zone feature is available with Solaris Version 10.

Related tasks:

"Installing the storage agent to a Solaris Zone" on page 92

Related reference:

"DSMSTA SETSTORAGESERVER command" on page 103

Installing the storage agent using the GUI installation wizard

You can use the GUI installation wizard to install the storage agent.

Before beginning this procedure, you must complete the following tasks:

- Verify that your system meets the hardware and software requirements.
- Ensure that you completed the configuration work sheets.
- Close all active Tivoli Storage Manager products. Installation stops if an active Tivoli Storage Manager process is detected. If the installation stops, close all active Tivoli Storage Manager products and try installing the storage agent again.
- Log in with the root user ID. If you do not log in with the root user ID, certain key Tivoli Storage Manager functions do not work correctly.
- Before installing any Tivoli Storage Manager components, ensure that the **LD_LIBRARY_PATH_64** environment variable is *not* set.

Tip: To reduce workload and processing time, and to optimize performance, do not install the storage agent and the Tivoli Storage Manager server on the same system.

To install the storage agent:

1. Access the installation files, by using one of the following methods:
   - If you are installing the storage agent by using the Tivoli Storage Manager DVD, insert the Tivoli Storage Manager DVD into a DVD drive. Ensure that the DVD is mounted on directory `/dvdrom` and change to that directory.
   - If you downloaded the program from Passport Advantage as an executable file, complete these steps:
     a. Verify that you have enough space to store the installation files when they are extracted from the product package. For space requirements, see the Passport Advantage download document.

        Tip: In the next step, the files are extracted to the current directory. Ensure that the executable file is in the directory where you want the extracted files to be located.

     b. Change to the directory where you placed the executable file.
        1) Change the file permissions by entering the following command:

           ```
           chmod a+x package_name.bin
           ```

2) Extract the installation files:

   `./package_name.bin`

   The value for *package_name* is the name of the installation package. The value is typically a name such as `CZ1JLML.tar.gz`. The package is large, so the extraction process can take some time.

2. Select a method to start the installation wizard:
   - To start the wizard and save your responses, enter the **./install.bin -r /response.rsp** command, and specify the -r option.
   - To start the wizard without saving your responses, enter the **./install.bin** command:
3. Follow the wizard directions, clicking **Next** to step through the wizard.

   In the component list, select the storage agent component. There is no default, so you must make a selection. Otherwise, you receive an error message and are returned to the components page.
4. After you install the storage agent and before you customize it for your use, go to the Tivoli Storage Manager support website: http://www.ibm.com/support/entry/portal/Overview/Software/Tivoli/Tivoli_Storage_Manager. Click **Downloads** and apply any applicable fixes.

At the end of the installation, a summary is provided. If there were any errors during the installation, another summary page lists the errors and directs you to an error log file. The installation log is stored in the `/var/tivoli/tsm` directory.

The default installation directory is `/opt/tivoli/tsm/StorageAgent/bin`.

The Global Security Kit (GSKit) is automatically installed when you install the storage agent component.

Related concepts:

"Software requirements" on page 7

Related information:

Tivoli Storage Manager for Storage Area Networks support

Passport Advantage download document

Installing the storage agent using the console installation wizard

You can use the console installation wizard to install the storage agent.

Before beginning this procedure, you must complete the following tasks:

- Verify that your system meets the hardware and software requirements.
- Ensure that you completed the configuration work sheets.
- Close all active Tivoli Storage Manager products. Installation stops if an active Tivoli Storage Manager process is detected. If the installation stops, close all active Tivoli Storage Manager products and try installing the storage agent again.
- Log in with the root user ID. If you do not log in with the root user ID, certain key Tivoli Storage Manager functions do not work correctly.
- Before installing any Tivoli Storage Manager components, ensure that the **LD_LIBRARY_PATH_64** environment variable is *not* set.

Tip: To reduce workload and processing time, and to optimize performance, do not install the storage agent and the Tivoli Storage Manager server on the same system.

To install the storage agent:

1. Access the installation files, by using one of the following methods:
   - If you are installing the storage agent by using the Tivoli Storage Manager DVD, insert the Tivoli Storage Manager DVD into a DVD drive. Ensure that the DVD is mounted on directory `/dvdrom` and change to that directory.
   - If you downloaded the program from Passport Advantage as an executable file, complete these steps:
     a. Verify that you have enough space to store the installation files when they are extracted from the product package. For space requirements, see the Passport Advantage download document.

        Tip: In the next step, the files are extracted to the current directory. Ensure that the executable file is in the directory where you want the extracted files to be located.

     b. Change to the directory where you placed the executable file.
        1) Change the file permissions by entering the following command:
           `chmod a+x package_name.bin`
        2) Extract the installation files:
           `./package_name.bin`

        The value for *package_name* is the name of the installation package. The value is typically a name such as `CZ1JLML.tar.gz`. The package is large, so the extraction process can take some time.
2. Start the wizard:
   - To start the wizard and save your responses:
     – Enter the following command and specify the -r option:
       `./install.bin -i console -r /response.rsp`
   - To start the wizard without saving your responses, enter the following command:
     – `./install.bin -i console`
3. Follow the wizard directions, clicking **Next** to step through the wizard.

   In the component list, select the storage agent component. There is no default, so you must make a selection. Otherwise, you receive an error message and are returned to the components page.
4. After you install the storage agent and before you customize it for your use, go to the Tivoli Storage Manager support website: http://www.ibm.com/support/entry/portal/Overview/Software/Tivoli/Tivoli_Storage_Manager. Click **Downloads** and apply any applicable fixes.

At the end of the installation, a summary is provided. If there were any errors during the installation, another summary page lists the errors and directs you to an error log file. The installation log is stored in the `/var/tivoli/tsm` directory.

The default installation directory is `/opt/tivoli/tsm/StorageAgent/bin`.

The Global Security Kit (GSKit) is automatically installed when you install the storage agent component.

Related concepts:

"Software requirements" on page 7

Related information:

Tivoli Storage Manager for Storage Area Networks support

Passport Advantage download document

Installing the storage agent in silent mode

You can install the storage agent in silent mode.

Before beginning this procedure, you must complete the following tasks:

- Verify that your system meets the hardware and software requirements.
- Ensure that you completed the configuration work sheets.
- Close all active Tivoli Storage Manager products. Installation stops if an active Tivoli Storage Manager process is detected. If the installation stops, close all active Tivoli Storage Manager products and try installing the storage agent again.
- Log in with the root user ID. If you do not log in with the root user ID, certain key Tivoli Storage Manager functions do not work correctly.
- Before installing any Tivoli Storage Manager components, ensure that the **LD_LIBRARY_PATH_64** environment variable is *not* set.

Tip: To reduce workload and processing time, and to optimize performance, do not install the storage agent and the Tivoli Storage Manager server on the same system.

To install the storage agent:

1. Access the installation files, by using one of the following methods:
   - If you are installing the storage agent by using the Tivoli Storage Manager DVD, insert the Tivoli Storage Manager DVD into a DVD drive. Ensure that the DVD is mounted on directory `/dvdrom` and change to that directory.
   - If you downloaded the program from Passport Advantage as an executable file, complete these steps:
     a. Verify that you have enough space to store the installation files when they are extracted from the product package. For space requirements, see the Passport Advantage download document.

        Tip: In the next step, the files are extracted to the current directory. Ensure that the executable file is in the directory where you want the extracted files to be located.

     b. Change to the directory where you placed the executable file.
        1) Change the file permissions by entering the following command:

           ```
           chmod a+x package_name.bin
           ```

        2) Extract the installation files:

           ```
           ./package_name.bin
           ```

        The value for *package_name* is the name of the installation package. The value is typically a name such as `CZ1JLML.tar.gz`. The package is large, so the extraction process can take some time.
2. Using silent mode is one method of installing the storage agent.
   - To start the silent installation and include the storage agent, licenses, and device driver, enter the following command on a single line:

```
./install.bin -i silent
-DIBM_TSM_LICENSE_ACCEPTED=true
-DINSTALL_STAGENT=1
-DINSTALL_DEVICES=1
```

To define the silent installation, specify the variables in this file:

```
./install.bin
```

Table 22. Variables for the silent installation

Variable	Description
• -DIBM_TSM_LICENSE_ACCEPTED=true • -DIBM_TSMEE_LICENSE_ACCEPTED=true • -DIBM_SSAM_LICENSE_ACCEPTED=true • -DIBM_TSMSAN_LICENSE_ACCEPTED=true (required)	Specify one or two variables or the installation stops. It also stops if you specify more than two variables. The wizard installs the license agreement for the Tivoli Storage Manager product that is selected. **Tip:** If two products are specified, the wizard checks that one of them is the Tivoli Storage Manager for Storage Area Networks license: IBM_TSMSAN_LICENSE_ACCEPTED=true. If one variable is not, the wizard stops.
-DINSTALL_DEVICES=1 (optional)	Install the Tivoli Storage Manager device driver.
-DINSTALL_STAGENT=1 (optional)	Install the Tivoli Storage Manager storage agent.

Restrictions:

– You must include IBM_TSMSAN_LICENSE_ACCEPTED=true or the installation fails.

– Do not change the installation directory (the *USER_INSTALL_DIR* variable).

- A response file contains variables that you selected during a prior installation, using the GUI or console wizard. To use an existing response file, enter the following command:

  ```
  ./install.bin -i silent DIBM_TSM_LICENSE_ACCEPTED=true -f response_file
  ```

  where the *response_file* is the full directory path to a file that you previously created in the Tivoli Storage Manager installation process.

  If you include IBM_TSMSAN_LICENSE_ACCEPTED=true in the response file manually, enter the following command:

  ```
  ./install.bin -i silent -f response_file
  ```

  You might see a difference between response files, depending on whether you used a GUI or console installation mode.

3. After you install the storage agent and before you customize it for your use, go to the Tivoli Storage Manager support website: http://www.ibm.com/support/entry/portal/Overview/Software/Tivoli/Tivoli_Storage_Manager. Click **Downloads** and apply any applicable fixes.

At the end of the installation, a summary is provided. If there were any errors during the installation, another summary page lists the errors and directs you to an error log file. The installation log is stored in the `/var/tivoli/tsm` directory.

The default installation directory is `/opt/tivoli/tsm/StorageAgent/bin`.

The Global Security Kit (GSKit) is automatically installed when you install the storage agent component.

Related concepts:

"Software requirements" on page 7

Related information:

Tivoli Storage Manager for Storage Area Networks support

Passport Advantage download document

Installing silently using a batch script:

To receive a return code from the silent installation, run it using a batch script.

To see the progress of the installation, create a batch script by completing the following steps:

1. Create a file and name it `install.bat`. The file name must end with `.bat`, not `.bat.txt`.
2. Choose an installation option, with or without a response file, and enter the command into the `install.bat` file. Save it. For example:

   ```
   install.exe -i silent -DIBM_TSM_LICENSE_ACCEPTED=true -f response_file
   ```

3. Open a command prompt to run the batch file. Issue this command:

   ```
   install.bat
   ```

4. After the installation is complete, issue the following command to retrieve the return code:

   ```
   echo %ERRORLEVEL%
   ```

If any errors occurred during the installation, a summary page lists the errors and directs you to an error log file. Fix the errors before continuing. The installation log is stored in the directory that was chosen for the installation. Check the files `log.txt` and `logs.zip`.

Configuring the storage agent

After the installation is completed, you must configure the storage agent to ensure communication with the backup-archive client and the Tivoli Storage Manager server. The z/OS media server must be configured to access the Tivoli Storage Manager server.

To configure the storage agent, complete the following steps:

1. Point the server to the storage agent by issuing the **DEFINE SERVER** command on the Tivoli Storage Manager server.
2. Complete the steps in "Defining storage agents to the Tivoli Storage Manager server" on page 83.
3. To ensure communication between the storage agent and devices and libraries controlled by the z/OS media server, complete the steps in "Defining paths from the storage agent to the z/OS media server" on page 83.
4. Ensure that the `DEVCONFIG` option is specified in the storage agent options file `dsmsta.opt`.

   For example, for a device configuration file named `devconfig.out`, edit the `dsmsta.opt` file by typing the following line:

   ```
   DEVCONFIG devconfig.out
   ```

   The device configuration file can be located in the following directory:

   ```
   /opt/tivoli/tsm/StorageAgent/bin
   ```

5. Use the information that you collected in the configuration work sheets to issue the **DSMSTA SETSTORAGESERVER** command. For example:

```
dsmsta setstorageserver myname=storagnt mypassword=fun4me
myhladdress=agent.example.com
servername=tsmsrver serverpassword=not4u
hladdress=tsmsrver.example.com lladdress=1502
```

Requirement:

- The SERVERNAME option in the dsm.sys file, which is the client system options file, must match the SERVERNAME option in the dsm.opt file, which is the client user-options file. However, the option is unrelated to and does not need to match the SERVERNAME option that is defined for the storage agent in the storage-agent options file, dsmsta.opt.
- The HLADDRESS option must match the TCPSERVERADDRESS option that is in the dsm.sys file on the Tivoli Storage Manager client. When configuring the storage agent by using the **DSMSTA SETSTORAGESERVER** command, use addresses that correspond to the communications method used by the backup-archive client. With the backup-archive client, you can use either IPv4 (**COMMMETHOD TCPIP**) or IPv6 (**COMMMETHOD V6TCPIP**), but not both at the same time. To secure communication between the storage agent and the Tivoli Storage Manager server, ensure that your data is protected by Secure Sockets Layer (SSL).

The **DSMSTA SETSTORAGESERVER** command generates the following output in the storage agent device configuration file:

```
set staname storagnt
set stapassword xxxxxxx
set stakeydbpw xxxxxxx
set stahladdress agent.example.com
define server tsmsrver serverpassword=xxxxxxxxxxx
 hladdress=tsmsrver.example.com lladdress=1502
```

The passwords (shown as *xxxxxxxxxx*) are encrypted in the file.

The command also generates the following line in the dsmsta.opt file:

```
SERVERNAME tsmsrver
```

Related reference:

"Client-system and server-system configuration work sheets" on page 13

"The storage agent options file" on page 98

"DSMSTA SETSTORAGESERVER command" on page 103

"The device configuration file for the storage agent" on page 97

Related information:

Tivoli Storage Manager for Storage Area Networks support

Storage agent and client compatibility with Tivoli Storage Manager servers

Tivoli Storage Manager support

Setting up storage agent data transfer on the Tivoli Storage Manager server

To set up storage agent data transfer on the Tivoli Storage Manager server, you must set up server-to-server communication and define the storage agent that is installed on the client to the server.

Before beginning this procedure, ensure that you have the information recorded in the configuration-information work sheets.

Perform these tasks to define the storage agent and configure devices on the server:

1. "Setting up server-to-server communication"
2. "Defining storage agents to the Tivoli Storage Manager server" on page 83
3. "Defining paths from the storage agent to the z/OS media server" on page 83
4. "Confirming client node registration and configuration" on page 84

When you complete all the steps required to define the storage agent and configure devices on the server, you can configure the storage agent for z/OS media server access. For more information, see "Configuring the storage agent" on page 80.

Setting up server-to-server communication

You must set up server-to-server communication to enable the Tivoli Storage Manager servers and storage agents to access z/OS media server storage.

To set up server-to-server communication, issue the following commands on the Tivoli Storage Manager server. Replace the values in the example with values from the configuration-information work sheet.

```
set servername tsmsrver
set serverpassword not4u
set serverhladdress tsmsrver.example.com
set serverlladdress 1502
set crossdefine on
```

These commands establish the name, password, TCP/IP address, and port, of the server. They also allow other servers to define a connection on this server.

Verify that the password has been set for the server by issuing the **QUERY STATUS** command from a Tivoli Storage Manager administrative command line. The value of the **Server Password Set** field in the command output must be YES.

See the *Administrator's Guide* for details about the following:

- Defining media resources to access the Tivoli Storage Manager server
- Server-to-server communication

Defining storage agents to the Tivoli Storage Manager server

For each client that uses storage agent data transfer, define a storage agent to the server as if the storage agent is another server.

To define the storage agent, issue the **DEFINE SERVER** command from the Tivoli Storage Manager server that manages the client's data. Use the same name and password that you specified for the storage agent when you installed it on the client system, for example,

```
define server storagnt serverpassword=fun4me
hladdress=agent.tucson.ibm.com lladdress=1500 validateprotocol=all
```

The **VALIDATEPROTOCOL** parameter in the example is optional. This parameter specifies whether a cyclic redundancy check will be performed to validate data on all metadata transferred between the storage agent and the Tivoli Storage Manager server.
For details about data validation, see the *Administrator's Guide*. For details about the **DEFINE SERVER** command, see the *Administrator's Reference*.

You must also define the storage agent to the library manager. The storage agent must be able to contact the library manager directly when making mount requests. If the storage agent is only defined to the library client, it uses information from the client to define itself to the library manager. If the storage agent is unable to define itself to the library manager, you must define the storage agent manually using the **DEFINE SERVER** command issued from the library manager. For example:

```
define server storagnt serverpassword=fun4me
hladdress=agent.tucson.ibm.com lladdress=1500
```

You can complete the steps in "Configuring the storage agent" on page 80.

Defining paths from the storage agent to the z/OS media server

You must define a path from the storage agent to the z/OS media server library resource. A z/OS media server can manage both **FILE** and **TAPE** volume resources.

To define a path for a z/OS media library, use the **DEFINE PATH** command. For example, to define a path to a z/OS media library, that contains 3592 devices:

```
define path sta1 zos3592lib srctype=server desttype=library zosmediaserver=srv1zos
```

The `zosmediaserver=srv1zos` server definition is also defined between the Tivoli Storage Manager server and the z/OS media server.

For details about the **DEFINE PATH** command, see the *Administrator's Reference*.

Setting the storage agent data transfer destination

You need to set the storage agent data transfer destination to enable data transfer between the storage agent and the z/OS media server. The destination for data must be a LAN-free capable storage pool.

To set a LAN-free destination:

1. Define a copy group with its destination being the LAN-free capable storage pool. For example:

   ```
   define copygroup zosdirect zosdirectpolicy zosdirectdefmgt
      type=backup destination=storage_pool_name
   ```

2. Activate the policy set. For example:

```
activate policyset zosdirect zosdirectpolicy
```

For details about changing policy for clients that can use z/OS media server access, see the *Administrator's Guide*. For details about the commands, see the *Administrator's Reference*.

Note:

- If you do not want to use the default management class for z/OS media server access, create a management class.

  For details about the include-exclude list, see the *Backup-Archive Clients Installation and User's Guide*.
- With a hierarchical storage management client configured for storage agent data transfer, the management class (not the copy group) is set to a LAN-free capable storage pool.

Confirming client node registration and configuration

Client nodes must be registered and configured for LAN-free backups.

To verify that node settings are correct, issue the following command:

```
query node node_name format=detailed
```

If node settings are not correct, issue the **UPDATE NODE** command to adjust settings for the node. If the node has not been registered and configured for LAN-free backups, register the node with the **REGISTER NODE** command.

To help tune the use of your server LAN and z/OS media server LAN resources for storage agent data transfer, you can control the path that data transfers take for clients that have LAN-free data movement capability. For each client, you can select whether data read/write operations use the server LAN path, the z/OS media server LAN path, or either path. You can specify these settings with the **REGISTER NODE** and **UPDATE NODE** commands.

If the node belongs to a multi-threaded client and there are drives available, the MAXNUMMP parameter might restrict the number of drives that are available for the storage agent to use on behalf of the client. Specify the MAXNUMMP parameter on the **REGISTER NODE** or **UPDATE NODE** command.

For details about commands, see the *Administrator's Reference*.

Verifying the storage agent configuration

To ensure that the storage agent is moving data to the z/OS media server, you must verify that the hardware and software components are configured correctly.

To verify the storage agent configuration, complete the following steps:

1. Start the storage agent:

   Restart the client system. Change to the storage agent directory and issue the **DSMSTA** command.

   When the storage agent starts, it contacts all available shared libraries, including those libraries that do not have a defined path. As a result, a delay might occur during startup processing. The storage agent also determines if the Tivoli Storage Manager server is a library client or library manager. If the server is a library client, the storage agent attempts to define itself to the library

manager if it is not known to the library manager. When the storage agent communicates with the Tivoli Storage Manager server, Secure Sockets Layer (SSL) information is displayed to indicate that SSL is in use.

2. Run a backup operation from the client.
3. Log on to the Tivoli Storage Manager server and storage agent by using a Tivoli Storage Manager administrative command-line client.
4. To verify that the storage agent is moving the backup data to the z/OS media server and the proper sessions have been established, issue the **QUERY SESSION** command. In the command output, look for information about bytes sent and bytes received. If the storage agent is successfully moving the data, complete the following steps:
   - Querying a session on the storage agent shows bytes received for the node increasing to the total amount of data being backed up.
   - Querying a session on the Tivoli Storage Manager server shows a very small number of bytes (metadata) received for the same node.

   If the node's session has these characteristics, and you receive a message stating that the backup was successful, you configured your system correctly.

   There are several ways to query a session. If the process is running in the foreground, you can issue the **QUERY SESSION** command on the storage agent console. Alternatively, you can use a command-line client to connect to the storage agent on the administration port of the storage agent. Use the same administrator ID and password for this command that you use on the server.
5. If you receive a message saying that the backup has failed, verify the following tasks:
   - The Tivoli Storage Manager server is running. If the Tivoli Storage Manager server is not running, the storage agent will not start.
   - The z/OS media server is available and accessible from the storage agent.
   - The client, storage agent, and server are communicating with each other.
   - The mount and message are displayed on the storage agent console.

   If you retry the backup operation after the first failure, the client attempts to use the LAN connection for data movement. To force data movement from the storage agent to the z/OS media server, stop and restart the client.

Determining whether the storage agent moves data

To ensure data transfer from the storage agent to the z/OS media server, you must verify the network connectivity and the Tivoli Storage Manager software components.

Messages and backup reports can indicate whether the storage agent is moving data to the z/OS media server successfully. You can also use the **QUERY SESSION** and **QUERY ACTLOG** commands to verify data movement.

To determine whether the storage agent moves the data, use one or both of the following methods:

- Monitor the **QUERY SESSION** output against the node that is running the backup from the storage agent to the z/OS media server. Verify that the proper sessions have been established:
  1. Log in to the Tivoli Storage Manager server and storage agent using a Tivoli Storage Manager administrative command-line client.

2. Verify that the storage agent is moving the backup data to the z/OS media server and the proper sessions have been established, issue the **QUERY SESSION** command. In the command output, look for information about bytes sent and bytes received. If data movement is occurring, complete the following steps:
   - Query a session on the storage agent to show the bytes received for the node increasing to the total amount of data being backed up.
   - Query a session on the Tivoli Storage Manager server to show a very small number of bytes (metadata) received for the same node.

   If the node session shows these characteristics, the storage agent is moving data to the z/OS media server.

   Tip: During a failover where the storage agent is sending data directly to the server by proxy because it cannot store the data directly, the **QUERY SESSION** statistics on the server show a much higher byte count.

- Issue either of the following **QUERY ACTLOG** commands on the server to which the client is connected:

  ```
  query actlog search=storage_agent_name
  ```

  If the query locates entries in the activity log that relate to the storage agent, the client is transferring data to the z/OS media server.

Related information:

Connecting to a Tivoli Storage Manager storage agent by using an administrative command-line client

Appendix A. Starting and stopping the storage agent

You can configure the storage agent to start automatically when the system restarts. You can also start and stop the storage agent manually.

Automating the storage agent startup

When the storage agent is installed, an entry is made to the inittab that enables the storage agent to start automatically. You can use scripts, located in the storage agent installation directory, to modify the inittab.

- addtoinit (or addtoinit console)

  Adds an entry to the inittab that redirects output to `/dev/console` and enables automatic startup. For example:

  ```
  aa:234:once:/opt/tivoli/tsm/StorageAgent/bin/dsmsta.rc >/dev/console
     2<>/dev/console
  ```

- addtoinit null

  Adds an entry to the inittab that redirects output to `/dev/null` and enables text-based login to the console. For example:

  ```
  aa:234:once:/opt/tivoli/tsm/StorageAgent/bin/dsmsta.rc >/dev/null
  ```

- addtoinit saved

  Restores the inittab entry from *storage_agent _home_directory*`/oldinit` to `/etc/inittab`. If more than one entry exists in the `/etc/inittab` file, addtoinit saved restores the first entry only.

- removefrominit

  Removes any entry that refers to *storage_agent_home_directory*`/dsmsta.rc` and records these entries in a file called *storage_agent_home_directory*`/oldinit`. If more than one entry exists in the `/etc/inittab` file, removefrominit stores all entries in the `oldinit` file.

Manually starting and stopping the storage agent

You can start and stop the storage agent from the storage agent directory. You can also use an administrative client to issue commands supported by the storage agent.

To start the storage agent:

1. Restart the client system.
2. From the operating system command line, change to the storage agent directory (the default is `/opt/tivoli/tsm/StorageAgent/bin`) and issue the **DSMSTA** command.

Stop the storage agent by typing the following command at the Storage Agent (STA) command line prompt:

```
halt
```

In most cases it is not necessary to stop and restart a LAN-free storage agent to pick up changes from the data manager server. However, restarting the storage agent might be necessary if you changed the storage pool, library, device class, or drive information while LAN-free data movement was in process.

The storage agent keeps a list of storage pools, libraries, and device classes in memory to determine potential LAN-free destinations. The target volume and library selection occurs on the data manager server.

Certain storage pool attributes can result in failed requests rather than the LAN failover by the storage agent. If the storage agent has a LAN-free path established to the storage device, failover will not occur. However, if the storage agent incorrectly identifies a LAN-free destination and the server is unable to process the request, the operation has advanced beyond the point when LAN failover occurs, and the storage agent request does not succeed. If this occurs, stop and restart the storage agent, and then retry the operation.

Appendix B. Connecting to a Tivoli Storage Manager storage agent by using an administrative command-line client

You can use a command-line client to connect to the storage agent on the administration port of the storage agent.

Connecting to a Tivoli Storage Manager storage agent by using an administrative command-line client

You can configure the administrative command-line client to communicate directly with a storage agent and issue commands that are supported by the storage agent.

1. To configure the administrative command-line client, define the following options in the `dsm.sys` file for the storage agent:

   Tip: In this configuration example, the storage agent is on agent.example.com.

   ```
   servername storageagent
   commmethod tcpip
   tcpport 1500
   tcpserveraddress agent.example.com
   ```

2. Start the administrative client and specify the following command:

   ```
   dsmadmc -se=storageagent
   ```

   Requirement: Your user ID and password must be registered with the server.

Appendix C. Customizing the storage agent environment

You can customize the storage agent for specialized tasks.

ACSLS legacy data migration and coexistence

If StorageTek Automated Cartridge System Library Software (ACSLS) shared-library support is not possible in your configuration, data migration is required.

If your environment consists of Tivoli Storage Manager storage pools associated with an ACSLS library type and an ECARTRIDGE device type, the library can be updated with the SHARED=YES option to enable LAN-free data movement. However, if your environment consists of Tivoli Storage Manager storage pools associated with an ACSLS library type and a GENERICTAPE device type, data migration is required rather than coexistence because Tivoli Storage Manager ACSLS shared library support cannot co-exist with external library support.

Data migration of ACSLS to external library support is necessary only when Tivoli Storage Manager ACSLS shared library support is not possible in your configuration. The only situation where ACSLS shared library support is not possible is when your environment does not contain a Tivoli Storage Manager server installed on AIX, Solaris, or Windows to serve as the library manager. Migrate the existing data from existing (old) storage pools to new storage pools associated with the appropriate policy, device class, and library definitions. Migration of data also allows the entire environment to be LAN-free, providing better performance and better utilization of tape drives and media.

Figure 14 on page 92 displays the normal migration path from an old storage pool containing the data associated with the ACSLS library type to a new storage pool associated with an EXTERNAL library type and an ECARTRIDGE device class.

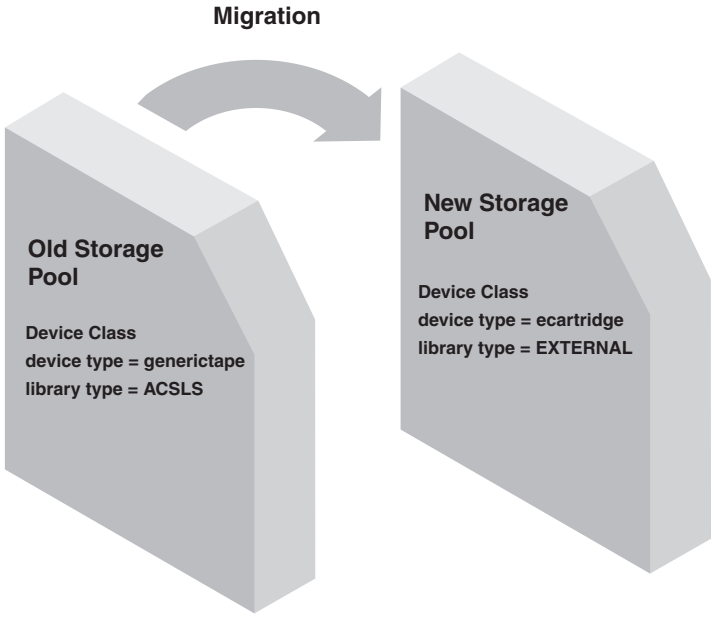


Figure 14. Legacy ACSLS data migration

Two methods to migrate data are:

- Use the IBM Tivoli Storage Manager server MOVE DATA command. This method allows the legacy ACSLS data to move to a new storage pool without moving any expired files in the aggregates. For more information, see the *Administrator's Guide*.
- Use the IBM Tivoli Storage Manager server storage pool reclamation function. This method works by reclaiming the active files from the legacy ACSLS storage pools. Reclamation processing, however, is very resource intensive and should be performed during periods of little activity on the server. For more information, see the *Administrator's Guide*.

For detailed information about how to migrate from an external library environment to a shared ACSLS library environment, see the *Administrator's Guide*.

Related concepts:

"External libraries" on page 22

Installing the storage agent to a Solaris Zone

Solaris Zones are available with Solaris Version 10. There are two types of zones: global and local.

Global and local Solaris zones

The global zone is the default zone on a Solaris host system and controls system resources. Local zones can be created and controlled from the global zone, and they run processes in isolation on the same host system.

To install the storage agent to either the global zone or a local zone, log in to the zone you want to install the server to, and complete the normal installation process for your system. You can install the server to more than one zone by completing each installation separately. The storage agent is installed only to the current zone.

For information about installing the Tivoli Storage Manager device driver to a Solaris zone, refer to the chapter on using devices in the *Administrator's Guide*.

For more information about Solaris zones, see your Solaris system administration documentation.

Creating a Solaris zone

To install a storage agent to a Solaris zone, the zone must have write access to the `/usr`, `/opt`, `/var`, and `/tmp` directories. A default zone does not have write access to the `/usr` directory.

The storage agent installation process requires a Solaris local zone to have write permissions for the `/usr`, `/opt`, `/var` and `/tmp` directories when creating the local zone from the global zone. By default, a local zone has write permission to `/opt`, `/var` and `/tmp` directories but it does not have a write permission for `/usr` directory. To install a storage agent to a local zone on the Solaris platform, configure this zone with write access to `/usr` directory.

Complete the following procedure to create a basic local zone with write access to the `/usr` directory.

1. From the global zone, create a zone directory:

   ```
   # mkdir -m 700 /zones/sunshade1
   ```

2. Configure the zone:

   ```
   # zonecfg -z sunshade1
   ```

   ```
   sunshade1: No such zone configured
   Use 'create' to begin configuring a new zone.
   zonecfg:sunshade1> create
   zonecfg:sunshade1> set zonepath=/zones/sunshade1
   zonecfg:sunshade1> set autoboot=true
   zonecfg:sunshade1> remove inherit-pkg-dir dir=/usr
   zonecfg:sunshade1> add net
   zonecfg:sunshade1:net> set address=9.11.100.1
   zonecfg:sunshade1:net> set physical=bnx0
   zonecfg:sunshade1:net> end
   zonecfg:sunshade1> add attr
   zonecfg:sunshade1:net> set name=comment
   zonecfg:sunshade1:net> set type=string
   zonecfg:sunshade1:net> set value="This is sunshade1..."
   zonecfg:sunshade1:net> end
   zonecfg:sunshade1> verify
   zonecfg:sunshade1> commit
   zonecfg:sunshade1>exit
   ```

3. Verify the zone:

   ```
   # zoneadm list -cv
   ```

   ```
     ID NAME         STATUS  PATH                  BRAND    IP
      0 global        running  /                     native   shared
      - sunshade1     configured /zones/sunshade1   native   shared
   ```

   ```
   # zonecfg -z sunshade1 info
   ```

```
zonename: sunshade1
zonepath: /zones/sunshade1
brand: native
autoboot: false
bootargs:
pool:
limitpriv:
scheduling-class:
ip-type: shared
inherit-pkg-dir:
        dir: /lib
inherit-pkg-dir:
        dir: /platform
inherit-pkg-dir:
        dir: /sbin
net:
        address: 9.11.100.1
        physical: bnx0
attr:
        name: comment
        type: string
        value: "This is sunshade1..."
```

4. Install the zone:

   ```
   # zoneadm -z sunshade1 install
   ```

5. Start the zone:

   ```
   # zoneadm -z sunshade1 boot
   # zoneadm list -cv
   ```

   ```
     ID NAME         STATUS  PATH                  BRAND    IP
      0 global        running  /                     native   shared
      - sunshade1     configured /zones/sunshade1   native   shared
   ```

6. Configure the zone for the network:

   ```
   # zlogin -C sunshade1 # -- configure zone for the network
   ```

After a local zone is created for the storage agent, the Tivoli Storage Manager storage agent and device driver packages can be installed to the zone. You can install and run the storage agent and device driver in local zones using the same process to install and run them in global zones.

Configuring multiple clients to use the same storage agent

You can configure two or more clients to use the same storage agent.

To configure clients:

- If the clients reside on the same system as the storage agent, set the appropriate options and values in the client's `dsm.sys` file.
- If the clients do not reside on the same system as the storage agent, set the following options with the appropriate values:
  - `LANFREECOMMMETHOD TCPIP`
  - `LANFREETCPSERVERADDRESS`

    Specify the TCP/IP address of the system where the storage agent is installed.
  - `LANFREETCPPORT`

    Specify the same TCP/IP port address as specified by the `TCPPORT` option in the storage agent options file `dsmsta.opt`.

Using LAN and LAN-free paths in the same backup operation

During a single client backup operation, you can send some of the data over a LAN-free path and some of the data over a LAN path.

Before beginning this procedure:

- Ensure that the values for the **DATAWRITEPATH** and **DATAREADPATH** in client node definition are set to ANY. Use the server command **REGISTER NODE** or **UPDATE NODE** to set the parameter values.
- Ensure that the active policy set of the domain to which the client is registered has at least two management classes. One of the management classes must point to a destination storage pool that is enabled for LAN-free data movement. The other management class must point to a destination storage pool that is not enabled for LAN-free data movement.
- Ensure that ENABLELANFREE=YES is set in the following file:

  dsm.sys (server stanza)

To send data over LAN and LAN-free paths in the same backup operation:

Specify client INCLUDE statements that bind data that requires the LAN-free path to the management class that uses a LAN-free-enabled storage pool. Specify separate client INCLUDE statements that bind data that requires the LAN path to a management class that does not use a LAN-free enabled storage pool. The INCLUDE statements are located in the following file:

The file that is specified with the `INCLEXCL` client option

Tip: If the default management class for the policy set does not specify a LAN-free-enabled storage pool, you can omit the INCLUDE statement for the LAN data path. You can omit the INCLUDE statement because the data that is not bound by an INCLUDE statement is bound to the default and sent over the LAN.

Appendix D. Storage agent commands and configuration files

Use files and commands to administer and configure the storage agent and devices.

The device configuration file for the storage agent

The device configuration file for the storage agent includes information about the storage agent and about the Tivoli Storage Manager server with which the storage agent communicates and that is managing the SAN-attached libraries and drives that the storage agent uses.

The file is typically named devconfig and is located with the storage agent program:

/opt/tivoli/tsm/StorageAgent/bin

The **DSMSTA SETSTORAGESERVER** command normally generates the contents of the file, and you can also use the command to add information to the file.

Typical contents of the device configuration file are as follows:

```
set staname storagnt
set stapassword fun4me
set stakeydbpw password
set stahladdress agent.example.com
define server tsmsrver serverpassword=not4u
  hladdress=tsmsrver.example.com lladdress=1502
```

In this example, storagnt is the name of the storage agent and tsmsrver is the name of the Tivoli Storage Manager server.

Properties

SET STANAME
Sets the name of the storage agent. The name must be the same as the name that was used to define the storage agent as a server to the Tivoli Storage Manager server.

SET STAPASSWORD
Sets the password of the storage agent. The password must be the same as the password that was used when defining the storage agent as a server to the Tivoli Storage Manager server. The password is encrypted.

SET STAKEYDBPW
Sets the password that is used to verify and control access to the Secure Sockets Layer (SSL) database. The password is obfuscated and stored in the storage agent options file.

SET STAHLADDRESS
Sets the TCP/IP address of the storage agent.

DEFINE SERVER
Define the Tivoli Storage Manager server with which the storage agent communicates.

The storage agent options file

The storage agent options file contains the name of the server with which the storage agent communicates, along with other options. Normally, you do not need to make any changes to the options file unless your Tivoli Storage Manager server changes.

The options file for the storage agent is named dsmsta.opt. The dsmsta.opt file is located where the storage agent program was installed. The default path is:

/opt/tivoli/tsm/StorageAgent/bin

For detailed information about these options, see the *Administrator's Reference*.

For detailed information about the COMMMETHOD and LANFREECOMMMETHOD options, see the *Backup-Archive Clients Installation and User's Guide*.

Required options

Note: Uppercase letters indicate allowed abbreviations.

DEVCONFig *file_name*
The name of the device configuration file for the storage agent. A typical name for the file is devconfig.

SERVERName *server_name*
The name of the Tivoli Storage Manager server with which the storage agent communicates. The **DSMSTA SETSTORAGESERVER** command inserts this option.

TCPPort *number*

Specifies the port number on which the server TCP/IP communication driver is to wait for requests for client sessions.

Using different port numbers for the options TCPPORT and TCPADMINPORT enables you to create one set of firewall rules for client sessions and another set for other session types (administrative sessions, server-to-server sessions, SNMP subagent sessions, storage agent sessions, library client sessions, managed server sessions, and event server sessions). If the two port numbers are different, separate threads will be used to service client sessions and the other session types. If you allow the two options to use the same port number (by default or by explicitly setting them to the same port number), a single server thread will be used to service all session requests.

Additional options

ADMINONClientport
Specifies whether or not the TCPPORT can be used by administrative sessions. You can specify one of the following values:

- **YES** (default)

  If the option is set to YES, or if the TCPPORT and TCPADMINPORT are the same value (the default), then the administrative sessions can use the TCPPORT.

- **NO**

  If the option is set to NO, and if the TCPADMINPORT value is different than the TCPPORT value, then administrative sessions cannot use TCPPORT.

CHECKTAPEPOS

Specifies whether the Tivoli Storage Manager server validates the position of data blocks on tape. The CHECKTAPEPOS option applies only to operations using tape drives. It does not apply to non-tape, sequential-access device classes such as FILE or OPTICAL. If the server information about position does not match the position detected by the drive, an error message is displayed, the transaction is rolled back, and the data is not committed to the database.

The default is YES.

The following options are available:

Yes
Specifies that the Tivoli Storage Manager server validates data position on tape. For drives that support append-only mode, this parameter specifies that Tivoli Storage Manager enables the drive to also validate the data position during each WRITE operation to prevent data overwrite.

No Specifies that all data position validation is turned off.

TSMonly
Specifies that the Tivoli Storage Manager server validates data position on tape. The server does not use append-only mode even if the drive supports the feature.

DRIVEonly
Specifies that the Tivoli Storage Manager server enables append-only mode for drives that support this feature. The server does not validate the data position on tape.

COMMTimeout *seconds*

Specifies the maximum number of seconds that the server waits for an expected client message during an operation that causes a database update. The default value is 60. The minimum value is 1. If the length of time exceeds this time-out, the server ends the session with the client. You may want to increase the time-out value to prevent clients from timing out. Clients may time out if there is a heavy network load in your environment or when they are backing up large files.

IDLETimeout *minutes*

Specifies the maximum number of minutes that a client session can be idle before the server cancels the session. The default value is 15 minutes. The minimum value is 1 minute. You may want to increase the time-out value to prevent clients from timing out if there is a heavy network load in your environment. Note, however, that a large number of idle sessions could prevent other users from connecting to the server.

MAXSessions *number_of_sessions*

Specifies the maximum number of simultaneous client sessions that can connect with the server. The default value is 25 client sessions. The minimum value is 2 client sessions. The maximum value is limited only by available virtual memory size or communication resources.

MSGSTACKTRACE *on | off*

Specifies that a list of functions will be shown on the server console, and will also be directed to the activity log after specific messages have been issued. The output will help the Tivoli Storage Manager service team to diagnose specific problems quicker. It is recommended that this option be set to ON.

RESOURCETimeout *minutes*

Specifies the maximum number of minutes that a storage agent waits for a resource on the server. The default value is 60 minutes. The minimum value is 1 minute.

For database resources and sessions on the storage agent, the Tivoli Storage Manager resource monitor picks the shortest time-out value to start a recovery process.

In contrast, in the case of library sharing, the resource monitor picks the longest time for both the library manager and library client to recover. For more efficient management of shared library resources, consider setting resource time-outs at the same limit for all participants in a shared configuration. In any case of error recovery, Tivoli Storage Manager always defers to the longest timeout limit.

You should also specify this option in the server options file. The server uses this option to monitor some of the storage agent sessions and resources and will cancel sessions based on the value you specify.

Important: If this option is specified in the server options file, that value will override the value specified in the storage agent's options file.

SANDISCOVERY

Specifies whether the Tivoli Storage Manager SAN discovery function is enabled. When set to ON, the storage agent will perform SAN discovery in the following instances:

- During storage agent initialization
- When the device path has been changed and there is a conflict between the device serial number and the device path provided by the server

SANDISCOVERY OFF is the default value for AIX, Linux, HP-UX, Oracle Solaris, and 64-bit Microsoft Windows. SANDISCOVERY ON is the default value for 32-bit Microsoft Windows.

The options available include:

ON Specifies that the server performs SAN discovery when the device path has been changed, or when the **QUERY SAN** command is issued.

OFF

Disables the SAN discovery function but does not take the device path offline. Set the SANDISCOVERY option to OFF if the HBA used by the storage agent does not support SAN device mapping.

UNSCANNEDPATHOFF

Disables the SAN discovery function and takes the device path offline if the server is unable to open it.

Using SAN discovery, the storage agent can automatically correct the device's special file name if it has been changed. If the HBA used by the storage agent does not support SAN device mapping, you should set the SANDISCOVERY option to OFF.

For information about Tivoli Storage Manager supported HBAs for SAN device mapping, see the Tivoli Storage Manager for Storage Area Networks support site at http://www.ibm.com/software/sysmgmt/products/support/IBMTivoliStorageManager.html.

The storage agent does not require persistent binding with the SAN discovery function enabled.

SSLTCPADMINPORT

Specifies the port address on which the server TCP/IP communication driver waits for requests for sessions that are enabled by Secure Sockets Layer (SSL). The sessions are for the command-line administrative client.

When you use the SSLTCPADMINPORT or SSLTCPPORT option and start the server, a key database file cert.kdb is created. The key database file is created in the server instance directory and is initialized with a self-signed certificate.

The following types of sessions do not use SSL:

- NDMP (Network Data Management Protocol)
- ACSLS (Automated Cartridge System Library Software)
- SNMP (Simple Network Management Protocol) subagent

If the ADMINONCLIENTPORT option is set to NO, SSL-enabled sessions for the administrative client require SSLTCPADMINPORT with a port number other than one specified by the SSLTCPPORT option. The SSLTCPADMINPORT option does not affect the TCPPORT or TCPADMINPORT options and their interaction with the ADMINONCLIENTPORT option.

The TCP/IP communications driver must be enabled with COMMMETHOD TCPIP or COMMMETHOD V6TCPIP.

SSLTCPPORT

Specifies the Secure Sockets Layer (SSL) port number. The server TCP/IP communication driver waits for requests on this port for SSL-enabled sessions from the client.

The following types of sessions do not use SSL:

- NDMP (Network Data Management Protocol)
- ACSLS (Automated Cartridge System Library Software)
- SNMP (Simple Network Management Protocol) subagent
- Database restore operations

If the ADMINONCLIENTPORT option is set to NO, SSL-enabled sessions for the administrative client require the SSLTCPADMINPORT option with a port number different than one specified by the SSLTCPPORT option. The SSLTCPPORT option does not affect the TCPPORT or TCPADMINPORT options and their interaction with the ADMINONCLIENTPORT option.

The TCP/IP communications driver must be enabled in the appropriate client options file with COMMMETHOD TCPIP option or COMMMETHOD V6TCPIP option. The backup-archive client supports either the COMMMETHOD TCPIP option or the COMMMETHOD V6TCPIP option, but not both at the same time.

STAKEYDBPW

Specifies the password that is used to verify and control access to the SSL key database. The user cannot edit the value of STAKEYDBPW.

STAMaxpooledsessions *number*

Specifies the number of individual sessions that are allowed to start and stop between the storage agent and the Tivoli Storage Manager server. The range of values is 0 - 150, with a default of 25. Each session is governed by the IDLETIMEOUT option and is stopped when the timeout value is exceeded. If the storage agent needs more sessions than specified, additional sessions are allowed. Although the default value is typically sufficient, setting this option with a low number can adversely affect

performance. Be aware that if the storage agent has multiple client sessions, increasing the value of this option will help support these sessions.

TCPADMINPORT *number*

Specifies the port number on which the server TCP/IP communication driver is to wait for requests for sessions other than client sessions. This includes administrative sessions, server-to-server sessions, SNMP subagent sessions, storage agent sessions, library client sessions, managed server sessions, and event server sessions. The default is the value of TCPPORT.

Using different port numbers for the options TCPPORT and TCPADMINPORT enables you to create one set of firewall rules for client sessions and another set for the other session types listed above. By using the **SESSIONINITIATION** parameter of **REGISTER NODE** and **UPDATE NODE**, you can close the port specified by TCPPORT at the firewall, and specify nodes whose scheduled sessions will be started from the server. If the two port numbers are different, separate threads will be used to service client sessions and the session types. If you allow the two options to use the same port number (by default or by explicitly setting them to the same port number), a single server thread will be used to service all session requests.

Client sessions that attempt to use the port specified by TCPADMINPORT will be terminated (if TCPPORT and TCPADMINPORT specify different ports). Administrative sessions are allowed on either port, (unless the ADMINONCLIENTPORT option is set to NO) but by default will use the port specified by TCPADMINPORT.

THROUGHPUTDatathreshold *kilobytes_per_second*

Specifies the throughput that client sessions must achieve to prevent cancellation after THROUGHPUTTIMETHRESHOL *minutes* have elapsed. The default value of 0 prevents examining client sessions for insufficient throughput. Throughput is computed by adding send and receive byte counts and dividing by the length of the session. The length does not include time spent waiting for media mounts and starts at the time a client sends data to the server for storage. The minimum value is 0; the maximum is 99999999.

THROUGHPUTTimethreshold *minutes*

Specifies the threshold for examining client sessions and cancelling them if the data throughput threshold is not met (see THROUGHPUTDATATHRESHOLD). This threshold does not include time spent waiting for media mounts. The time threshold starts when a client begins sending data to the server for storage (as opposed to setup or session housekeeping data). The default value of 200 prevents examining client sessions for low throughput. The minimum value is 0; the maximum is 99999999.

USELARGEBUFFERS *yes | no*

Specifies that large buffers are used for client-server communications. The default of YES specifies that large buffers are used; NO specifies that they are not used.

DSMSTA SETSTORAGESERVER command

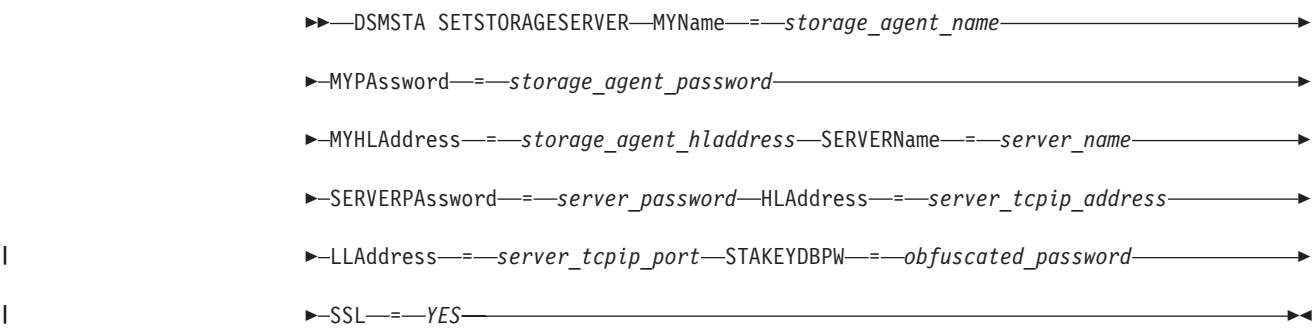
Use the **DSMSTA SETSTORAGESERVER** command to initialize the storage agent and add communication information to the device configuration file and the storage agent options file dsmsta.opt.

Use this utility on the client system where the storage agent has been installed.

This utility does not remove any previous entries in the files. It appends information to the existing files. The option DEVCONFIG, which sets a name for the device configuration file, must be in the dsmsta.opt file for the command to work. See "Examples" on page 104.

When configuring the storage agent using the **DSMSTA SETSTORAGESERVER** command, use addresses that correspond to the communications method used by the backup-archive client. The backup-archive client supports either IPv4 (**COMMMETHOD TCPIP**) or IPv6 (**COMMMETHOD V6TCPIP**), but not both at the same time.

Syntax



Parameters

All parameters are required. Allowed abbreviations for the options are shown in uppercase letters.

MYName
Specifies the name of the storage agent. This name appears in the SET STANAME command that is inserted into the device configuration file.

You must use the same name when you define the storage agent as a server to the Tivoli Storage Manager server.

MYPAssword
Specifies the password of the storage agent. This value is encrypted and used in the **SET STAPASSWORD** command that is inserted into the device configuration file.

You must use the same password when you define the storage agent as a server to the Tivoli Storage Manager server.

MYHLAddress
Specifies the TCP/IP address of the storage agent. This value is used internally in the **SET STAHLADDRESS** command that is inserted into the device configuration file.

SERVERName
Specifies the name of the Tivoli Storage Manager server. This name appears in the **DEFINE SERVER** command that is inserted into the device configuration file.

SERVERPAssword
Specifies the password of the server. This value is encrypted and appears in the **SERVERPASSWORD** parameter of the **DEFINE SERVER** command that is inserted into the device configuration file.

HLAddress
Specifies the TCP/IP address of the server. This value is used in the **HLADDRESS** parameter of the **DEFINE SERVER** command.

LLAddress
Specifies the TCP/IP port on which to access the server. This value is used in the **LLADDRESS** parameter of the **DEFINE SERVER** command.

SSL
Specifies whether the storage agent will use Secure Sockets Layer (SSL) for communicating with the server. The default value is NO.

STAKEYDBPW
Specifies the password that is used to verify and control access to the SSL key database. The value of the **STAKEYDBPW** parameter is stored in the storage agent options file.

Examples

Issue the **DSMSTA SETSTORAGESERVER** command with the following information:

- Storage agent
  - Name: storagnt
  - Password: fun4me
  - TCP/IP address: agent.example.com
- Tivoli Storage Manager server
  - Name: tsmsrver
  - Password: not4u
  - TCP/IP address: tsmsrver.example.com
  - SSL port: 1542

The command is:

```
dsmsta setstorageserver myname=storagnt mypassword=fun4me
myhladdress=agent.example.com
servername=tsmsrver serverpassword=not4u
   hladdress=tsmsrver.example.com lladdress=1502
```

The command generates the following lines in the device configuration file for the storage agent:

```
set staname storagnt
set stapassword xxxxx
set stahladdress agent.example.com
define server tsmsrver serverpassword=xxxxxxxx
  hladdress=tsmsrver.example.com lladdress=1502
```

The passwords (shown as *xxxxxxxx*) are encrypted in the file.

The command also generates the following line in the dsmsta.opt file for the storage agent:

```
servername tsmsrver
```

To enable SSL communication and to ensure the storage agent is authenticated through an LDAP directory server, issue the following command:

```
dsmsta setstorageserver myname=storagnt mypassword=fun4me
myhladdress=agent.example.com
servername=tsmsrver serverpassword=not4u
ssl=yes
stakeydbpw=password
hladdress=tsmsrver.example.com lladdress=1500
ssltcpport=1543
```

Related tasks:

"Installing the storage agent" on page 31

"Installing the storage agent" on page 52

"Installing the storage agent" on page 75

Tivoli Storage Manager device utilities

You can use device utilities for tasks related to configuring storage devices for the Tivoli Storage Manager storage agent.

autoconf (Auto configure devices)

Use the autoconf utility to configure devices for use with the Tivoli Storage Manager storage agent.

The **autoconf** utility performs the following tasks:

- Loads the driver to the kernel
- Creates the necessary files for the Tivoli Storage Manager device driver
- Creates device information files for libraries and tape devices

The **autoconf** utility is included in the device driver package and is installed to the `/opt/tivoli/tsm/devices/bin` directory.

Options

/t Enables tracing for the **autoconf** utility.

/? Displays information about the **autoconf** utility and its parameters.

Example: Configure devices by using the autoconf utility

Run **autoconf** to configure Tivoli Storage Manager devices:

```
> /opt/tivoli/tsm/devices/bin/autoconf
```

rmstdev (Detect and delete device special files)

Use the **rmstdev** utility to detect and delete device special files that are created by the Oracle Solaris st device driver. If these files exist on the system and you are using the Tivoli Storage Manager or IBM® tape device driver, data can be overwritten.

Run the rmstdev utility as the root user after each system reboot unless the storage agent is started automatically through the rc.dsmserv or dsmsta.rc utility. If you are not a root user, the rmstdev utility operates only in preview mode and you cannot issue `rmstdev -d` to delete files.

The rmstdev utility is included in the Tivoli Storage Manager storage agent package and is installed to the /opt/tivoli/tsm/StorageAgent/bin directory.

Options

/d Deletes st device special files that correspond to devices that are configured by the Tivoli Storage Manager device driver or the IBM® tape device driver.

/t Enables tracing for **rmstdev**.

/? Displays information about **rmstdev** and its parameters.

Example: Preview a list of st device special files

Run **rmstdev** to list all st device special files corresponding to Tivoli Storage Manager devices that are detected on the system:

```
> /opt/tivoli/tsm/devices/bin/rmstdev
```

Related tasks:

"Preventing tape labels from being overwritten" on page 44

tsmdlist (Display information about devices)

Use the **tsmdlist** utility to view device names and other information about medium changer, tape, and optical devices that are controlled by the Tivoli Storage Manager device driver.

After devices are configured, you can run the **tsmdlist** utility to display device information. The utility saves this information in output files that you can retrieve. The output files are named lbinfo for medium changer devices, mtinfo for tape devices, and optinfo for optical devices. After a device is added or reconfigured, you can update these output files by running the **tsmdlist** utility again. If you configure devices by using the **autoconf** utility, **tsmdlist** runs automatically after the devices are configured.

The tsmdlist utility and the output files it generates are in the devices/bin directory, which is /opt/tivoli/tsm/devices/bin, by default. Before you run the tsmdlist utility, make sure that either the Tivoli Storage Manager storage agent is stopped or that all device activities are stopped. If a device is in use by the Tivoli Storage Manager storage agent when the tsmdlist utility runs, a device busy error is issued.

Options

/t Displays trace messages for the **tsmdlist** utility.

/? Displays usage information about **tsmdlist** and its parameters.

Example: Display information about all devices

Display information about all devices that were configured by the Tivoli Storage Manager device driver:

```
tsmdlist
```

Appendix E. Accessibility features for the Tivoli Storage Manager product family

Accessibility features help users who have a disability, such as restricted mobility or limited vision, to use information technology products successfully.

Accessibility features

The following list includes the major accessibility features in the Tivoli Storage Manager family of products:

- 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

The Tivoli Storage Manager Information Center, and its related publications, are accessibility-enabled. For information about the accessibility features of the information center, see the following topic: http://pic.dhe.ibm.com/infocenter/tsminfo/v6r3/topic/com.ibm.help.ic.doc/iehs36_accessibility.html.

Keyboard navigation

On Windows, the Tivoli Storage Manager product family follows Microsoft conventions for all keyboard navigation and access. Drag and Drop support is managed by using the Microsoft Windows Accessibility option known as *MouseKeys*. For more information about MouseKeys and other Windows accessibility options, see the Windows online help, citing the keyword "MouseKeys".

On other operating systems, these products follow the operating-system conventions for keyboard navigation and access.

Vendor software

The Tivoli Storage Manager product family 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.

IBM and accessibility

See the IBM Human Ability and Accessibility Center (http://www.ibm.com/able) for information about the commitment that IBM has to accessibility.

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Glossary

A glossary is available with terms and definitions for the IBM Tivoli Storage Manager family of products.

You can view the glossary in the Tivoli Storage Manager information center at http://pic.dhe.ibm.com/infocenter/tsminfo/v6r3.

To view glossaries for other IBM products, see http://www.ibm.com/software/globalization/terminology/.

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