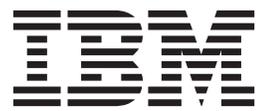IBM Tivoli Storage Manager for SAN
for Linux
Version 7.1

Storage Agent User's Guide

IBM

IBM Tivoli Storage Manager for SAN
for Linux
Version 7.1

Storage Agent User's Guide

IBM

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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 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 across all publications or to download PDF versions of individual
publications, go to the Tivoli Storage Manager information center at
http://pic.dhe.ibm.com/infocenter/tsminfo/v7r1.

You also can find the Tivoli Storage Manager product family information centers
and other information centers that contain official product documentation for
current and previous versions of Tivoli products at Tivoli Documentation Central.
Tivoli Documentation Central is available at http://www.ibm.com/
developerworks/community/wikis/home/wiki/Tivoli Documentation Central.

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.

Command names

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 command in any column of the input line.

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 a command appears entirely in uppercase letters, you cannot abbreviate it. You can enter the command 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.

```
►►──CMDNAme───────────────────────────────────────────►◄
```

Note: Command names in descriptive text are always capitalized.

Required parameters

When a parameter is on the same line as the command name, the parameter is required. When two or more parameter values are in a stack and one of them is on the line, you *must* specify one value.

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

```
►►──PARMName──=──┬─A─┬──────────────────────────────────►◄
                 ├─B─┤
                 └─C─┘
```

Optional parameters

When a parameter is below the line, the parameter is optional. In this example, you can enter PARMNAME=A or nothing at all. Do not include any blanks immediately before or after the equal sign (=).

```
►►─┬──────────────────┬─────────────────────────────────────────►◄
   └─PARMName──=──A─┘
```

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

```
►►─┬────────────────────────┬─────────────────────────────────────►◄
   └─PARMNAme──=──┬──A──┬─┘
                  ├──B──┤
                  └──C──┘
```

Defaults

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

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

```
      ┌─PARMNAme──=──A─────┐
►►─┴───────────────────────┴──────────────────────────────────────►◄
   └─PARMName──=──┬──A──┬─┘
                  ├──B──┤
                  └──C──┘
```

Variables

Highlighted lowercase items (*like this*) denote variables. In these examples, *var_name* represents variables::

```
►►──CMDNAme──var_name──────────────────────────────────────────────►◄
```

```
►►─┬────────────────────────────┬──────────────────────────────────►◄
   └─PARMname──=──var_name─┘
```

Special characters

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

*   Asterisk

:   Colon

,   Comma

= Equal sign

- Hyphen

( ) Parentheses

. Period

Repeating values

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.

```
      ┌─,──────────┐
►►──┴──file_name──┴──────────────────────────────────────────────────►◄
```

Repeatable choices

A stack of values followed by an arrow returning to the left means that you can select more than one value or, when permitted, 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 (=).

```
                    ┌─,──────────┐
►►──PARMNAme──=──┬──┬──value1──┬─┴──────────────────────────────────►◄
                    ├──value2──┤
                    └──value3──┘
```

Footnotes

Footnotes are enclosed in parentheses.

```
      ┌─,──────────────┐
      │    (1)          │
►►──┴──────file_name──┴────────────────────────────────────────────►◄
```

Notes:

1   You can specify up to five file names.

Entering parameters

The order in which you enter parameters can be important. The following example shows a portion of the command for defining a copy storage pool:

```
►►──DEFine STGpool──pool_name──device_class_name──POoltype──=──COpy──────►
```

```
                                          ┌─REClaim──=──100───────┐
►──┬───────────────────────────────┬──┴──REClaim──=──percent──┴──────►◄
   └──DESCription──=──description──┘
```
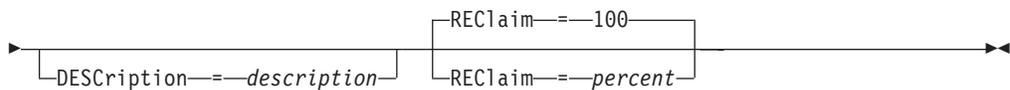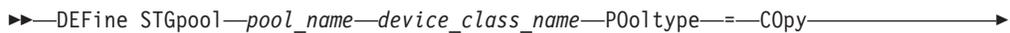
The first two parameters in this command (*pool_name* and *device_class_name* are required parameters. *pool_name* and *device_class_name* are also positional. That is, they must be entered in the order shown, immediately after the command name. The **POOLTYPE** parameter is a required keyword parameter. **DESCRIPTION** and **RECLAIM**, are optional keyword parameters. Keyword parameters are identified by an equal sign that specifies a specific value or a variable. Keyword parameters must follow any positional parameters in a command.

The following command entries, in which the keyword parameters are ordered differently, are both acceptable:

```
define stgpool mycopypool mydeviceclass pooltype=copy description=engineering
   reclaim=50
define stgpool mycopypool mydeviceclass description=engineering pooltype=copy
   reclaim=50
```

The following example, in which one of the positional parameters follows a keyword parameter, is not acceptable:

```
define stgpool mycopypool pooltype=copy mydeviceclass description=engineering
   reclaim=50
```

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 ├──▶◀

Fragment:

├─┬─A─┬──┤
  ├─B─┤
  └─C─┘

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.

▶▶──CMDNAme───▶◀

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.

```
►►──CMDNAme──var_name────────────────────────────────────────────►◄
```

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.

```
        ┌─,──────┐
►►──────▼─repeat─┴───────────────────────────────────────────────►◄
```

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

```
        ┌─,──────┐
        │ (1)    │
►►──────▼────repeat─┴────────────────────────────────────────────►◄
```

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 (=).

```
►►──CMDNAme──=──┬─A─┬──────────────────────────────────────────►◄
                ├─B─┤
                └─C─┘
```

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 (=).

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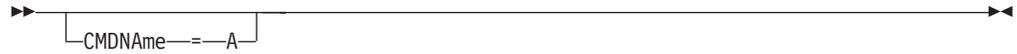
When two or more items are in a stack below the line, all of them are optional. In this example, you can choose CMDNAME=A, CMDNAME=B, CMDNAME=C, or nothing at all. Do not include any blanks immediately before or after the equal sign (=).

```
►►─────────────────────────────────────────────────────────────►◄
   └─CMDNAme──=──┬─A─┬─┘
                 ├─B─┤
                 └─C─┘
```

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 (=).

```
     ┌─CMDNAme──=──A──────┐
►►───┤                    ├──────────────────────────────────────►◄
     └─CMDNAme──=──┬─A─┬──┘
                   ├─B─┤
                   └─C─┘
```
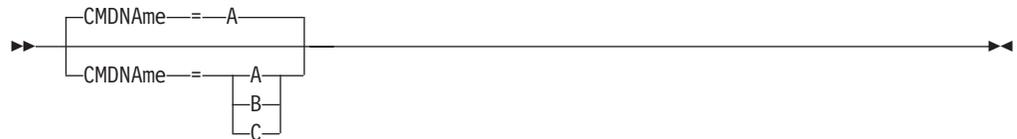
Repeatable Choices: A stack of items followed by an arrow returning to the left means that you can select more than one item or, in some cases, repeat a single item. In this example, you can choose more than one value, with each name delimited with a comma. Do not include any blanks before or after the equal sign (=).

```
              ┌──────,──────┐
►►──CMDNAme──=─▼──┬─value1─┬─┴───────────────────────────────────►◄
                  ├─value2─┤
                  └─value3─┘
```

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 ├─────────────────────────────────────────────────►◄
```

Fragment:

```
   ┌─A─┐
├──┤─B─├──────────────────────────────────────────┤
   └─C─┘
```
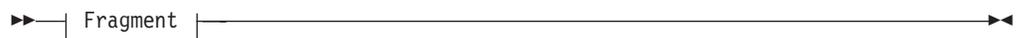
New for Tivoli Storage Manager for Storage Area Networks Version 7.1

IBM Tivoli Storage Manager for Storage Area Networks is updated for Version 7.1.

Deprecated device types

In Tivoli Storage Manager Version 7.1, certain device types are deprecated. The following device types are deprecated. While you can use these device types with Tivoli Storage Manager Version 7.1, plan to migrate data to new devices before you upgrade to a later release of Tivoli Storage Manager.

- 3490
- 3570
- CARTRIDGE
- OPTICAL
- WORM
- QIC
- DTF

For a list of devices and valid device class formats, see the Tivoli Storage Manager Supported Devices website for your operating system:

> http://www.ibm.com/software/sysmgmt/products/support/
> IBM_TSM_Supported_Devices_for_Linux.html

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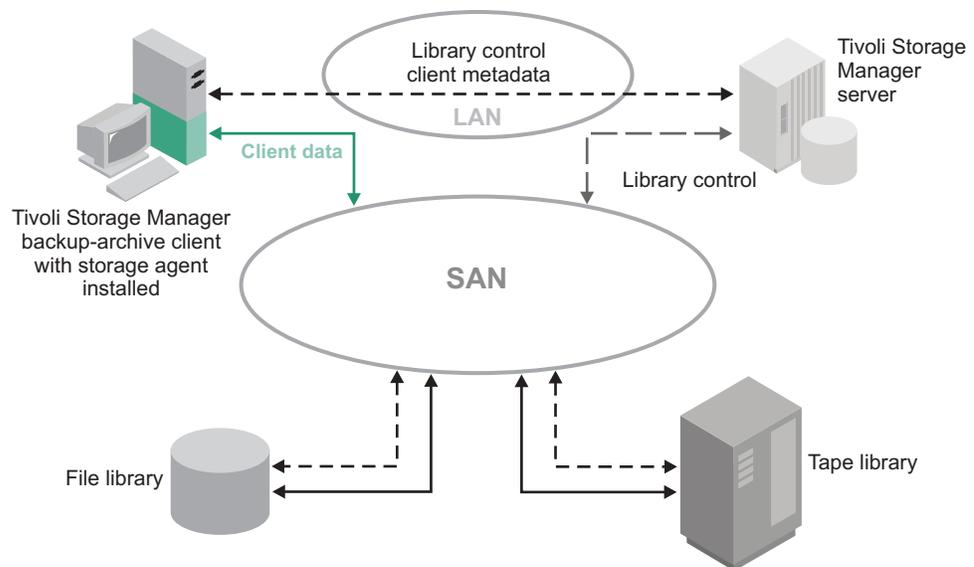
Figure 1. SAN data movement. Solid lines indicate data movement. Broken lines indicate movement of control information and metadata.

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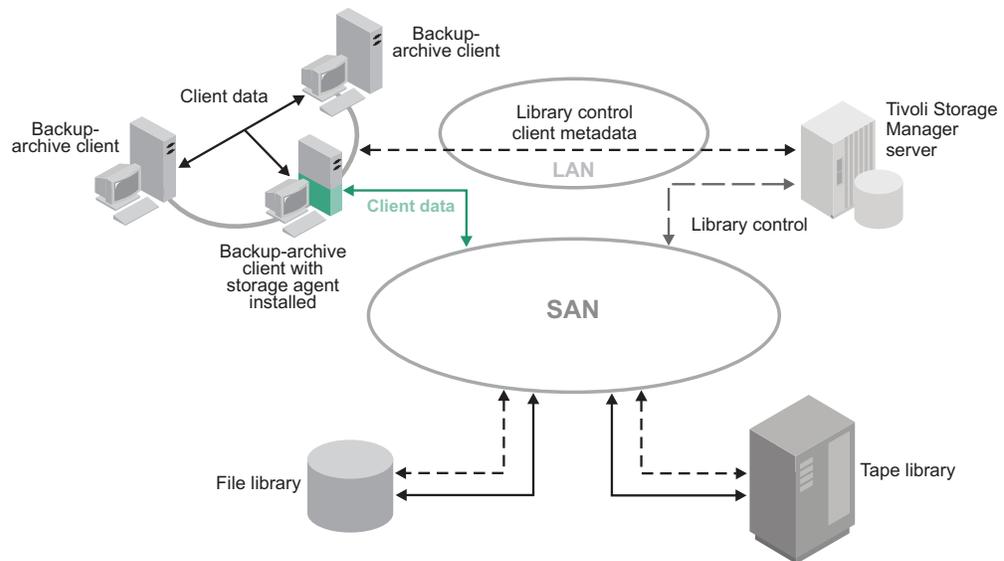
Figure 2. SAN data movement with the LANFREECOMMMETHOD option. Solid lines indicate data movement. Broken lines indicate movement of control information and metadata.

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 runs 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 349X 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, 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 20

"File device sharing" on page 21

"External libraries" on page 22

Related information:

↪ IBM General Parallel File System

↪ TotalStorage SAN File System

LAN-free client-data backup: Scenario

Tape and file media to be used for client backup data is stored in a storage pool that uses a device that is 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 use 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 you start a no-query restore, the Tivoli Storage Manager server builds a list of files to restore and sends data to the client while it builds the list. The restore can therefore be restarted if it is interrupted.

Multiple sessions are used for the no-query restore when data for the restore is stored 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 that are 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 are stored. The server generates a list that is 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 the storage agent can access the volume, determines 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 that is 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 that consists 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 that is installed on a client system communicates with the z/OS media server over the LAN.
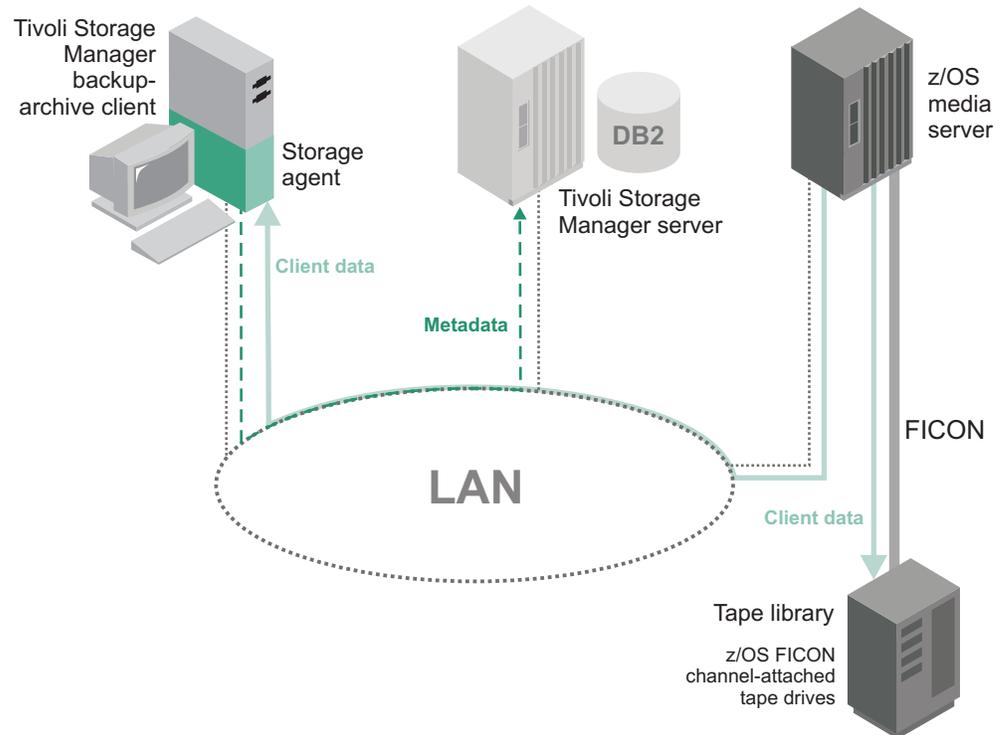
Figure 3. Data movement in a z/OS media server environment. Solid lines indicate data movement. Solid lines with arrows indicate client data. Broken lines indicate movement of control information and metadata.

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, by 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 that is 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

➥ 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.

For information about environments that the Linux storage agent supports, see
http://www.ibm.com/software/sysmgmt/products/support/
IBMTivoliStorageManager.html.

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

Note:

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, or
IBM TotalStorage SAN File System must be installed.

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

Related information:

➡ IBM General Parallel File System

➡ TotalStorage SAN File System

Network requirements

You must ensure that your system meets the network requirements when you use
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 you configure 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 1. 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 it communicates 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 you set 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 show 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 you use 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 when you install the software on client systems, and when you define the storage agent and configuring devices.
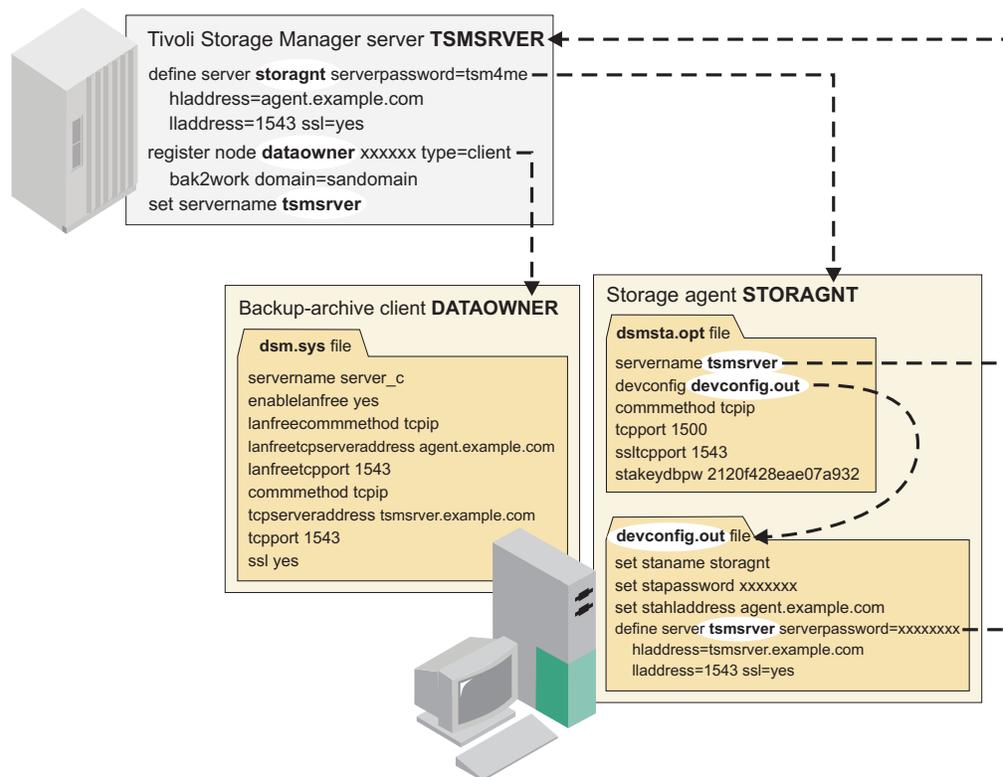
Figure 4. Connections between the client, storage agent, and server. The passwords are shown as *xxxxxxx* because they are encrypted in the file.

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 78

"Configuring a storage agent and server to use SSL" on page 61

"Configuring a storage agent and server to use SSL" on page 39

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 you start 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 that are configured on the system, on which the server or storage agent are located. As in prior releases, COMMMETHOD TCPIP specifies that only IPv4 is used. When you configure the storage agent by 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 by using 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-system and server-system information before you install and configure 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.	
Storage agent password	The password for the storage agent.	
TCP/IP address	The TCP/IP address of the storage agent.	
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.	
LANFREESSL option	The option that specifies that the Tivoli Storage Manager client enables Secure Sockets Layer (SSL) when it communicates with the storage agent.	
SSLRequired option	The option that specifies whether the client must use SSL when it communicates with the storage agent.	
Tip: For details about the `LANFREECOMMMETHOD` option, see the *Backup-Archive Clients Installation and User's Guide*.		

Device information

Table 2. 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 3. 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 4. 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.	
Password	The password for the server.	
TCP/IP address	The TCP/IP address for the server.	
TCP/IP port	The TCP/IP port for the server.	
SSL port	The SSL port for the server.	

Device information

Table 5. 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 6. ACSLS, 3494, SCSI, or VTL library environment

Type of information	Description	Use this column to record the values for your environment
Library name	The name of an ACSLS, 3494, SCSI, or VTL library.	

Table 7. 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.	
Storage agent password	The password for the storage agent.	
TCP/IP address	The TCP/IP address of the storage agent.	
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`))	
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.	
z/OS media server Password	The password for the z/OS media server server.	
TCP/IP address	The TCP/IP address for the z/OS media server.	

Type of information	Description	Use this column to record the values for your environment
TCP/IP port	The TCP/IP port for the z/OS media server.	

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.	
Password	The password for the server.	
TCP/IP address	The TCP/IP address for the server.	
TCP/IP port	The TCP/IP port for the server.	

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.	
z/OS media server Password	The password for the z/OS media server server.	
TCP/IP address	The TCP/IP address for the z/OS media server.	
TCP/IP port	The TCP/IP port for the z/OS media server.	

Related tasks:

"Obtaining device information" on page 18

"Verifying and updating client node information" on page 78

Obtaining device information

You use the device information from the storage agent when you define paths for the server that functions as the library manager. If you are configuring a FILE Library, you do not need to obtain device information.

About this task

Obtaining tape-device information in a Linux environment is different depending on whether your environment supports IBM devices or non IBM devices.

For information about configuring Tivoli Storage Manager device drivers for tape-drives and libraries, see the *Administrator's Guide*. Instructions are available for configuring selected devices or all devices.

Related tasks:

Obtaining special file names for IBM tape devices:

Accessing IBM SCSI tape drives and libraries requires the IBM tape device driver. After you install and loading the IBM tape device driver for your IBM SCSI tape drives and libraries, a set of special file names are available for each device.

Procedure

View special file names by issuing the following command on the system where the storage agent is installed:

```
ls /dev/IBM*
```

Results

The name for tape drives typically has the form /dev/IBMtape*x*, where *x* is a number. The name for tape libraries typically has the form /dev/IBMchanger*x*, where *x* is a number 0 - 255.

Obtaining the special file names of non-IBM tape devices:

Accessing non-IBM tape drives and libraries requires the Tivoli Storage Manager Linux Passthru driver and the Linux SCSI generic driver. After these drivers are installed, you can obtain special file names for the drives and libraries.

About this task

The Tivoli Storage Manager Linux Passthru driver replaces the Tivoli Storage Manager Linux SCSI device driver in the device driver package (tsmscsi). This Passthru driver runs on both Linux 2.4.x and 2.6.x kernels. The installation of the Tivoli Storage Manager Linux Passthru driver is done with the installation of the storage agent. You must install the Linux SCSI generic driver (sg) along with the Linux operating system.

Procedure

Use the Tivoli Storage Manager Linux Passthru driver:

1. Verify that the device is connected to your system and active.
2. Verify that the device is correctly detected by your system by issuing the following command:

```
cat /proc/scsi/scsi
```

3. Ensure that both the Tivoli Storage Manager device driver package (tsmscsi) and the storage agent package are installed.

4. Run the configuration method that you prefer (autoconf or tsmscsi) for the Tivoli Storage Manager Passthru driver. Both methods are available in the Tivoli Storage Manager device driver package and both methods perform the following tasks:

   - Load the Linux SCSI generic driver (sg) to the kernel.
   - Create necessary files for the Passthru driver.
   - Create device information files for libraries (`/dev/tsmscsi/lbinfo`) and tape devices (`/dev/tsmscsi/mtinfo`).
   - To run the autoconf configuration method, issue the following command from the directory where the TIVsm-tsmscsi package is installed:
     ```
     autoconf
     ```
   - To run the tsmscsi configuration method:
     a. Copy the two sample configuration files to the installation directory (`/opt/tivoli/tsm/devices/bin`) from `lb.conf.smp` and `mt.conf.smp` to `lb.conf` and `mt.conf`, respectively.
     b. Edit the `lb.conf` and `mt.conf` files. Add one stanza (as shown in the example at the start of the file) for each SCSI target, ID, and LUN combination. Each combination of SCSI target, ID, and LUN entries correspond to a tape drive or library you want configured. Make sure that the files meet these requirements:
        – The example that is located at the start of the files must be removed.
        – There must be a new line between each stanza.
        – There must be one new line after the last stanza.
        – A number sign (#) must not exist in either file.
     c. Run the `tsmscsi` script from the device driver installation directory.

5. Verify that the device is configured properly by viewing the text files for libraries (`/dev/tsmscsi/lbinfo`) and tape devices (`/dev/tsmscsi/mtinfo`).

6. Determine the special file names for the tape drives and libraries:
   - To determine the names for the tape drives, issue the following command:
     ```
     ls /dev/tsmscsi/mt*
     ```
   - To determine the names for the libraries issue the following command:
     ```
     ls /dev/tsmscsi/lb*
     ```

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:

- Automated Cartridge System Library Software (ACSLS), Small Computer System Interface (SCSI), virtual tape library (VTL), and 349*x* tape-library sharing
- File device sharing by using IBM General Parallel File System (GPFS)
- External libraries
- Tivoli Storage Manager for z/OS Media storage

Related tasks:

"Preventing tape label overwrites" on page 45

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.

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 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 server can support library clients that are at the same or earlier version as the library manager. Library clients at a higher version than the library manager are not supported. When you use 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.

Note: If you define a library manager server that is shared with the Tivoli Storage Manager server, the SANDISCOVERY option must be set to ON. By default, this option is set to OFF.

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 when 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 operations:
- Migrations
- Expiration of files that is 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
- 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.
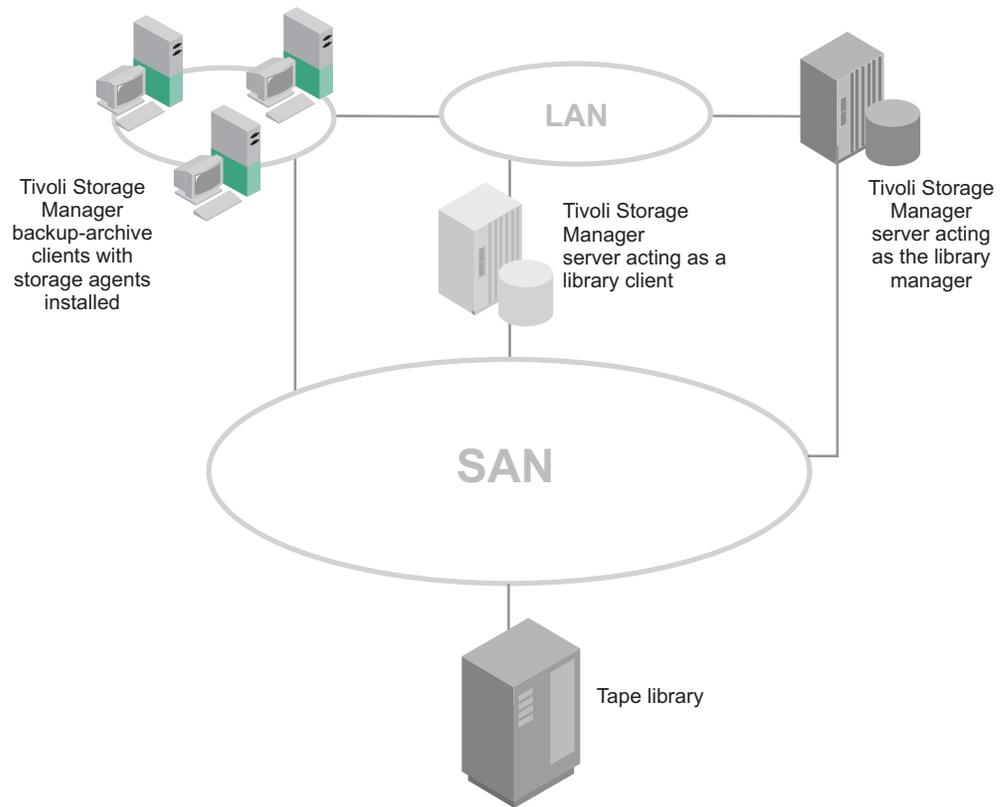
Figure 5. Library manager and client LAN-free configuration

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 be on a Tivoli Storage Manager server on AIX, HP-UX, Linux, Solaris, or Windows.

File device sharing

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

Note: 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.

Related information:

IBM General Parallel File System

TotalStorage SAN File System

External libraries

If you cannot use a Tivoli Storage Manager native library (SCSI, 349*x*, ACSLS, and virtual tape library), 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 6. 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 by 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 6. ACSLS library environment
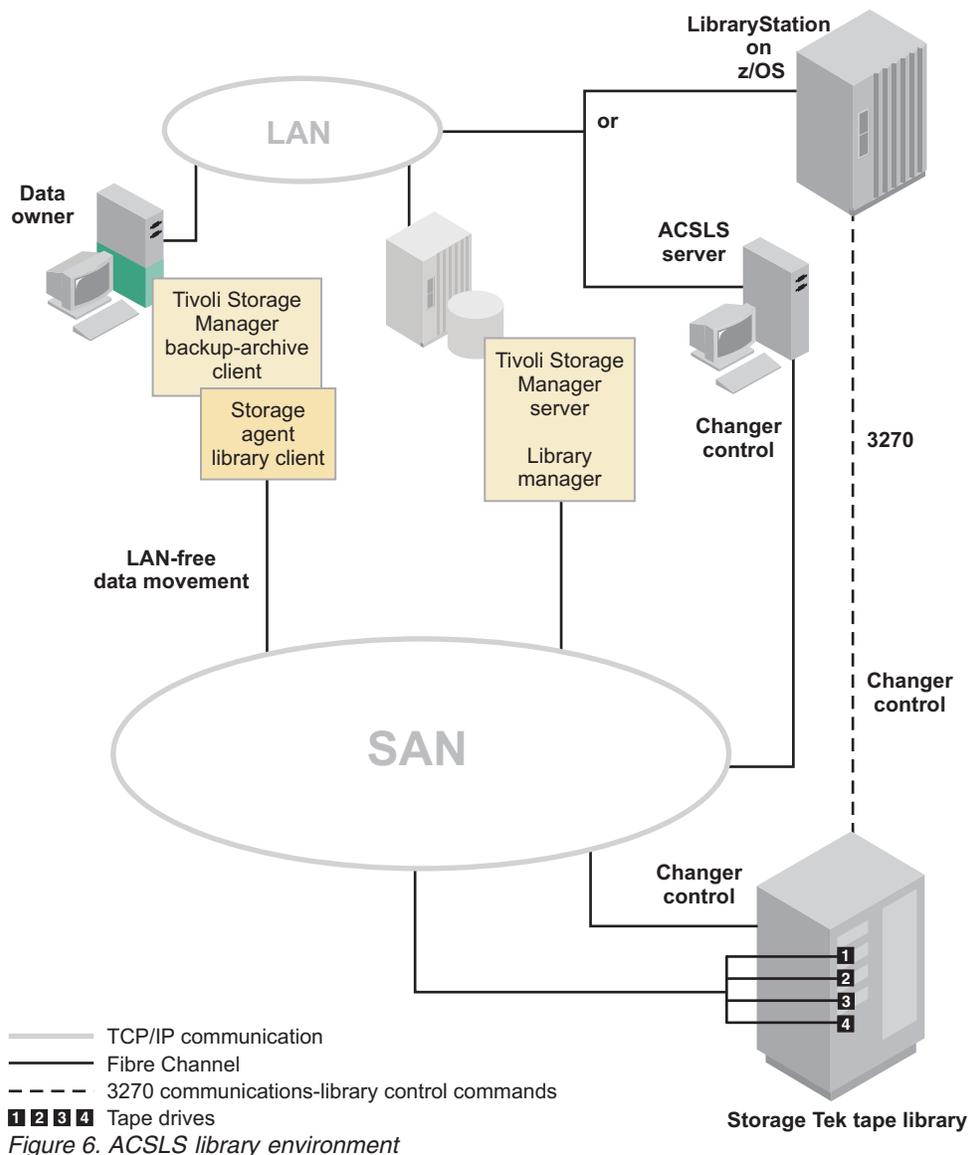
If you have data that is associated with the Tivoli Storage Manager ACSLS library type and want to take advantage of LAN-free data movement, you must consider coexistence and migration issues.

If you stored data by 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 98

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 8. Device types

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

If a Virtual Tape Library (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 you define 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 by 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 9.

Table 9. 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 you begin

Before you install and configure the tape-library and file-device-sharing environments, verify that you completed the following actions:

- 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 that is recorded in the configuration-information worksheets.

About this task

The major installation and configuration steps are:

1. "Establishing network connections"
2. "Installing and configuring software on client systems" on page 28
3. "Configuring the devices on the server" on page 38
4. "Defining paths from the storage agent to drives" on page 42
5. "Verifying the LAN-free configuration" on page 46
6. "Determining whether the data movement was LAN-free" on page 47

Related reference:

"Configuration work sheets for storage agent configuration" on page 12

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.

Procedure

Establish network connections by completing the following steps:

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, or IBM TotalStorage SAN File System on the applicable systems.

Related concepts:

"File device sharing" on page 21

Related information:

⊑➡ Tivoli Storage Manager for Storage Area Networks support

⊑➡ IBM General Parallel File System

⊑➡ 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.

About this task

Install and configure the software by completing the following tasks:

1. "Installing and configuring the client"
2. Only Data Protection application clients: "Installing and configuring the API" on page 31
3. "Installing the storage agent" on page 32
4. "Configuring the storage agent" on page 37

Related concepts:

"Communications between the client, storage agent, and Tivoli Storage Manager server" on page 8

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 78

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 you begin

Before you install and configure the client, 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 worksheets.
* 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.

Procedure

Install and configure the client by completing 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 worksheets, modify the following file:

- `dsm.sys` client system-options file

Tip: The file can be 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 10. 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
Shared memory	TCP/IP (standard with platforms)	Linux x86_64, Linux on System z, Linux on Power Systems

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 28. 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
```

What to do next

If you installed a Data Protection application client, you must install and configure the Tivoli Storage Manager client API.

Related concepts:

"Communications between the client, storage agent, and Tivoli Storage Manager server" on page 8

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 78

Related reference:

"Client-system and server-system configuration work sheets" on page 12

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.

Procedure

Verify client node information by completing the following steps:

1. Identify the client node or nodes that use the storage agent. In a typical environment, a storage agent is used only by the client node that is 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 must 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 that is 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 97

"Using LAN and LAN-free paths in the same backup operation" on page 97

Installing and configuring the API

If you are using a Tivoli Storage Manager Data Protection application client, you must install and configure the Tivoli Storage Manager API.

Before you begin

Before you install and configure the API, verify that the client system meets the prerequisites for the application programming interface (API) software. You can download the latest software levels from the Tivoli Storage Manager product support website.

For details about installing the API software, see the *Backup-Archive Clients Installation and User's Guide*.

Requirement: If multiple Data Protection application clients are using LAN-free data movement, configure the API on each client system.

Procedure

1. Install the Tivoli Storage Manager client API.
2. Specify the environment variables. The Tivoli Storage Manager API uses unique environment variables to locate files.
   - DSMI_CONFIG is the fully qualified name for the client user option file.
   - DSMI_DIR points to the path that contains `dsm.sys`, `dsmtca`, and the subdirectory `en_US`.
   - en_US subdirectory must contain `dsmclientV3.cat`.
   - DSMI_LOG points to the path for the `dsierror.log` file.

   Tip: The quickest method to set the environment variables is to add these variables to the `user profile` file.

   The following examples show how to set up these environment variables in the user profile:
   ```
   export dsmi_config=/opt/tivoli/tsm/client/api/bin/dsm.opt
   export dsmi_dir=/opt/tivoli/tsm/client/api/bin
   export dsmi_log=/home/user_a/logdir
   ```
3. Edit an existing stanza or create a stanza in the `dsm.sys` file to specify the communications options between the Tivoli Storage Manager API and server. For example:
   ```
   servername              server_c
   commmethod              tcpip
   enablelanfree           yes
   lanfreecommmethod       tcpip
   lanfreetcpserveraddress test.example.com
   lanfreetcpport          1500
   tcpport                 1502
   tcpserveraddress        server_c.example.com
   ```
   The example uses a TCPPORT of 1502. However, the default TCPPORT is 1500.

   If a `dsm.sys` file does not exist in the directory that is specified by DSMI_DIR, create a symbolic link to the `dsm.sys` file in the Tivoli Storage Manager client installation directory. For example:
   ```
   ln -s /opt/tivoli/tsm/client/ba/bin/dsm.sys
          /opt/tivoli/tsm/client/api/bin/dsm.sys
   ```

Related reference:

"Client-system and server-system configuration work sheets" on page 12

Related information:

↪ Tivoli Storage Manager for Storage Area Networks support

↪ Storage agent and client compatibility with Tivoli Storage Manager servers

↪ Tivoli Storage Manager support

Installing the storage agent

The storage agent can be found in the Tivoli Storage Manager installation package. You can obtain the installation package from the product DVD or from an IBM download site.

Before you begin

If you plan to download the files, set the system user limit for maximum file size to unlimited to ensure that the files can be downloaded correctly.

1. To query the maximum file size value, issue the following command:

   ```
   ulimit -Hf
   ```

2. If the system user limit for maximum file size is not set to unlimited, change it to unlimited by following the instructions in the documentation for your operating system.

About this task

If you obtain the package from the product DVD, ensure that the installation files are visible on the DVD drive.

If you obtain the package from an IBM download site, you must extract the installation files.

Procedure

1. Download the appropriate package file from one of the following websites, or you can access the files from the product DVD:
   - For a first time installation or a new release go to Passport Advantage® at: http://www.ibm.com/software/lotus/passportadvantage/. Passport Advantage is the only site that you can download a licensed package file from.
   - For the latest information, updates, and maintenance fixes, go to the Tivoli Storage Manager support site: http://www.ibm.com/support/entry/portal/ Overview/Software/Tivoli/Tivoli_Storage_Manager.

2. If you download the package from one of the download sites, complete the following steps:
   a. Verify that you have enough space to store the installation files when they are extracted from the product package.
   b. Download the package file to the directory of your choice. The path must contain no more than 128 characters. Be sure to extract the installation files to an empty directory. Do not extract to a directory that contains previously extracted files, or any other files.

      Also, ensure that you have executable permission for the package file.
   c. If necessary, change the file permissions by issuing the following command:

      ```
      chmod a+x package_name.bin
      ```
   d. Issue the following command to extract the installation files:

```
    ./package_name.bin
```
where *package_name* is like the following example:
```
7.1.0.000-TIV-TSMSRV-LinuxX64.bin
7.1.0.000-TIV-TSMSRV-LinuxS390X.bin
```
3. Select one of the following methods of installing the storage agent from the Tivoli Storage Manager installation package:
   - "Installing the storage agent by using the installation wizard" on page 55
   - "Installing the storage agent by using console mode" on page 56
   - "Installing the storage agent in silent mode" on page 57

Related reference:

"DSMSTA SETSTORAGESERVER command" on page 107

Installing the storage agent by using the installation wizard

You can install or update the storage agent by using the IBM Installation Manager graphical wizard.

Before you begin

Ensure that you review the following important information about installing:

- Verify that the operating system is set to the language that you require. By default, the language of the operating system is the language of the installation wizard.

On test servers only: Use the following command to bypass prerequisite checks such as the operating system and the required memory. Do not issue this command on a production server.
```
./install.sh -g -vmargs "-DBYPASS_TSM_REQ_CHECKS=true"
```

Procedure

Choose whether to install from a downloaded package file, or from the DVD, and complete the following steps to begin the installation:

Option	Description
Installing from a downloaded package file:	1. Change to the directory where you downloaded the package file.
	2. Start the graphical interface installation wizard by issuing the following command:
	```./install.sh```
Installing from DVD media:	1. Insert the DVD into the DVD drive. **Tip:** Ensure that the installation files are visible on the DVD drive.
	2. Start the graphical interface installation wizard by issuing the following command:
	```./install.sh```

What to do next

- If errors occur during the installation process, these errors are recorded in log files that are stored in the IBM Installation Manager logs directory.

  You can view installation log files by clicking **File** > **View Log** from the Installation Manager tool. To collect these log files, click **Help** > **Export Data for Problem Analysis** from the Installation Manager tool.

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 by using console mode

You can install or update the storage agent by using the command line in console mode.

Before you begin

Ensure that you review the following important information about installing:

- Verify that the operating system is set to the language that you require. By default, the language of the operating system is the language of the installation wizard.

On test servers only: Use the following command to bypass prerequisite checks such as the operating system and the required memory. Do not issue this command on a production server.

```
./install.sh -c -vmargs "-DBYPASS_TSM_REQ_CHECKS=true"
```

Procedure

Choose whether to install from a downloaded package file, or from the DVD, and complete the following steps to begin the installation:

Option	Description
Installing from a downloaded package file:	1. Change to the directory where you downloaded the package file.
	2. Start the installation wizard in console mode, by issuing the following command: `./install.sh -c` You can generate a response file as part of a console mode installation. Complete the console mode installation options, and in the Summary panel, specify G to generate the responses.

Option	Description
Installing from DVD media:	1. Insert the DVD into the DVD drive. **Tip:** Ensure that the installation files are visible on the DVD drive. 2. Start the installation wizard in console mode, by issuing the following command: `./install.sh -c` You can generate a response file as part of a console mode installation. Complete the console mode installation options, and in the Summary panel, specify G to generate the responses.

What to do next

*   If errors occur during the installation process, these errors are recorded in log files that are stored in the IBM Installation Manager logs directory.

    You can view installation log files by clicking **File** > **View Log** from the Installation Manager tool. To collect these log files, click **Help** > **Export Data for Problem Analysis** from the Installation Manager tool.

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 or update the storage agent in silent mode without any user interaction.

Before you begin

A silent installation can use response files for data input. The following sample response files are provided for installing, updating, and uninstalling Tivoli Storage Manager:

*   `install_response_sample.xml`
*   `update_response_sample.xml`
*   `uninstall_response_sample.xml`

If you want to use one of the sample response files, they can be found after you extract the package files, in the `input` subdirectory. You can use these sample files as they are or you can customize them to suit your needs. It is optimal to use the sample response files. These sample files contain instructions and default values to help you avoid any unnecessary warnings.

On test servers only: Use the following command to bypass prerequisite checks such as the operating system and the required memory. Do not issue this command on a production server.

`./install.sh -s -acceptLicense -vmargs "-DBYPASS_TSM_REQ_CHECKS=true"`

Procedure

1. Create a response file, or use one of the sample response files such as `install_response_sample.xml` or `update_response_sample.xml`.
2. To start the silent installation, issue one of the following commands from the directory where the installation package file is extracted:

Option	Description

Installing from a downloaded package file or DVD media:	To start the installation by accepting the default values, issue the following command:
	
	`./install.sh -s -acceptLicense`
	
	To start the installation with a custom response file, issue the following command, where *response_file* represents the response file path, including the file name:
	
	`./install.sh -s -input` *response_file* `-acceptLicense`

What to do next

- If errors occur during the installation process, these errors are recorded in log files that are stored in the IBM Installation Manager logs directory.

  You can view installation log files by clicking **File** > **View Log** from the Installation Manager tool. To collect these log files, click **Help** > **Export Data for Problem Analysis** from the Installation Manager tool.

Related concepts:

"Software requirements" on page 7

Related information:

⇨ Tivoli Storage Manager for Storage Area Networks support

⇨ Passport Advantage download document

Defining and configuring the storage agent

You must define and configure the storage agent to communicate with the backup-archive client and the Tivoli Storage Manager server.

Defining storage agents to the Tivoli Storage Manager server

For each client that uses LAN-free data transfer, you must define the client's storage agent to the server.

Before you begin

Use the same name and password that you specified for the storage agent when you installed it on the client system.

Procedure

Define storage agents to the server by completing the following steps:

1. Define the storage agent by issuing the **DEFINE SERVER** command from the Tivoli Storage Manager server (library manager or library client) that will manage the client's data.

   ```
   define server storagnt serverpassword=fun4me
   hladdress=agent.tucson.ibm.com lladdress=1502 ssl=yes
   ```

   In the preceding example, the **SSL** 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.

2. Verify that the storage agent is defined to the library manager by issuing the following command from the library-manager server:

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

Important: If the library-manager server is different from 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. The storage agent must be able to contact the library manager directly when it sends mount requests. If the storage agent is only defined to the library client, it attempts to use information from the library client to define itself to the library manager.

What to do next

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

Configuring the storage agent

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

Before you begin

- Ensure that you complete the steps in "Defining storage agents to the Tivoli Storage Manager server" on page 58.
- Use the information that you collected in the configuration worksheets.

Procedure

Configure the storage agent by completing the following steps:

1. Point the server to the storage agent by issuing the **DEFINE SERVER** command on the Tivoli Storage Manager server.

2. 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 is in the following directory:

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

3. Initialize the storage agent and add communication information by issuing 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
   ```

   Requirements:

   - 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 you configure the storage agent by using the **DSMSTA SETSTORAGESERVER** command, use addresses that correspond to the communications method that is used by the backup-archive client. With the backup-archive client, you can use either IPv4 (**COMMMETHOD TCPIP** option) or IPv6 (**COMMMETHOD V6TCPIP** option), but not both.
- 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 stahladdress agent.example.com
define server tsmsrver serverpassword=xxxxxxxxxxx
 hladdress=tsmsrver.example.com lladdress=1502
```

In the preceding example, the passwords are encrypted.

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 12

"Storage agent options file" on page 102

"DSMSTA SETSTORAGESERVER command" on page 107

"The device configuration file for the storage agent" on page 101

Related information:

➡ Tivoli Storage Manager for Storage Area Networks support

➡ Storage agent and client compatibility with Tivoli Storage Manager servers

➡ Tivoli Storage Manager support

Configuring the devices on the server

To set up LAN-free communications on the Tivoli Storage Manager server, you must set up server-to-server communication and configure the devices on the server.

Before you begin

Before you begin the procedure, ensure that you have the information that is recorded in the configuration-information worksheets.

About this task

Complete these tasks to set up server-to-server communication and configure devices on the server:

1. "Setting up server-to-server communication" on page 39
2. "Configuring SAN drives" on page 41
3. "Setting the LAN-free destination" on page 41
4. "Confirming client node registration and configuration" on page 42

Related reference:

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.

Procedure

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 worksheet.

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

Results

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

What to do next

Verify that the password is 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.

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 Secure Sockets Layer (SSL) communication method. SSL is set up independently on both the storage agent and the Tivoli Storage Manager server.

Procedure

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. If the **SSLTCPADMIN** is not specified, use the **SSLTCPPORT** port instead. 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, you must change the key database password and then issue the **DSMSTA SETSTORAGESERVER** command.

   a. Open a command window and change the password by issuing the following command:

      ```
      gsk8capicmd_64 -keydb -changepw -db cert.kdb -pw oldpw -newpw newpw
      ```

   b. Rerun the **DSMSTA SETSTORAGESERVER** command and specify the **STAKEYDBPW=newpassword** parameter.

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.

Results

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

Configuring SAN drives

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

Configuring tape drives

You can connect tape drives to the storage agent to allow for LAN-free backups and restores of data.

Before you begin

Before you configure the tape drives, you must have the library manager and a library definition defined. Optionally, you can have library clients that are defined.

About this task

- To configure tape drives to the storage agent, complete the following steps on the library manager:

  1. Update the shared ACSLS, SCSI, VTL, or 3494 library by setting the **SHARED** parameter to YES.

  2. Define paths from the storage agent server definition to each of the drives by using the **DEFINE PATH** command.

Configuring disk drives

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

Procedure

Configure disk drives by completing the following steps:

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.

What to do next

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.

Procedure

Set a LAN-free destination by completing the following steps:

1. Define a copy group with a destination to 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 that is 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
```

What to do next

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 must 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.

Procedure

Verify that node settings are correct by issuing the following command:

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

What to do next

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 using 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

Before you begin defining paths to your SAN drives, consider the following guidelines:
- If not already done, 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 by using the device names as identified by the storage agent on each client system.

About this task

Figure 7. Device information

Procedure

Define paths by issuing the **DEFINE PATH** command on the Tivoli Storage Manager server that is designated as the library manager. For example:

```
define path storagnt drive1 srctype=server desttype=drive
 library=sanlib1 device=/dev/tsmscsi/mt1
```

What to do next

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 you define 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 you complete 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 46

Defining paths for disk devices

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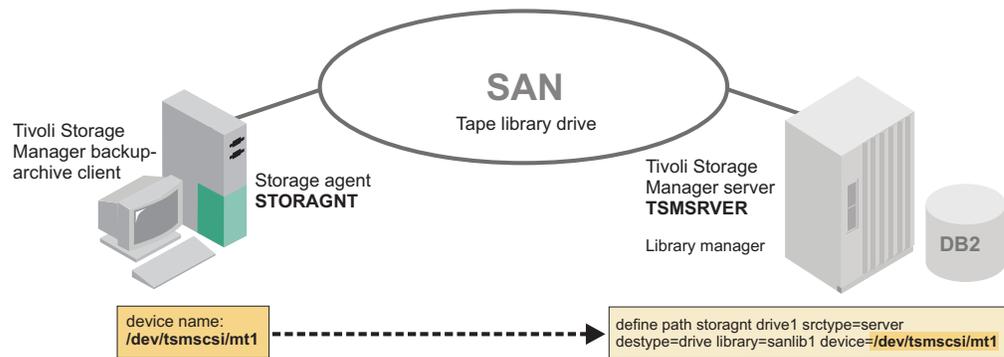
Example

For example, suppose the directory d:\tsmdata\server1 is GPFS mounted on the Tivoli Storage Manager server. On the storage agent, the directory is GPFS mounted as /tsmdata/server1.
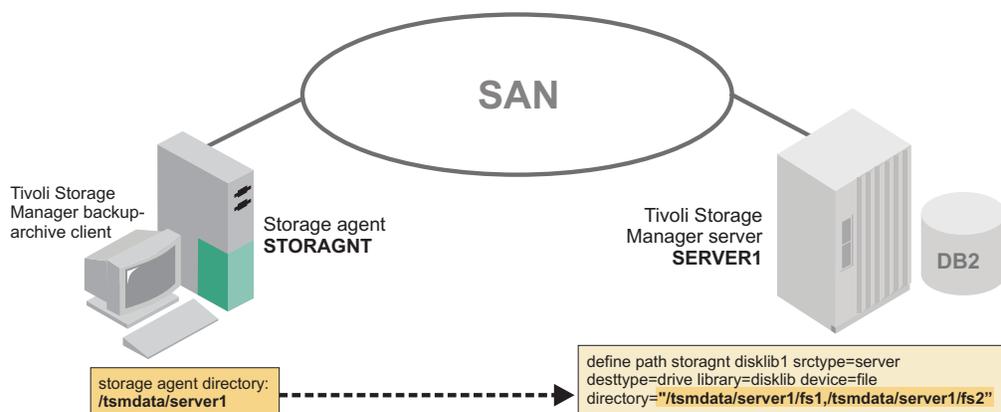
Figure 8. Device information

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 that is 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.

About this task

The Tivoli Storage Manager Passthru device driver uses the Linux SCSI generic device driver (sg) to control and operate tape devices that are attached on the system. If the Linux generic SCSI tape device driver (st) is loaded to the kernel and configures attached tape devices, conflicts about how a device is managed can result. The reason for the conflicts is that the generic sg driver and the st driver can both control the same device. To prevent tape label overwrites, complete one of the following tasks:

If the st driver controls devices that are used by Tivoli Storage Manager, Tivoli Storage Manager internal tape labels can be overwritten and data can be lost. If an application uses the st driver to control devices and the non-rewind option is not specified, tapes are automatically rewound following completion of an operation. 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 labels from being overwritten, ensure that only the Tivoli Storage Manager Passthru driver controls devices that are used by Tivoli Storage Manager. Remove the st driver from the kernel. Alternatively, if the driver is used by some applications on the system, delete the special files that correspond to Tivoli Storage Manager devices. Deleting the special files ensures that the st driver can no longer control them.

If you are using the IBMtape device driver to control devices on your system, you might encounter the same issues with device driver control conflicts. Review your IBMtape documentation to determine how to resolve this issue and prevent data loss.

Procedure

- Remove the st driver.

  If no other applications on the system use st devices, remove the st driver from the kernel. Issue the following command to unload the st driver:

  `rmmod st`
- Delete device special files that correspond to Tivoli Storage Manager devices.

  If there are applications that require use of the st driver, delete the special files that correspond to Tivoli Storage Manager devices. These special files are generated by the st driver, so when they are eliminated, the st driver can no longer control the corresponding Tivoli Storage Manager devices. Device special file names for tape drives are displayed in the /dev/ directory. They have the form /dev/[n]st[0-255][l][m][a].

  List the st drive special file names and Tivoli Storage Manager device special file names by using the **ls** command. Based on the output of the device sequences,

you can find devices in the st devices list that matches devices in the Tivoli
Storage Manager devices list. You can them use the **rm** command to delete st
devices.

Issue the following commands to list the st and Tivoli Storage Manager devices:

```
ls -l /dev/*st*
ls -l /dev/tsmscsi/mt*
```

Delete the st devices with the **rm** command:

```
rm /dev/*st*
```

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

Verify that the server is online and running before you verify the LAN-free
configuration.

Procedure

Verify LAN-free configuration by completing the following steps:

1. Start the storage agent:

   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 selected client. Before you set the DISPLAYLFINFO option, consider how this
   outcome can affect your environment.

3. Determine which destinations for a node are capable of LAN-free data
   movement by issuing 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 you proceed
   to the next step.

4. Run a backup operation from the client.

5. If you receive a message that indicates that the backup failed, verify the
   following items:

   - 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 are defined paths from the server.

If you try the backup operation again 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.

Procedure

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 is displayed to inform 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 that is 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 sessions are 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 that is increasing to the total amount of data that is being backed up.

     - Querying a session on the Tivoli Storage Manager server shows a few bytes of metadata that is 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

Chapter 4. Installing and configuring external-library environments

An external library is controlled by software, for example a drive such as IBM Enterprise Removable Media Manager or Gresham Enterprise DistribuTape. 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

Before you install and configure the external-library environments, complete the following steps:

- 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 that is recorded in the configuration-information worksheets.
- Obtain an external library manager that can use the external library interface, for example, IBM Enterprise Removable Media Manager. For details about interfaces, see the *Administrator's Guide*.
- You can use the Gresham's Enterprise DistribuTape to manage the environment instead of ACSLS.

About this task

The major installation and configuration steps are in the following list:

1. "Establishing network connections"
2. "Installing and configuring software on client systems" on page 50
3. "Configuring the devices on the server" on page 60
4. "Verifying the LAN-free configuration" on page 65
5. "Determining whether the data movement was LAN-free" on page 66

Related concepts:

"External libraries" on page 22

Related reference:

"Configuration work sheets for storage agent configuration" on page 12

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.

Procedure

Establish network connections by attaching 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.

About this task

Install and configure the software by completing the following tasks:
1. "Installing and configuring the client"
2. Only Data Protection application clients:"Installing and configuring the API" on page 53
3. "Installing the storage agent" on page 54
4. "Configuring the storage agent" on page 59

Related concepts:

"Communications between the client, storage agent, and Tivoli Storage Manager server" on page 8

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 78

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 you begin

Before you install and configure the client, 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 worksheets.
- 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.

Procedure

Install and configure the client by completing 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 worksheets, modify the following file:

- `dsm.sys` client system-options file

Tip: The file can be 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 11. 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
Shared memory	TCP/IP (standard with platforms)	Linux x86_64, Linux on System z, Linux on Power Systems

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
```

What to do next

If you installed a Data Protection application client, you must install and configure the Tivoli Storage Manager client API.

Related concepts:

"Communications between the client, storage agent, and Tivoli Storage Manager server" on page 8

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 78

Related reference:

"Client-system and server-system configuration work sheets" on page 12

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.

Procedure

Verify client node information by completing the following steps:

1. Identify the client node or nodes that use the storage agent. In a typical environment, a storage agent is used only by the client node that is 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 must 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 that is 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 97

"Using LAN and LAN-free paths in the same backup operation" on page 97

Installing and configuring the API

If you are using a Tivoli Storage Manager Data Protection application client, you must install and configure the Tivoli Storage Manager API.

Before you begin

Before you install and configure the API, verify that the client system meets the prerequisites for the application programming interface (API) software. You can download the latest software levels from the Tivoli Storage Manager product support website.

For details about installing the API software, see the *Backup-Archive Clients Installation and User's Guide*.

Requirement: If multiple Data Protection application clients are using LAN-free data movement, configure the API on each client system.

Procedure

1. Install the Tivoli Storage Manager client API.
2. Specify the environment variables. The Tivoli Storage Manager API uses unique environment variables to locate files.
   - DSMI_CONFIG is the fully qualified name for the client user option file.
   - DSMI_DIR points to the path that contains `dsm.sys`, `dsmtca`, and the subdirectory `en_US`.
   - en_US subdirectory must contain `dsmclientV3.cat`.
   - DSMI_LOG points to the path for the `dsierror.log` file.

   Tip: The quickest method to set the environment variables is to add these variables to the `user profile` file.

   The following examples show how to set up these environment variables in the user profile:

   ```
   export dsmi_config=/opt/tivoli/tsm/client/api/bin/dsm.opt
   export dsmi_dir=/opt/tivoli/tsm/client/api/bin
   export dsmi_log=/home/user_a/logdir
   ```

3. Edit an existing stanza or create a stanza in the `dsm.sys` file to specify the communications options between the Tivoli Storage Manager API and server. For example:

   ```
   servername              server_c
   commmethod              tcpip
   enablelanfree           yes
   lanfreecommmethod       tcpip
   lanfreetcpserveraddress test.example.com
   lanfreetcpport          1500
   tcpport                 1502
   tcpserveraddress        server_c.example.com
   ```

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

   If a `dsm.sys` file does not exist in the directory that is specified by DSMI_DIR, create a symbolic link to the `dsm.sys` file in the Tivoli Storage Manager client installation directory. For example:

   ```
   ln -s /opt/tivoli/tsm/client/ba/bin/dsm.sys
          /opt/tivoli/tsm/client/api/bin/dsm.sys
   ```

Related reference:

"Client-system and server-system configuration work sheets" on page 12

Related information:

→ Tivoli Storage Manager for Storage Area Networks support

→ Storage agent and client compatibility with Tivoli Storage Manager servers

→ Tivoli Storage Manager support

Installing the storage agent

The storage agent can be found in the Tivoli Storage Manager installation package. You can obtain the installation package from the product DVD or from an IBM download site.

Before you begin

If you plan to download the files, set the system user limit for maximum file size to unlimited to ensure that the files can be downloaded correctly.

1. To query the maximum file size value, issue the following command:

   ```
   ulimit -Hf
   ```

2. If the system user limit for maximum file size is not set to unlimited, change it to unlimited by following the instructions in the documentation for your operating system.

About this task

If you obtain the package from the product DVD, ensure that the installation files are visible on the DVD drive.

If you obtain the package from an IBM download site, you must extract the installation files.

Procedure

1. Download the appropriate package file from one of the following websites, or you can access the files from the product DVD:
   - For a first time installation or a new release go to Passport Advantage at: http://www.ibm.com/software/lotus/passportadvantage/. Passport Advantage is the only site that you can download a licensed package file from.
   - For the latest information, updates, and maintenance fixes, go to the Tivoli Storage Manager support site: http://www.ibm.com/support/entry/portal/Overview/Software/Tivoli/Tivoli_Storage_Manager.

2. If you download the package from one of the download sites, complete the following steps:
   a. Verify that you have enough space to store the installation files when they are extracted from the product package.
   b. Download the package file to the directory of your choice. The path must contain no more than 128 characters. Be sure to extract the installation files to an empty directory. Do not extract to a directory that contains previously extracted files, or any other files.

      Also, ensure that you have executable permission for the package file.
   c. If necessary, change the file permissions by issuing the following command:

      ```
      chmod a+x package_name.bin
      ```
   d. Issue the following command to extract the installation files:

```
    ./package_name.bin
```
where *package_name* is like the following example:
```
7.1.0.000-TIV-TSMSRV-LinuxX64.bin
7.1.0.000-TIV-TSMSRV-LinuxS390X.bin
```
3. Select one of the following methods of installing the storage agent from the Tivoli Storage Manager installation package:
   - "Installing the storage agent by using the installation wizard"
   - "Installing the storage agent by using console mode" on page 56
   - "Installing the storage agent in silent mode" on page 57

Related reference:

"DSMSTA SETSTORAGESERVER command" on page 107

Installing the storage agent by using the installation wizard

You can install or update the storage agent by using the IBM Installation Manager graphical wizard.

Before you begin

Ensure that you review the following important information about installing:

- Verify that the operating system is set to the language that you require. By default, the language of the operating system is the language of the installation wizard.

On test servers only: Use the following command to bypass prerequisite checks such as the operating system and the required memory. Do not issue this command on a production server.
```
./install.sh -g -vmargs "-DBYPASS_TSM_REQ_CHECKS=true"
```

Procedure

Choose whether to install from a downloaded package file, or from the DVD, and complete the following steps to begin the installation:

Option	Description
Installing from a downloaded package file:	1. Change to the directory where you downloaded the package file. 2. Start the graphical interface installation wizard by issuing the following command: `./install.sh`
Installing from DVD media:	1. Insert the DVD into the DVD drive. **Tip:** Ensure that the installation files are visible on the DVD drive. 2. Start the graphical interface installation wizard by issuing the following command: `./install.sh`

What to do next

- If errors occur during the installation process, these errors are recorded in log files that are stored in the IBM Installation Manager logs directory.

  You can view installation log files by clicking **File** > **View Log** from the Installation Manager tool. To collect these log files, click **Help** > **Export Data for Problem Analysis** from the Installation Manager tool.

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 by using console mode

You can install or update the storage agent by using the command line in console mode.

Before you begin

Ensure that you review the following important information about installing:

- Verify that the operating system is set to the language that you require. By default, the language of the operating system is the language of the installation wizard.

On test servers only: Use the following command to bypass prerequisite checks such as the operating system and the required memory. Do not issue this command on a production server.

```
./install.sh -c -vmargs "-DBYPASS_TSM_REQ_CHECKS=true"
```

Procedure

Choose whether to install from a downloaded package file, or from the DVD, and complete the following steps to begin the installation:

Option	Description
Installing from a downloaded package file:	1. Change to the directory where you downloaded the package file. 2. Start the installation wizard in console mode, by issuing the following command: `./install.sh -c` You can generate a response file as part of a console mode installation. Complete the console mode installation options, and in the Summary panel, specify G to generate the responses.

Option	Description
Installing from DVD media:	1. Insert the DVD into the DVD drive. **Tip:** Ensure that the installation files are visible on the DVD drive.
	2. Start the installation wizard in console mode, by issuing the following command: `./install.sh -c`
	You can generate a response file as part of a console mode installation. Complete the console mode installation options, and in the Summary panel, specify `G` to generate the responses.

What to do next

- If errors occur during the installation process, these errors are recorded in log files that are stored in the IBM Installation Manager logs directory.

  You can view installation log files by clicking **File** > **View Log** from the Installation Manager tool. To collect these log files, click **Help** > **Export Data for Problem Analysis** from the Installation Manager tool.

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 or update the storage agent in silent mode without any user interaction.

Before you begin

A silent installation can use response files for data input. The following sample response files are provided for installing, updating, and uninstalling Tivoli Storage Manager:

- `install_response_sample.xml`
- `update_response_sample.xml`
- `uninstall_response_sample.xml`

If you want to use one of the sample response files, they can be found after you extract the package files, in the `input` subdirectory. You can use these sample files as they are or you can customize them to suit your needs. It is optimal to use the sample response files. These sample files contain instructions and default values to help you avoid any unnecessary warnings.

On test servers only: Use the following command to bypass prerequisite checks such as the operating system and the required memory. Do not issue this command on a production server.

```
./install.sh -s -acceptLicense -vmargs "-DBYPASS_TSM_REQ_CHECKS=true"
```

Procedure

1. Create a response file, or use one of the sample response files such as `install_response_sample.xml` or `update_response_sample.xml`.
2. To start the silent installation, issue one of the following commands from the directory where the installation package file is extracted:

Option	Description

Installing from a downloaded package file or DVD media:	To start the installation by accepting the default values, issue the following command:
	
	`./install.sh -s -acceptLicense`
	
	To start the installation with a custom response file, issue the following command, where *response_file* represents the response file path, including the file name:
	
	`./install.sh -s -input ` *response_file* ` -acceptLicense`

What to do next

- If errors occur during the installation process, these errors are recorded in log files that are stored in the IBM Installation Manager logs directory.

   You can view installation log files by clicking **File** > **View Log** from the Installation Manager tool. To collect these log files, click **Help** > **Export Data for Problem Analysis** from the Installation Manager tool.

Related concepts:

"Software requirements" on page 7

Related information:

➡ Tivoli Storage Manager for Storage Area Networks support

➡ Passport Advantage download document

Defining and configuring the storage agent

You must define and configure the storage agent to communicate with the backup-archive client and the Tivoli Storage Manager server.

Defining storage agents to the Tivoli Storage Manager server

For each client that uses LAN-free data transfer, you must define a storage agent to the server.

Before you begin

Use the same name and password that you specified for the storage agent when you installed it on the client system.

Procedure

Define the storage agent by issuing the **DEFINE SERVER** command from the Tivoli Storage Manager server that will manage the client data. 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 is run to validate data on all metadata that is 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*.

What to do next

You must also define the storage agent to the library manager. The storage agent must be able to contact the library manager directly when its makes mount requests. If the storage agent is only defined to the library client, it attempts 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 by using the **DEFINE SERVER** command that is issued from the library manager. For example:

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

In the preceding example, the **SSL** 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."

Configuring the storage agent

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

Before you begin

- Ensure that you complete the steps in "Defining storage agents to the Tivoli Storage Manager server" on page 58.
- Use the information that you collected in the configuration worksheets.

Procedure

Configure the storage agent by completing the following steps:

1. Point the server to the storage agent by issuing the **DEFINE SERVER** command on the Tivoli Storage Manager server.
2. 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 is in the following directory:

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

3. Initialize the storage agent and add communication information by issuing 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
   ```

   Requirements:

- 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 you configure the storage agent by using the **DSMSTA SETSTORAGESERVER** command, use addresses that correspond to the communications method that is used by the backup-archive client. With the backup-archive client, you can use either IPv4 (**COMMMETHOD TCPIP** option) or IPv6 (**COMMMETHOD V6TCPIP** option), but not both.
- 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 stahladdress agent.example.com
define server tsmsrver serverpassword=xxxxxxxxxxx
 hladdress=tsmsrver.example.com lladdress=1502
```

In the preceding example, the passwords are encrypted.

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 12

"Storage agent options file" on page 102

"DSMSTA SETSTORAGESERVER command" on page 107

"The device configuration file for the storage agent" on page 101

Related information:

➡ Tivoli Storage Manager for Storage Area Networks support

➡ Storage agent and client compatibility with Tivoli Storage Manager servers

➡ Tivoli Storage Manager support

Configuring the devices on the server

To set up LAN-free communications on the Tivoli Storage Manager server, you must set up server-to-server communication and configure the paths to the library.

Before you begin

Before configure the devices on the server, ensure that you have the information that is recorded in the configuration-information worksheets.

Procedure

Set up server-to-server communication and configure devices on the server by completing the following tasks:

1. "Setting up server-to-server communication" on page 61
2. "Installing an external media manager" on page 63

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.

Procedure

Set up server-to-server communication by issuing the following commands on the Tivoli Storage Manager server. Replace the values in the example with values from the configuration-information worksheet.

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

Results

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

What to do next

Verify that the password is 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 Secure Sockets Layer (SSL) communication method. SSL is set up independently on both the storage agent and the Tivoli Storage Manager server.

Procedure

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. If the **SSLTCPADMIN** is not specified, use the **SSLTCPPORT** port instead. 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, you must change the key database password and then issue the **DSMSTA SETSTORAGESERVER** command.

   a. Open a command window and change the password by issuing the following command:

   ```
   gsk8capicmd_64 -keydb -changepw -db cert.kdb -pw oldpw -newpw newpw
   ```

   b. Rerun the **DSMSTA SETSTORAGESERVER** command and specify the **STAKEYDBPW=newpassword** parameter.

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.

Results

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.

Configuring a path to the library manager

Configure a path to the library manager.

About this task

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.

Procedure

- If you are using a shared ACSLS library manager, configure a path to the library manager by completing the following steps from the library manager:
  1. Define a library type of ACSLS. For example:
     ```
     define library libmgr1 libtype=ACSLS shared=YES
     ```
  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 LTO. For example:
     ```
     define devclass device_class_name library=libmgr1
      devtype=lto 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 that is 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.

Procedure

- 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
  ```

What to do next

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.

About this task

Set a LAN-free destination by completing the following steps:

Procedure

1. Define a copy group with a destination to the LAN-free capable storage pool. You created the 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
   ```

What to do next

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

Related tasks:

Confirming client node registration and configuration

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

Procedure

Verify that node settings are correct by issuing the following command:

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

What to do next

If node settings are not correct, issue the **UPDATE NODE** command to adjust settings for the node. If the node is not 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.

Procedure

Verify the LAN-free configuration by completing the following steps:

1. Start the storage agent by changing to the storage agent directory and issuing the **DSMSTA** command.

   Tip: 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 in the activity log to indicate whether 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. Verify that the backup is LAN-free and the sessions are established by issuing 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 that increases to the total amount of data that is backed up.
- Querying a session on the Tivoli Storage Manager server shows a few bytes (metadata) received for the same node.

If the node's session has these characteristics, and you receive a message that states 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 that states that the backup failed, ensure that the following conditions exist:
   - The Tivoli Storage Manager server is running. If the Tivoli Storage Manager server is not running, the storage agent does 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 try the backup operation again 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.

Procedure

Determine whether data movement is LAN-free by using 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 sessions are established:
  1. Log in to the Tivoli Storage Manager server and storage agent by using a Tivoli Storage Manager administrative command-line client.
  2. Verify that the backup is LAN-free and the sessions are established by issuing 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 that increases to the total amount of data that is backed up.
     - Querying a session on the Tivoli Storage Manager server shows a few 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.

Related information:

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

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

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*.

About this task

The main installation and configuration steps are:

1. "Establishing network connections" on page 72
2. "Installing and configuring software on client systems" on page 76
3. "Setting up storage agent data transfer on the Tivoli Storage Manager server" on page 87
4. "Configuring the storage agent" on page 85
5. "Verifying the storage agent configuration" on page 89

Related concepts:

"External libraries" on page 22

Related reference:

"Configuration work sheets for storage agent configuration" on page 12

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.
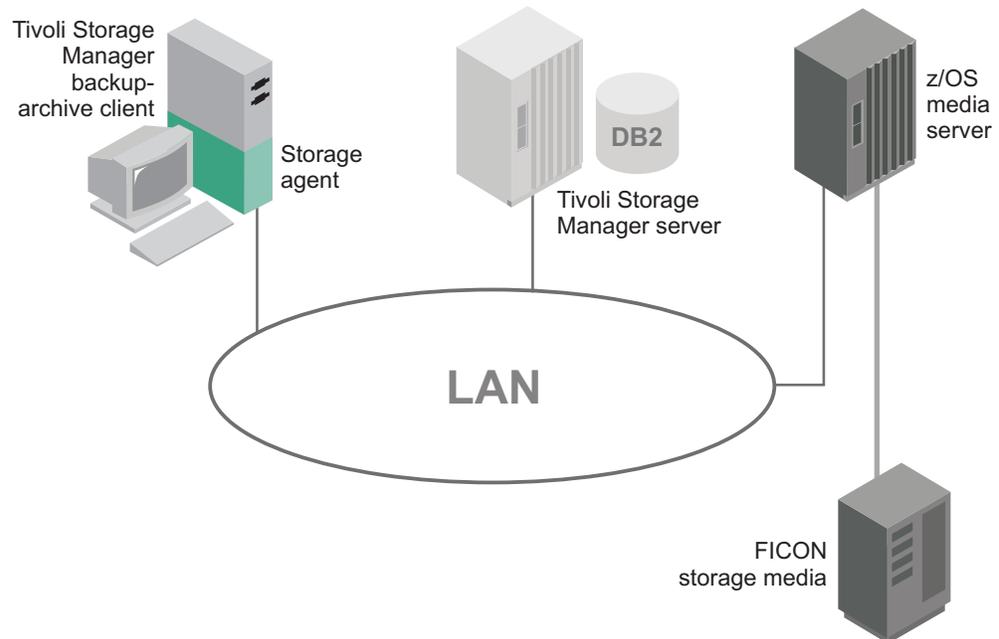

Figure 9. A z/OS media server environment

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

About this task

A typical backup operation to z/OS media server storage consists of the steps that are outlined in Figure 10:
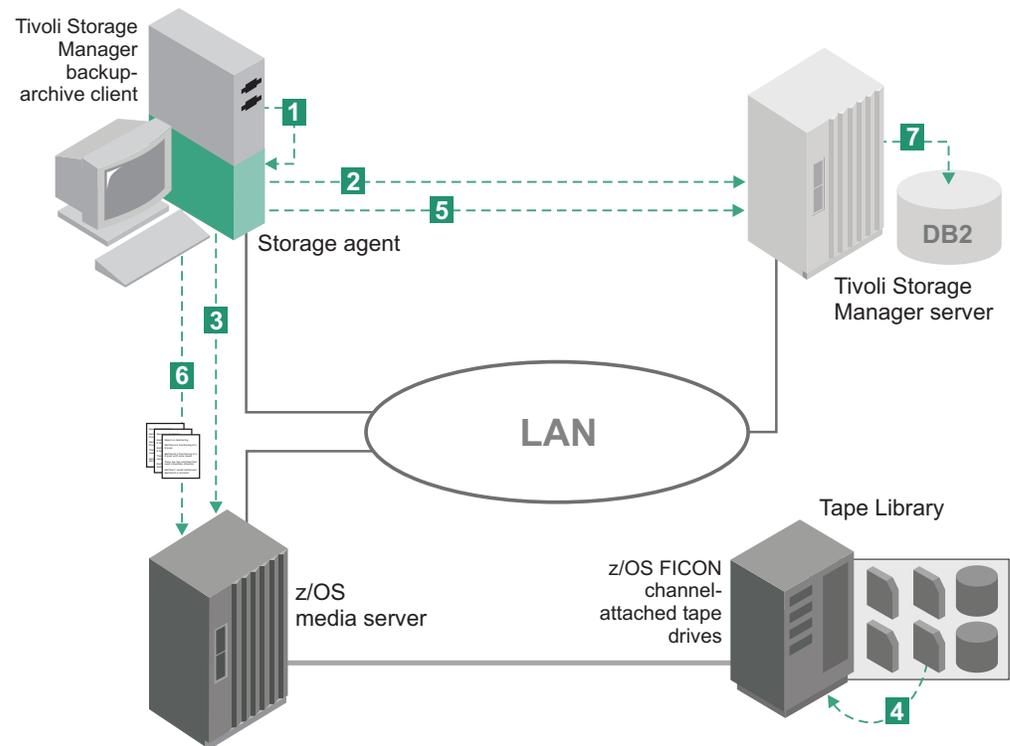
Figure 10. Data flow from the backup-archive client to z/OS media server storage

Procedure

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 it 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 11. 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
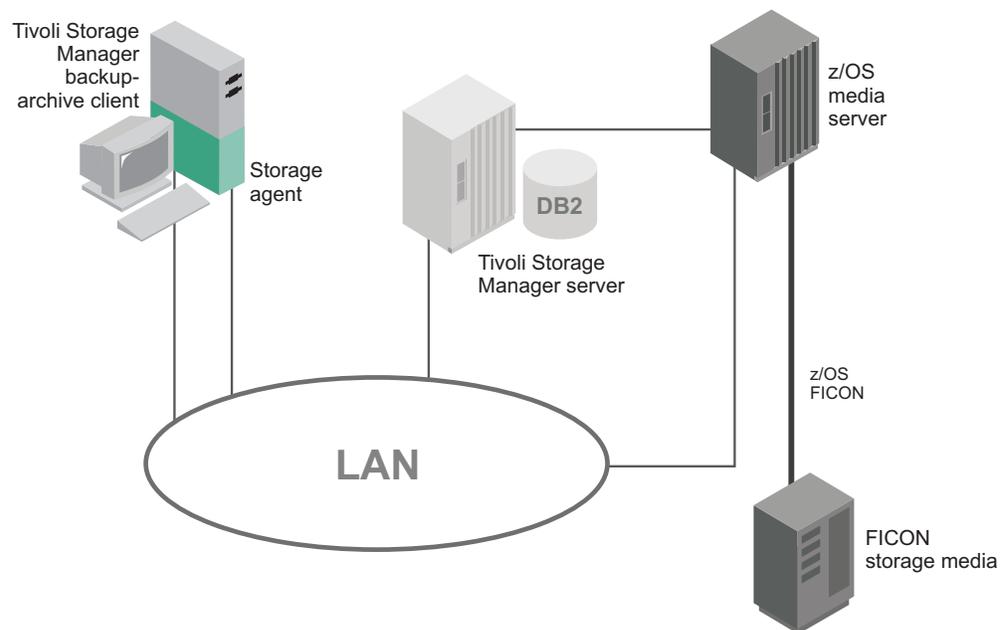- Tivoli Storage Manager server to the z/OS media server
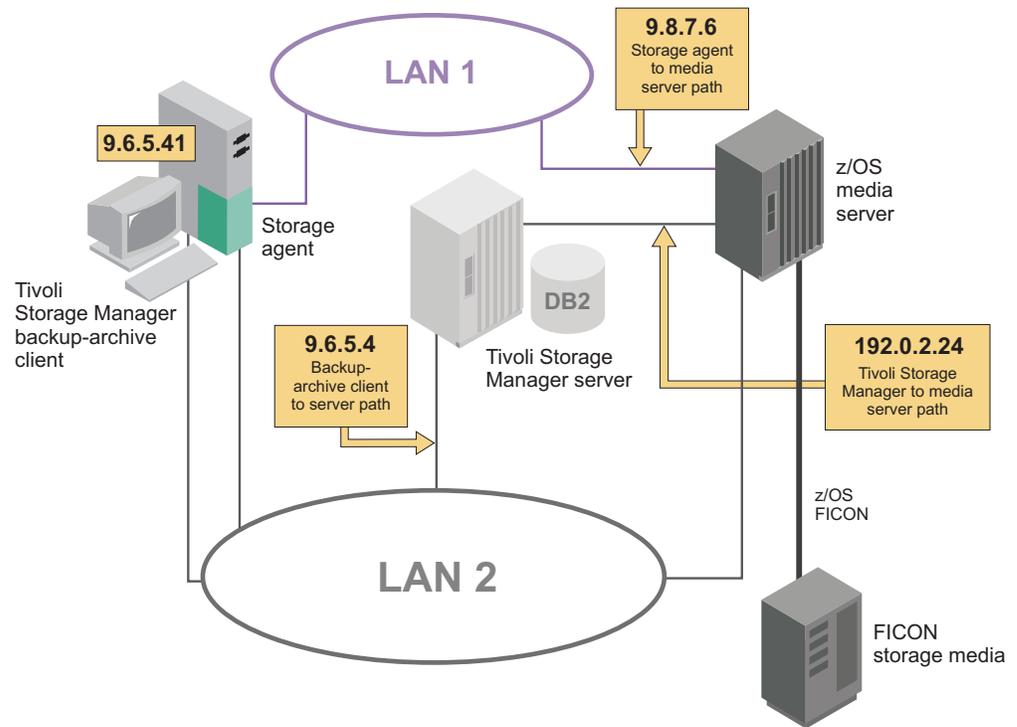
Figure 12. Network connection between a storage agent, a Tivoli Storage Manager server, and a z/OS media server, using two LANs.

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.

Establishing network connections in a Linux for System z environment

You can establish network connections for data movement from a storage agent to a z/OS media server on Linux for System z®.

Figure 13. Data movement from a storage agent to a Linux for System z can communicate with a z/OS media server using HiperSockets.

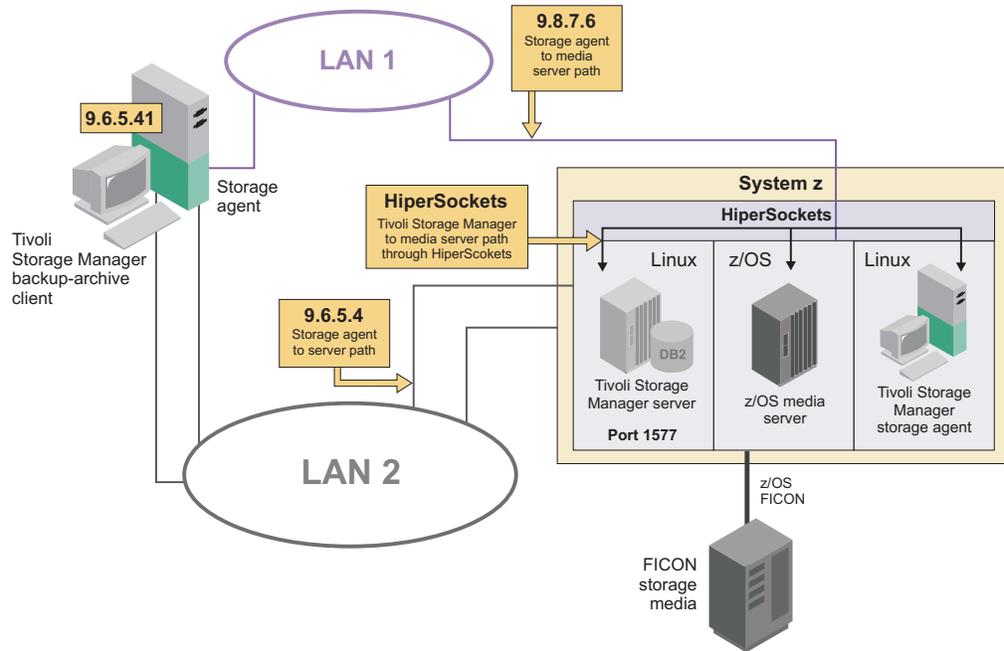Figure 13 displays a Tivoli Storage Manager for Linux on System z server that connects to a z/OS media server by using HiperSockets™. Client data is transferred between the storage agent and the z/OS media server using HiperSockets. Metadata is transferred from the storage agent to the Tivoli Storage Manager server, by using HiperSockets. It is possible that the connection from the Tivoli Storage Manager server to the z/OS media server can be isolated from the network connection of the client. Network addresses are specified in the server definition of the z/OS media server.

Table 12. Sample commands for establishing network connections in a Linux for System z Environment

Purpose	Sample command
Define the library resource.	`define library zosmedia libtype=zosmedia`

Define the storage agent.	`define server sqlstgagent`
	`serverpassword= sqlstgagentpw`
	`hladdress=9.6.5.41`
	`lladdress=1500`
	`description="sql storage agent for z/os`
	`media storage access"`

Define the Linux for System z storage agent.	`define server zlinuxstgagent`
	`serverpassword= zlinuxstgagentpw`
	`hladdress=hipersockets`
	`lladdress=1556`
	`description="zlinux storage agent hipersockets`
	`for z/os media storage access"`

Build a definition representative of the HiperSockets link to the z/OS media server.	`define server zosmedservhiper`
	`serverpassword=zosmedservpw`
	`hladdress=hipersockets`
	`lladdress=1555`
	`description="hipersockets link`
	`provides tsm server access to`
	`z/os media storage"`

Table 12. Sample commands for establishing network connections in a Linux for System z Environment (continued)

Purpose	Sample command

Define a library path for the Tivoli Storage Manager server to access z/OS media server by using HiperSockets.	`define path server1 zosmedia`
	`srctype=server`
	`desttype=library`
	`zosmediaserver=zosmedservhiper`
	
	This example uses server1 for the Tivoli Storage Manager server name.

Build a definition representative of the external LAN link to the z/OS media server.	`define server zosmedservlan`
	`serverpassword=zosmedservpw`
	`hladdress=9.8.7.6`
	`lladdress=1555`
	`description="external lan provide`
	`storage agent access to z/os`
	`media storage"`

Define a library path for the Tivoli Storage Manager storage agent to access z/OS media server via external LAN.	`define path sqlstgagent zosmedia`
	`srctype=server`
	`desttype=library`
	`zosmediaserver=zosmedservlan`

Define a library path for the Tivoli Storage Manager Linux for System z storage agent to access z/OS media server by using HiperSockets.	`define path zlinuxstgagent zosmedia`
	`srctype=server`
	`desttype=library`
	`zosmediaserver=zosmedservhiper`

The **SETSTORAGESERVER** command can be used to configure the storage agent for this example.	`dsmsta setstorageserver myname=sqlstgagent`
	`mypassword=sqlstgagentpw`
	`myhladdress=9.6.5.41`
	`servername=server1`
	`serverpassword=server1`
	`hladdress=9.6.5.4`
	`lladdress=1577`

Issue the **SETSTORAGESERVER** command to configure the storage agent to use Secure Sockets Layer (SSL) for this example.	`dsmsta setstorageserver myname=sqlstgagent`
	`mypassword=sqlstgagentpw`
	`stakeydbpw=stakeydbpassword`
	`myhladdress=9.6.5.41`
	`servername=server1`
	`serverpassword=server1`
	`hladdress=9.6.5.4`
	`lladdress=1577`

The **SETSTORAGESERVER** command can be used to configure the Tivoli Storage Manager Linux for System z storage agent for this example.	`dsmsta setstorageserver myname=zlinuxstgagent`
	`mypassword=zlinuxstgagentpw`
	`myhladdress=hipersockets`
	`servername=server1`
	`serverpassword=server1`
	`hladdress=hipersockets`
	`lladdress=1577`

Important: When a specific network address must connect the storage agent to the z/OS media server, you must supply an additional server definition. In Table 12 on page 74, the zosMedServLAN server is defined to expose the network address of 9.8.7.6 as a means of connecting to the z/OS media server. This address represents one of two network addresses that are used for z/OS media server connectivity. In the example, the HiperSockets connects the Tivoli Storage Manager server to the z/OS media server. The zosMedServHiper server definition HLAddress of HiperSockets defines the HiperSockets connection.

Both server definitions represent a single z/OS media server library resource. The two PATH definitions reference the same library.

An important distinction between a Linux for System z storage agent and other storage agents is the **zosmediaserver** parameter where each library path references a specific z/OS media server name. The Tivoli Storage Manager server uses the HiperSockets network and the SQL storage agent uses the external LAN network.

The Tivoli Storage Manager server and Linux for System z storage agent both use the HiperSockets network connection. The z/OS media server authenticates incoming connections from the Tivoli Storage Manager server and storage agent by using a single passphrase. Both server definitions must specify the same **serverpassword** value. In Table 12 on page 74, the **serverpassword** value of **zosmedservpw** must be specified for the z/OS media server **PASSPHRASE** option.

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.

About this task

Install and configure the software by completing the following tasks:
1. "Installing and configuring the client"
2. For Data Protection application clients: "Installing and configuring the API" on page 79
3. "Installing the storage agent" on page 80
4. "Configuring the storage agent" on page 85

Related concepts:

"Communications between the client, storage agent, and Tivoli Storage Manager server" on page 8

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 78

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 you begin

Before you begin 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 worksheets.
- 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.

Procedure

Complete the following steps to install and configure the client:

1. Using the LAN-free communications protocol and LAN-free port information that you collected in the configuration worksheets, modify the following file:

   - `dsm.sys` client system-options file

   Tip: The file can be 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 13, Table 14, and Table 15.

Table 13. 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 14. 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
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 15. 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
Shared memory	TCP/IP (standard with platforms)	Linux x86_64, Linux on System z, Linux on Power Systems

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 77. 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
```

What to do next

If you installed a Data Protection application client, you must install and configure the API.

Related reference:

"Client-system and server-system configuration work sheets" on page 12

"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.

Procedure

Complete the following steps to verify client node information:

1. Identify the client node or nodes that uses the storage agent. In a typical environment, a storage agent is used only by the client node that is 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 must 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 that is 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 97

"Using LAN and LAN-free paths in the same backup operation" on page 97

Installing and configuring the API

If you are using a Tivoli Storage Manager Data Protection application client, you must install and configure the Tivoli Storage Manager API.

Before you begin

Before you install and configure the API, verify that the client system meets the prerequisites for the application programming interface (API) software. You can download the latest software levels from the Tivoli Storage Manager product support website.

For details about installing the API software, see the *Backup-Archive Clients Installation and User's Guide*.

Requirement: If multiple Data Protection application clients are using LAN-free data movement, configure the API on each client system.

Procedure

1. Install the Tivoli Storage Manager client API.
2. Specify the environment variables. The Tivoli Storage Manager API uses unique environment variables to locate files.

   * DSMI_CONFIG is the fully qualified name for the client user option file.
   * DSMI_DIR points to the path that contains `dsm.sys`, `dsmtca`, and the subdirectory `en_US`.
   * en_US subdirectory must contain `dsmclientV3.cat`.
   * DSMI_LOG points to the path for the `dsierror.log` file.

   Tip: The quickest method to set the environment variables is to add these variables to the `user profile` file.

   The following examples show how to set up these environment variables in the user profile:

```
export dsmi_config=/opt/tivoli/tsm/client/api/bin/dsm.opt
export dsmi_dir=/opt/tivoli/tsm/client/api/bin
export dsmi_log=/home/user_a/logdir
```

3. Edit an existing stanza or create a stanza in the `dsm.sys` file to specify the communications options between the Tivoli Storage Manager API and server. For example:

```
servername               server_c
commmethod               tcpip
enablelanfree            yes
lanfreecommmethod        tcpip
lanfreetcpserveraddress  test.example.com
lanfreetcpport           1500
tcpport                  1502
tcpserveraddress         server_c.example.com
```

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

If a `dsm.sys` file does not exist in the directory that is specified by DSMI_DIR, create a symbolic link to the `dsm.sys` file in the Tivoli Storage Manager client installation directory. For example:

```
ln -s /opt/tivoli/tsm/client/ba/bin/dsm.sys
        /opt/tivoli/tsm/client/api/bin/dsm.sys
```

Related reference:

"Client-system and server-system configuration work sheets" on page 12

"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

Installing the storage agent

The storage agent can be found in the Tivoli Storage Manager installation package. You can obtain the installation package from the product DVD or from an IBM download site.

Before you begin

If you plan to download the files, set the system user limit for maximum file size to unlimited to ensure that the files can be downloaded correctly.

1. To query the maximum file size value, issue the following command:
   ```
   ulimit -Hf
   ```

2. If the system user limit for maximum file size is not set to unlimited, change it to unlimited by following the instructions in the documentation for your operating system.

About this task

If you obtain the package from the product DVD, ensure that the installation files are visible on the DVD drive.

If you obtain the package from an IBM download site, you must extract the installation files.

Procedure

1. Download the appropriate package file from one of the following websites, or you can access the files from the product DVD:

    - For a first time installation or a new release go to Passport Advantage at: http://www.ibm.com/software/lotus/passportadvantage/. Passport Advantage is the only site that you can download a licensed package file from.
    - For the latest information, updates, and maintenance fixes, go to the Tivoli Storage Manager support site: http://www.ibm.com/support/entry/portal/Overview/Software/Tivoli/Tivoli_Storage_Manager.

2. If you download the package from one of the download sites, complete the following steps:

    a. Verify that you have enough space to store the installation files when they are extracted from the product package.

    b. Download the package file to the directory of your choice. The path must contain no more than 128 characters. Be sure to extract the installation files to an empty directory. Do not extract to a directory that contains previously extracted files, or any other files.

       Also, ensure that you have executable permission for the package file.

    c. If necessary, change the file permissions by issuing the following command:

       `chmod a+x package_name.bin`

    d. Issue the following command to extract the installation files:

       `./package_name.bin`

       where *package_name* is like the following example:

       ```
       7.1.0.000-TIV-TSMSRV-LinuxX64.bin
       7.1.0.000-TIV-TSMSRV-LinuxS390X.bin
       ```

3. Select one of the following methods of installing the storage agent from the Tivoli Storage Manager installation package:

    - "Installing the storage agent by using the installation wizard" on page 55
    - "Installing the storage agent by using console mode" on page 56
    - "Installing the storage agent in silent mode" on page 57

Related reference:

"DSMSTA SETSTORAGESERVER command" on page 107

Installing the storage agent by using the installation wizard

You can install or update the storage agent by using the IBM Installation Manager graphical wizard.

Before you begin

Ensure that you review the following important information about installing:

- Verify that the operating system is set to the language that you require. By default, the language of the operating system is the language of the installation wizard.

On test servers only: Use the following command to bypass prerequisite checks such as the operating system and the required memory. Do not issue this command on a production server.

`./install.sh -g -vmargs "-DBYPASS_TSM_REQ_CHECKS=true"`

Procedure

Choose whether to install from a downloaded package file, or from the DVD, and complete the following steps to begin the installation:

Option	Description
Installing from a downloaded package file:	1. Change to the directory where you downloaded the package file. 2. Start the graphical interface installation wizard by issuing the following command: `./install.sh`
Installing from DVD media:	1. Insert the DVD into the DVD drive. **Tip:** Ensure that the installation files are visible on the DVD drive. 2. Start the graphical interface installation wizard by issuing the following command: `./install.sh`

What to do next

- If errors occur during the installation process, these errors are recorded in log files that are stored in the IBM Installation Manager logs directory.

  You can view installation log files by clicking **File** > **View Log** from the Installation Manager tool. To collect these log files, click **Help** > **Export Data for Problem Analysis** from the Installation Manager tool.

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 by using console mode

You can install or update the storage agent by using the command line in console mode.

Before you begin

Ensure that you review the following important information about installing:

- Verify that the operating system is set to the language that you require. By default, the language of the operating system is the language of the installation wizard.

On test servers only: Use the following command to bypass prerequisite checks such as the operating system and the required memory. Do not issue this command on a production server.

```
./install.sh -c -vmargs "-DBYPASS_TSM_REQ_CHECKS=true"
```

Procedure

Choose whether to install from a downloaded package file, or from the DVD, and complete the following steps to begin the installation:

Option	Description
Installing from a downloaded package file:	1. Change to the directory where you downloaded the package file. 2. Start the installation wizard in console mode, by issuing the following command: `./install.sh -c` You can generate a response file as part of a console mode installation. Complete the console mode installation options, and in the Summary panel, specify G to generate the responses.
Installing from DVD media:	1. Insert the DVD into the DVD drive. **Tip:** Ensure that the installation files are visible on the DVD drive. 2. Start the installation wizard in console mode, by issuing the following command: `./install.sh -c` You can generate a response file as part of a console mode installation. Complete the console mode installation options, and in the Summary panel, specify G to generate the responses.

What to do next

- If errors occur during the installation process, these errors are recorded in log files that are stored in the IBM Installation Manager logs directory.

  You can view installation log files by clicking **File** > **View Log** from the Installation Manager tool. To collect these log files, click **Help** > **Export Data for Problem Analysis** from the Installation Manager tool.

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 or update the storage agent in silent mode without any user interaction.

Before you begin

A silent installation can use response files for data input. The following sample response files are provided for installing, updating, and uninstalling Tivoli Storage Manager:

- `install_response_sample.xml`
- `update_response_sample.xml`
- `uninstall_response_sample.xml`

If you want to use one of the sample response files, they can be found after you extract the package files, in the `input` subdirectory. You can use these sample files as they are or you can customize them to suit your needs. It is optimal to use the sample response files. These sample files contain instructions and default values to help you avoid any unnecessary warnings.

On test servers only: Use the following command to bypass prerequisite checks such as the operating system and the required memory. Do not issue this command on a production server.

```
./install.sh -s -acceptLicense -vmargs "-DBYPASS_TSM_REQ_CHECKS=true"
```

Procedure

1. Create a response file, or use one of the sample response files such as `install_response_sample.xml` or `update_response_sample.xml`.
2. To start the silent installation, issue one of the following commands from the directory where the installation package file is extracted:

Option	Description

Installing from a downloaded package file or DVD media:	To start the installation by accepting the default values, issue the following command:
	
	`./install.sh -s -acceptLicense`
	
	To start the installation with a custom response file, issue the following command, where *response_file* represents the response file path, including the file name:
	
	`./install.sh -s -input response_file -acceptLicense`

What to do next

- If errors occur during the installation process, these errors are recorded in log files that are stored in the IBM Installation Manager logs directory.

  You can view installation log files by clicking **File** > **View Log** from the Installation Manager tool. To collect these log files, click **Help** > **Export Data for Problem Analysis** from the Installation Manager tool.

Related concepts:

"Software requirements" on page 7

Related information:

➥ Tivoli Storage Manager for Storage Area Networks support

➥ Passport Advantage download document

Defining and configuring the storage agent

You must define and configure the storage agent to communicate with the backup-archive client and the Tivoli Storage Manager server.

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.

Before you begin

Use the same name and password that you specified for the storage agent when you installed it on the client system.

Procedure

1. Define the storage agent by issuing the **DEFINE SERVER** command from the Tivoli Storage Manager server that manages the client's data. 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 is run to validate data on all metadata that is 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*.

2. Verify that the storage agent is defined to the library manager by issuing the following command from the library-manager server:

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

   Important: If the library-manager server is different from 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. The storage agent must be able to contact the library manager directly when it makes mount requests. If the storage agent is only defined to the library client, it attempts to use information from the library client to define itself to the library manager.

What to do next

You can complete the steps in "Configuring the storage agent."

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.

Procedure

Complete the following steps to configure the storage agent:

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."

3. To ensure communication between the storage agent and devices and libraries that are 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 88.

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 in the following directory:

   /opt/tivoli/tsm/StorageAgent/bin

5. Use the information that you collected in the configuration worksheets 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 you configure 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** option) or IPv6 (**COMMMETHOD V6TCPIP** option), 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 12

"Storage agent options file" on page 102

"DSMSTA SETSTORAGESERVER command" on page 107

"The device configuration file for the storage agent" on page 101

Related information:

Tivoli Storage Manager for Storage Area Networks support

Storage agent and client compatibility with Tivoli Storage Manager servers

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 path for the storage agent that is installed on the client to the server.

Before you begin

Before set up the storage agent data transfer, ensure that you have the information that is recorded in the configuration-information worksheets.

About this task

Perform these tasks to set up server-to-server communication and configure devices on the server:

1. "Setting up server-to-server communication"
2. "Defining paths from the storage agent to the z/OS media server" on page 88
3. "Confirming client node registration and configuration" on page 89

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.

Procedure

Set up server-to-server communication by issuing the following commands on the Tivoli Storage Manager server. Replace the values in the example with values from the configuration-information worksheet.

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

Results

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.

What to do next

Verify that the password is 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 tasks:
- Defining media resources to access the Tivoli Storage Manager server
- Server-to-server communication

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.

Procedure

Define a path for a z/OS media library by using 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.

What to do next

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

Setting the storage agent data transfer destination

You must 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.

Procedure

Set a LAN-free destination by completing the following steps:

1. Define a copy group with a destination to a 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
   ```

What to do next

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.

Procedure

Verify that node settings are correct by issuing the following command:

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

What to do next

If node settings are not correct, issue the **UPDATE NODE** command to adjust settings for the node. If the node is not 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.

Procedure

Verify the storage agent configuration by completing the following steps:
1. Start the storage agent:

   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. Verify that the storage agent is moving the backup data to the z/OS media server and the sessions are established by issuing 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 that is increasing to the total amount of data that is backing up.
- Querying a session on the Tivoli Storage Manager server shows a few bytes (metadata) received for the same node.

If the node's session has these characteristics, and you receive a message that states 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 that states that the backup 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 try the backup operation again 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.

About this task

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.

Procedure

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 are established:
  1. Log in to the Tivoli Storage Manager server and storage agent by 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 are 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 that increases to the total amount of data that is backed up.
     - Query a session on the Tivoli Storage Manager server to show a 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

You can configure the storage agent to start automatically when the system restarts.

Procedure

1. Log in to the system with the root user ID.
2. Copy the file dsmsta.rc from the directory where the storage agent is installed to the /etc/init.d directory. For example:

   cp /opt/tivoli/tsm/StorageAgent/bin/dsmsta.rc /etc/init.d
3. Ensure that the file has the execute permission. For example:

   chmod 755 /etc/init.d/dsmsta.rc
4. Issue the following **chkconfig** commands to automatically start the storage agent on run levels 3 and 5:

   chkconfig --add dsmsta.rc
   chkconfig --level 35 dsmsta.rc on

   Requirement: The script must exist in the /etc/init.d directory to run the **chkconfig** commands.

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 that are supported by the storage agent.

About this task

To start the storage agent:

1. Open the operating system command line and change to the storage agent directory (the default is /opt/tivoli/tsm/StorageAgent/bin).
2. 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 that is 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 advances beyond the point when LAN failover occurs, and the storage agent request does not succeed. If the storage agent request is unsuccessful, stop and restart the storage agent, and try the operation again.

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.

Procedure

1. Configure the administrative command-line client by defining 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.

Configuring multiple clients to use the same storage agent

You can configure two or more clients to use the same storage agent.

Procedure

To configure the clients:
- If the clients are on the same system as the storage agent, set the appropriate options and values in the client `dsm.sys` file.
- If the clients are not 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 you begin

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)

Procedure

Send data over LAN and LAN-free paths in the same backup operation by completing the following steps:

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.

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 that are 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 that are 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 that is 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 99 displays the normal migration path from an old storage pool that contains the data that is associated with the ACSLS library type to a new storage pool associated with an EXTERNAL library type and an ECARTRIDGE device class.
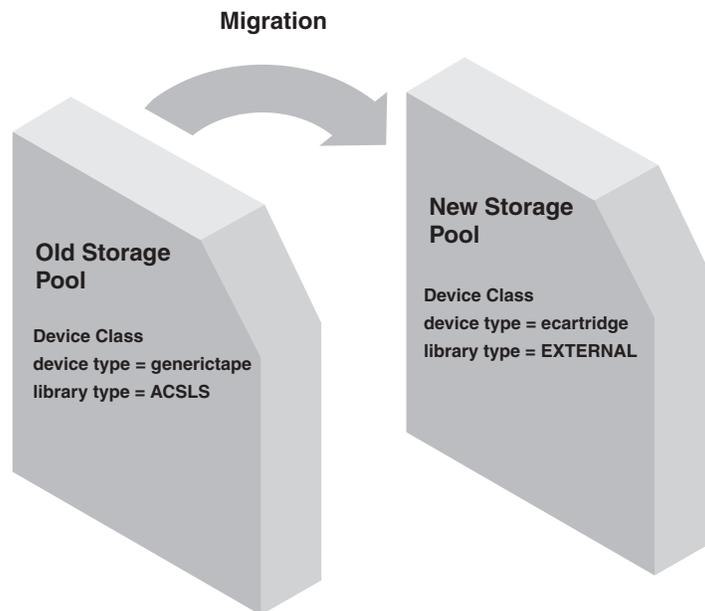
Migration

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

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 the Tivoli Storage Manager server with which the storage agent communicates.

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 you define 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.

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, do not change 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 options file is stored in the following default path:

    /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

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.

> Use different port numbers for the options `TCPPORT` and `TCPADMINPORT` 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 are 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 is used to service all session requests.

Additional options

ADMINONClientport
> Specifies whether 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 from 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

by using tape drives. It does not apply to non-tape, sequential-access device classes such as FILE. If the server information about the position does not match the position that is 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 the timeout, the server ends the session with the client. You might want to increase the timeout value to prevent clients from timing out. Clients might 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 might want to increase the timeout value to prevent clients from timing out if there is a heavy network load in your environment. Note, however, that many idle sessions might 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 are issued. The output helps the Tivoli Storage Manager service team to diagnose specific problems quicker. It is best practice that this option is 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 timeout 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 timeouts 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 cancel sessions that are based on the value you specify.

Important: If this option is specified in the server options file, that value overrides the value that is 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 uses SAN discovery in the following instances:

- During storage agent initialization
- When the device path is changed and there is a conflict between the device serial number and the device path that is provided by the server

`SANDISCOVERY OFF` is the default value for AIX, Linux, HP-UX, Oracle Solaris, and 64-bit Microsoft Windows.

The following options are available:

ON Specifies that the server uses SAN discovery when the device path is 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 special file name of the device if it is changed. If the HBA used by the storage agent does not support SAN device mapping, 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.

To help with problem determination, you can use the `dsmsanlist` module to obtain information about devices on a storage area network (SAN). The `dsmsanlist` module is installed by default when the Tivoli Storage Manager storage agent is installed.

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 from 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, extra sessions are allowed. Although the default value is typically sufficient, setting this option with a low number can adversely affect performance. If the storage agent has multiple client sessions, increasing the value of this option helps to 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. Non-client sessions include 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.

Use different port numbers for the options **TCPPORT** and **TCPADMINPORT** to create one set of firewall rules for client sessions and another set for the other non-client session types. By using the **SESSIONINITIATION** parameter of **REGISTER NODE** and **UPDATE NODE**, you can close the port that is specified by TCPPORT at the firewall, and specify nodes whose scheduled sessions are started from the server. If the two port numbers are different, separate threads are 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 is used to service all session requests.

Client sessions that attempt to use the port that is specified by TCPADMINPORT is 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 uses the port that is specified by TCPADMINPORT.

THROUGHPUTDatathreshold `kilobytes_per_second`

Specifies the throughput that client sessions must achieve to prevent cancellation after THROUGHPUTTIMETHRESHOL `minutes` elapses. The default value of 0 prevents examining client sessions for insufficient throughput. Throughput is computed by adding the send and receive byte counts and dividing by the length of the session. The length does not include time that is 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 canceling them if the data throughput threshold is not met (see THROUGHPUTDATATHRESHOLD). This threshold does not include time that is spent waiting for media mounts. The time threshold starts when a client begins sending data to the server for storage (as opposed to set up 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 is 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 108.

When you configure the storage agent by 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

```
►►──DSMSTA SETSTORAGESERVER──MYName──=──storage_agent_name─────────────────►

►──MYPAssword──=──storage_agent_password───────────────────────────────────►

►──MYHLAddress──=──storage_agent_hladdress──SERVERName──=──server_name──────►

►──SERVERPAssword──=──server_password──HLAddress──=──server_tcpip_address────►

►──LLAddress──=──server_tcpip_port──STAKEYDBPW──=──obfuscated_password───────►

►──SSL──=──YES──────────────────────────────────────────────────────────────►◄
```

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 is displayed 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 is displayed 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 is displayed 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 that 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:

Tivoli Storage Manager device utilities

You can use device utilities for tasks that are 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

/a Adds read and write permissions to Tivoli Storage Manager device files to allow all users access to the devices. Specify this value to configure devices if the Tivoli Storage Manager server is started by a non-root user.

/g Adds read and write permissions to the Tivoli Storage Manager device files to allow anyone in the same group as a root user to use the devices.

/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
```

Appendix E. Tivoli support information

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

From the IBM Support Portal at 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.

Communities and other learning resources

In addition to product documentation, many forms of assistance are available to help you get started as you deploy and use the Tivoli Storage Manager family of products. These resources can also help you to solve problems that you might have.

You can use forums, wikis, and other social media tools to ask questions, talk to experts, and learn from others.

User groups

Tivoli Global Storage Virtual User Group

Access this user group at http://www.tivoli-ug.org/storage.

This group makes it possible for individuals from many different industries and types of organizations to share information and work directly with the IBM product experts. Local chapters also exist where members meet in person to share experiences and hear from guest speakers.

ADSM.ORG

Access this mailing list at http://adsm.org.

This independently managed Storage Management discussion forum started when Tivoli Storage Manager was known as ADSTAR Distributed Storage Manager (ADSM). The members of this forum have many years of experience with Tivoli Storage Manager in almost every type of IT environment.

To subscribe to the forum, send 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*.

Tivoli Storage Manager community on Service Management Connect

Access Service Management Connect at http://www.ibm.com/developerworks/servicemanagement. In the Storage Management community of Service Management Connect, you can connect with IBM in the following ways:

- Become involved with transparent development, an ongoing, open engagement between users and IBM developers of Tivoli products. You can access early designs, sprint demonstrations, product roadmaps, and prerelease code.
- Connect one-on-one with the experts to collaborate and network about Tivoli and the Tivoli Storage Manager community.
- Read blogs to benefit from the expertise and experience of others.

- Use wikis and forums to collaborate with the broader user community.

Tivoli Storage Manager wiki on developerWorks®

Access this wiki at https://www.ibm.com/developerworks/servicemanagement/sm/index.html.

Find the latest best practices, white papers, and links to videos and other resources. When you log on, you can comment on content, or contribute your own content.

Tivoli Support Technical Exchange

Find information about upcoming Tivoli Support Technical Exchange webcasts at http://www.ibm.com/software/sysmgmt/products/support/supp_tech_exch.html. Replays of previous webcasts are also available.

Learn from technical experts who share their knowledge and then answer your questions. The sessions are designed to address specific technical issues and provide in-depth but narrowly focused training.

Other social media sites

LinkedIn
> You can join groups on LinkedIn, a social media site for professionals. For example:
> - **Tivoli Storage Manager Professionals**: http://www.linkedin.com/groups/Tivoli-Storage-Manager-Professionals-54572
> - **TSM**: http://www.linkedin.com/groups?gid=64540

Twitter
> Follow @IBMStorage on Twitter to see the latest news about storage and storage software from IBM.

Tivoli education resources

Use these education resources to help you increase your Tivoli Storage Manager skills:

Tivoli Education and Certification website
> View available education at http://www.ibm.com/software/tivoli/education.
>
> Use the Search for Training link to find local and online offerings of instructor-led courses for Tivoli Storage Manager.

Education Assistant
> Access resources at http://publib.boulder.ibm.com/infocenter/ieduasst/tivv1r0/index.jsp.
>
> Scroll to view the list of available training videos. Recorded product demonstrations are also available on a YouTube channel.

Searching knowledge bases

If a problem occurs while you are using one of the Tivoli Storage Manager family of products, you can search several knowledge bases.

Begin by searching the Tivoli Storage Manager Information Center at http://pic.dhe.ibm.com/infocenter/tsminfo/v7r1. Within the information center, you can enter words, phrases, or message numbers in the **Search** field to find relevant topics.

Searching the Internet

If you cannot find an answer to your question in the 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:
- IBM technotes.
- IBM downloads.
- IBM Redbooks publications.
- IBM Authorized Program Analysis Reports (APARs). Select the product and click **Downloads** to search the APAR list.

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.

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 and download the IBM Support Assistant web page at 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 a software problem might be available from the IBM software support website.

Procedure

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 the product, or a component for which you want to find a fix.
2. Click **Downloads**, and then click **Search for recommended fixes**.

If you have not previously customized the site:
Click **Downloads** and search for the product.

Receiving notification of product fixes

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

Procedure

1. From the support page at http://www.ibm.com/support/entry/portal/, click **Sign in** and 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.
2. Click **Manage all my subscriptions** in the Notifications pane.
3. Click the **Subscribe** tab, and then click **Tivoli**.
4. Select the products for which you want to receive notifications and click **Continue**.
5. 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.

Procedure

1. Ensure that you have completed the following prerequisites:
   a. Set up a subscription and support contract.
   b. Determine the business impact of the problem.
   c. Describe the problem and gather background information.
2. Follow the instructions in "Submitting the problem to IBM Software Support" on page 116.

Setting up and managing support contracts

You can set up and manage your Tivoli support contracts by enrolling in IBM Passport Advantage. The type of support contract that you need depends on the type of product you have.

Procedure

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:** For critical, system-down, or high-severity issues, 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 level	Description
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 critical, system-down, or severity 1 issues, 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**.

Appendix F. 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 IBM Tivoli Storage Manager family of products includes the following accessibility features:
- Keyboard-only operation using standard operating-system conventions
- Interfaces that support assistive technology such as screen readers

The command-line interfaces of all products in the product family are accessible.

Tivoli Storage Manager Operations Center provides the following additional accessibility features when you use it with a Mozilla Firefox browser on a Microsoft Windows system:
- Screen magnifiers and content zooming
- High contrast mode

The Operations Center and the Tivoli Storage Manager Server can be installed in console mode, which is accessible.

The Tivoli Storage Manager Information Center is enabled for accessibility. For information center accessibility information, see "Accessibility features in the information center" (http://pic.dhe.ibm.com/infocenter/tsminfo/v7r1/topic/com.ibm.help.ic.doc/iehs36_accessibility.html).

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/v7r1.

To view glossaries for other IBM products, see http://www.ibm.com/software/globalization/terminology/.

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